1 00:00:00:170 --> 00:00:06,298
good afternoon and welcome to Wallops

2 00:00:03,839 --> 00:00:07,589
Flight Facility in Virginia I'm Tabitha

3 00:00:06,299 --> 00:00:09,660
Thompson with NASA's Office of

4 00:00:07,589 --> 00:00:11,940
Communications this afternoon we're

5 00:00:09,660 --> 00:00:14,070
going to hear about several of the

6 00:00:11,939 --> 00:00:15,480
research experiments headed up to the

7 00:00:14,070 --> 00:00:18,089
International Space Station on

8 00:00:15,480 --> 00:00:21,359
tomorrow's cargo resupply services

9 00:00:18,089 --> 00:00:25,410
mission on orbital ATK's Cygnus we have

10 00:00:21,359 --> 00:00:26,820
a lot of great information to share with

11 00:00:25,410 --> 00:00:29,429
you we look forward to hearing your

12 00:00:26,820 --> 00:00:31,050
questions I'm gonna start with Camille

13 00:00:29,428 --> 00:00:32,879
Elaine with the International Space

14 00:00:31,050 --> 00:00:34,710
Station program science office and
Patrick O'Neil who's with the Center for the Advancement of Science in space.

Thank you Tabatha hello everybody.

It's so great to have a packed house and thank you for your interest in the science and research we're flying.

Tomorrow we are always excited tomorrow.

We'll be flying about 1900 pounds of research supplies and science onboard.

Orbital ATK CRS eight and that research will be supporting the 300 ongoing or new investigations that we have currently going on during expedition 53.

All the experiments are supporting a 54.
multitude of scientific disciplines that

the ISS has the capability to support

including the bulgy and biotechnology

physical science research human research

technology demonstration earth and space

science and education we know the

presence of the astronauts really

inspire students so we take that

opportunity to engage them in their

science technology engineering and math

the reason we do this research is for

several purposes to advance our

scientific knowledge through scientific

discovery we also want to enable future
space exploration we are also creating

44
00:01:57,060 --> 00:02:01,920
this commercial marketplace in low-earth

45
00:01:59,849 --> 00:02:05,069
orbit and then we're doing research that

46
00:02:01,920 --> 00:02:07,978
has a benefit to improving the quality

47
00:02:05,069 --> 00:02:10,769
of our lives here on earth we sponsor

48
00:02:07,978 --> 00:02:13,860
many different types of research NASA

49
00:02:10,770 --> 00:02:15,920
sponsors research to support our science

50
00:02:13,860 --> 00:02:18,480
missions to support our space technology

51
00:02:15,919 --> 00:02:21,089
missions to support our human research

52
00:02:18,479 --> 00:02:23,939
we also have international partners it's

53
00:02:21,090 --> 00:02:26,159
an international space station so we do

54
00:02:23,939 --> 00:02:28,500
research that is in support of our

55
00:02:26,159 --> 00:02:30,659
international partner national goals and

56
00:02:28,500 --> 00:02:33,569
then we do research that supports the

57
00:02:30,659 --> 00:02:35,490
ISS US National Laboratory which is
managed by the Center for the Advancement of Science in space and now, I'll hand it over to Patrick who represents cases and he'll tell you a little bit more about the research being done in the US National Lab Patrick. thank you very much Camille well hey once again as Camille said it's awesome to see so many people out here and my name is Pat Romo at the Center for the Advancement of Science in space. some of you might have been hearing about this organization called casus or the US National Lab prior to your
being here how many people knew that the ISS actually was a National Laboratory

Wow okay well that's it seems every single launch we're getting more and more and more people that are raising their hands which means that we're sending a lot of great research to the space station that's a great problem to have so a little background though for those that might not be familiar with the ISS National Lab concept in 2005 Congress declared the u.s. portion of National Laboratory the thought process was to try to open up research
channels to non NASA initiatives

specifically to use the space station to benefit life on Earth and so casus

became that entity that it was tasked

with managing the National Laboratory in 2011 and I have to say that we are really starting to enter the the golden years of the International Space Station

from a research perspective we're constantly evolving the station for the needs of the research community you're going to be hearing from some of the individuals who are responsible for commercial facilities on the station

...
today that are enabling more and more
access for researchers to be able to

leverage this incredible platform to

benefit life on Earth on this particular
launch we really do have kind of a

myriad of investigations that are going
up representing Life Sciences Earth

observation cube satellite technology

and there's gonna be an abundance of

student payloads are going up on this

investigation so it's truly an exciting
time to be involved in in the ISS

research and you know I think that we're

gonna hear a heck of a lot more about

some of the the payloads
me going up today I think at this point

Camille and I were happy to answer any

questions that the folks might have so

you mentioned there are 300 or so

experiments ongoing new who decides on

which experiments get involved in this

so I talked a little bit about

that earlier in the night and a news

conference so we have different sponsors

that sponsor their particular research

right so from a NASA perspective the

research we do to enable future space

exploration is sponsored through several

missions the science mission the space
technology mission the human research program then we have the US National Lab portfolio and they decide what science is important to them that has a benefit to our lives here on earth and so that's a whole other portfolio that they decide and then the international partners they decide what is important to them that support their national goals so those sponsors actually decide what type of research we'll do on the space station I understand there's a CubeSat launcher on the ISS but also the Cygnus that's going up has a certain capacity for cube
sets so I guess we're seeing that from here what what's the life of a CubeSat after it is you know orbited and and how long they take to deorbit and what's the capacity of the Cygnus oh my gosh you know what hold that question for the guys we have the CubeSat experts here the PI's who are gonna fly their CubeSat and it actually just depends so they'll be able to answer that question hi my name is Edward young from our hairiest room in high school you mentioned casus and that's where I believe the funding for the student
I guess that's university students and if so is that gonna be opening doors for potential high school programs as well so I would actually say the vast majority of the STEM payloads that go up that are part of the ISS National Lab manifest represent high school students and yeah middle school basically six to twelve so that's really kind of where we focus an awful lot of our efforts and you know as an educator I'm sure that you know that you know when you're in the middle school ages that's typically where you tend to see
the students kind of deter from math and science and so if anything we're really trying to you know show that the space station is something that you could take advantage of from a student research perspective there's a variety of programs that we are involved with or that we sponsor you're gonna hear actually a little bit about some of them today but you know happy to go and talk with you further about some other ways that you can be involved from a STEM education standpoint
thank you both very much up next we have Henry Martin to answer those burning questions about deploying Cuba keep sets.

Henry Martin with nano racks and Cassie Wang who is with the cargo resupply systems she's an engineer with orbital ATK hi welcome everybody I'm Cassie Wong.

with orbital ATK I'm a systems engineer on the CRS program Cygnus is primary mission is to deliver cargo to the International Space Station and to transport trash on the way back in vehicle reentry so we're very excited coming up the Cygnus service module.
consists of the pressurized cargo module

and the service module you can see in

the the picture behind me the lower

portion is the service module and the

upper portion is the cargo module the

service module consists of all the

subsystems that we need to fly the

missions such as the avionics the

communications equipment the guidance

navigation and control equipment there

are propulsion and all the other

subsystems the pressurized cargo module

holds over 900 cubic feet of volume for

the cargo somebody I work once told me
that holds 400,000 golf balls I

don't know I don't know if that provides

much of a reference but it does hold a

lot of cargo Oh eight-eight is delivering over 7400 pounds of cargo to

the station but Cygnus has really evolved into much more than just a

transport and delivery service it's now become a valuable secondary science

platform for all these payloads that you're gonna hear today so we're very excited about that at orbital ATK on the past three missions we hosted the Sapphire experiment and that studied flame propagation in microgravity
environment and that occurred after we departed the station the experiment began so that was an exciting opportunity for us Oh a 8 is also paving the way for a new capability for Cygnus and it's acting as an ISS lab extension so this will mean it's an active laboratory for the crew to use while on station this doesn't seem like too much of a big deal but if you think about it if you bring stuff continually into your house over and over it's going to get quite full if we're not bringing things out we bring a lot of cargo we bring a
lot of experiments to the space station

and not as much comes out so they are

quite tight for space for running labs

and experiments up there so being able

to unpack Cygnus and then bring in the

tango lab facility and use it as an

active lab is really quite a new

capability for the station and in quite

an exciting thing for Cygnus so we're

really excited about that opportunity we

are thrilled at or related to ke to

promote increasing our knowledge and

capabilities in space through the use of

Cygnus we are in a future mission going
to be able to support live rodents on

our mission so we can bring them up to

the space station for additional space

research we also have some concepts that

go beyond the international space

station there's some concepts out

there of using Cygnus as a deep space

habitat by connecting multiple

sicknesses together and allowing for for

it to be used as a habitat in space one

of our key partners though on secondary

missions is NanoRacks and NanoRacks is

flown with us for the last three

missions and they are flying again
and we're really excited it's record-breaking in this case that we have a full complement of satellites onboard NanoRacks.

so we have 14 cube SATs going to deploy deploy on oay 8 so here to talk a little bit more about that is Henry from from NanoRacks

why thank you Cassie hey good afternoon everybody my name is Henry Martin I'm going to talk all about the stuff we have on board the Oh 8 launch which includes stuff on the outside of the Cygnus as well as the inside I have some
slides so can we throw those up please

ok anyway I can start talking so like I said we have stuff on the inside and the outside that's pretty cool I'm gonna focus on the outside stuff first and then we'll talk a little bit on the inside and again I'm gonna focus more on our hardware which my job is to get the satellites that our payload developers have made into orbit so if we look here here's a couple of satellites there's a model of ice ARRA that's it that chefs at so they these satellites are being integrated in our cleanroom in Houston
to the external satellite deployer which goes on the service module of the Cygnus

so that's on the outside so go to the next slide here like Cassie said we have 14 total here it is again you can go to the next slide please so once they're all done we've done 14 total it's long hours long days it's a lot of hard work a lot of paperwork but that's ok once we're all done that's the last time anybody ever is going to touch so satellites so they're no more hands on people and so what we'll do is we'll put it in a box and then we ship it from
Houston to here so once it's here it's another game time so next slide please

and this is a video so this is kind of cool this is a time-lapse video of how we actually install this thing on the side of the service module of the Cygnus so you see that panel with the white square around it they wrap the bag up that's where the box which is kind of on the bottom left is going and so what we do it's it's really great to work with orbital on this they're so good at it it's hard work they have a fantastic team and what happens here is
essentially we take the box we mounted

on the outside cover it in a blanket so

it stays nice and warm and everybody's

happy and that's it that's also the last

time than anybody will ever touch it so

it's once it's there keep in mind it

never goes through the inside of the ISS

so it just hangs out with the Cygnus

until once it's done the Cygnus will

unload all of its cargo they'll load it

full of the trash and waste that is made

on orbit and instead of it going to burn

up immediately the Cygnus actually

travels to a higher orbit so the ISS

goes around 400 kilometers and what the
Cygnus does is it uses its extra prop to go to 500 and so if your question earlier about lifetime that's cool.

higher orbit equals higher lifetime

low-earth orbit actually pulls in things very slowly so eventually they all burn up and it cleans itself but if you go to 500 kilometers we estimate you get like three to five years a lifetime if you go directly from the ISS it's like nine months to a year so with that extra time you can get more science get more value some of our customers are doing straight research
our customers use the information they get and they sell it to various people for uses so that's really great about the Cygnus like I said this is the fourth time we've done this it's totally full as Cassie said before we were not able to fill it but now we've we are currently displaying the full capability of the system so if you go to the next slide so it's done it leaves you can see the little white box below well I guess above the green light that's our thing this is always 635 go to the next slide please
and so there they are the crews happy

they get to watch the leave you can see

the white box pretty cool

next slide please all right so this is a video of how this actually works so right now it's at 500 kilometers you can see the Earth orbiting in the back there it's pretty neat give it a little second and you can see there's three doors each one of those doors has a bunch of satellites and one of the silos behind it and once orbital issues the commands hopefully it'll go here a second the door will open and out come the cube
sets just like that so this time we'll

00:15:34,220 --> 00:15:37,759
have 14 total so we'll do it in sort of

00:15:35,899 --> 00:15:39,620
a phased approach we'll wait a few hours

00:15:37,759 --> 00:15:42,889
deploy the rest wait a few hours to play

00:15:39,620 --> 00:15:45,549
the rest and that's that's it for the

00:15:42,889 --> 00:15:48,169
external stuff our customers include

00:15:45,549 --> 00:15:51,889
universities research centers whom you

00:15:48,169 --> 00:15:54,829
will hear from soon the NRO office of a

00:15:51,889 --> 00:15:57,139
base launch as well as a commercial

00:15:54,830 --> 00:16:00,200
customer who we continue to contribute

00:15:57,139 --> 00:16:05,289
to their constellation on orbit the

00:16:00,200 --> 00:16:05,290
lemurs at aspire global out of Glasgow

00:16:07,120 --> 00:16:11,570
so that's it for me we also have some

00:16:09,620 --> 00:16:14,419
stuff on the inside which we'll talk

00:16:11,570 --> 00:16:16,250
about here one of them is a biological
satellite just super cool it's the first one for us it's a lot of many first for an annex here and with that I think I think I can turn this over thank you both don't don't like that if you have a question please raise your hand and wait for the microphone to reach you if you're following along on NASA social channels just use the hash tag ask NASA I think we have one right now so yeah this question came in through a hashtag ask NASA and it's about for orbital and it's the questions
from the sky fire 747 is there a specific order of loading supplies onto the rocket very good question.

yes there is so certainly things that are closer to the door are more accessible to the astronauts and so NASA gives us a priority for what is installed and based on what they are going to take out so certainly the crew will start in the front and then they go towards the back so that is given to us by NASA with install this in certain order and we follow that accordingly there's also what's considered late load
cargo

so things that are time critical those are installed later in our flow point it

to this but you didn't really tell us what it is so this is a satellite
deployer that we use on the inside of the ISS so a little different from the outside this goes on an airlock slide table in the Japanese airlock module

what it is is we take these satellites actually one like this one like this and on the ground we put them as we call it in the can we put it in here and then what we do is they load it on their
Cygnus it goes up the crew pulls it out

they'll put it on a slide table actually

there will be eight of these and the

Japanese robotic arm will come it'll

grab it it'll kind of point it away and

someone clicks a button and out go to

CubeSat so we are launching one of these

like this we're launching another one

which houses each cam set which we'll

hear from soon and that will join a

current complement of three others on

orbit one from Goddard one from JPL and

one from Penn State University

and they will perform their airlock

operations hopefully a little bit later
this month and that will be our 13th mission so we should get close to 200 cube sets and then once we deploy from the Cygnus we'll have hit over 200 before we came up here earlier that this is actually one that has flown so this is a that's true we reuse all of this stuff if we can I wish we could use the Cygnus but unfortunately it it burns up can't get it but this we reuse we can they work every time great thank you any other questions in the room I have a quick question my name is Brian Mayer I'm from the
orbital social or the CubeSat see

ejected mechanically or through a propulsive method it's just a spring

actually so what happens is the whole system is loaded before against the doors as we saw and when the door is open that spring works every time just

pushes them right out

but propulsion is a good thing you mentioned because two of the satellites were flying which you'll hear actually

have a small water prop system and one I won't steal your thunder and that one is

neat because not only is it one of the
first times we're flying prop to the station but this will actually go above the ISS which is the first for everybody us including the whole program we have time for one more question do we have one in the room anything from ask NASA okay thank you both thanks our next speaker is Elwood aegisub who is deputy program manager of the small spacecraft technology program hello everyone I'm really happy to be here the space technology Mission Directorate through the small spacecraft technology
program will be flying three spacecraft

on this particular mission and they're both going to be demonstrating some advanced communication systems you'll see some videos that will come up shortly that will actually show you what the projected flight sequence will look like for both of them these are models of the two spacecraft we have here the first one is ice ara the integrated solar array reflector a communication satellite and this other one there will be two of these is called OC SD optical communications and sensor demonstration
satellite and this one the optical communication satellite will demonstrate

the first time in the small sat platform

laser communications they're going to be using some technology that's very similar to some of the terrestrial technology it'll have a capability to demonstrate communication speeds through optical communications up to about 200 megabits per second which is really really an advancement for small satellites and then the the ice ara will use ka-band communications again to demonstrate high bandwidth communication
speeds or is that video okay I think the

first one should be ice ara

and it is and so this is the ice era

after it's been ejected from the

canister we call it and the unique thing

about this is that the solar array which

is on one side and then the antenna is

on the other side so this is the solar

array side that you see that will deploy

after the spacecraft is stabilized and

the particular orbit it'll pass over a

ground station that's located near JPL

in Southern California

and the system will start transmitting
their be their radio transmission over

the ground station there and with that

it'll we have about five months or so of

a lifetime we'll be doing several passes

to look at downloading basically some

some data at this high bandwidth speed

and this is the the ground station over

JPL next one in the next video you're going to see will be OCS D is being

[Music]

[Music]

[Music]

[Music]
there's a ground station so here's the

557
00:23:58,378 --> 00:24:03,778
maneuvering portion that I suppose so

558
00:24:01,589 --> 00:24:07,278
they'll they'll get to position roughly

559
00:24:03,778 --> 00:24:10,109
about 200 meters from each other and

560
00:24:07,278 --> 00:24:11,569
this is done autonomously this is not

561
00:24:10,109 --> 00:24:20,398
done from the ground which is another

562
00:24:11,569 --> 00:24:23,250
important feature and so these are

563
00:24:20,398 --> 00:24:25,558
capabilities that not will not only

564
00:24:23,250 --> 00:24:28,138
enhance the capabilities of the CubeSat

565
00:24:25,558 --> 00:24:30,298
platform in and of itself but it'll also

566
00:24:28,138 --> 00:24:32,628
be used it can be used in a

567
00:24:30,298 --> 00:24:35,519
cross-cutting fashion across other

568
00:24:32,628 --> 00:24:39,538
science missions that they help to to

569
00:24:35,519 --> 00:24:49,190
hope to work on and for future NASA

570
00:24:39,538 --> 00:24:49,190
missions that's it thank you thank you
if you have a question in the room please raise your hand and wait for the microphone to get to you and if you're following along on NASA social channels make sure that you use the hashtag ask NASA so while the satellites are in orbit what's the time what's the duration that they'll be in contact with with the ground SATs how long over each pass well they have direct contact with the ground stations they'll have something on the order of like maybe about forward about 10 minutes per pass it all depends upon the ground speed and
their tracking

they'll be doing a little bit of slewing as well over the ground

stations to maximize the contact

period

next question we'll take is from asknasa

so now this question is how many Mbps do current small satellites transmit

transmit via RF radio frequency so

that's a good question we're typically using UHF and lower

transmission speeds 99.6 kilobits so if you can imagine 200 with this now several orders of magnitude and we're in
the Giga Hertz range for this so it's very high speed right so at least an order of magnitude the KB hello um we were up at NASA Goddard last week learned about another NASA mission for laser communication between the ground station the satellites and the international space station is this laser communication in any way related to that one or is this a completely separate independent decision this is an independent this was we have funded this several years ago the thing that was interesting about this particular system
is is they use a combination of trusted

terrestrial based systems as well as as

more space-based applications but

they've been able to get this in a

really compact format the laser had

ended of itself is just very small so

this is a 1.5 u CubeSat and they looked

at this from the perspective of power

and NASA is your hand and do we have

anything from ask NASA

thank you thank you

our next speaker is Stubbins primo and

he is the project manager for ECAM sat

also from Ames Research Center hello

it's great to be here Wallops today
happy Veterans Day I know we have a few veterans around I've spoken to so I'm talking I'd like to talk about ECAM sat today's stands for e.coli antimicrobial satellite and it's sponsored by the human exploration and mission human exploration and operations Mission specifically the division is space and life space life and physical sciences at NASA headquarters that sponsored this today it is our goal to enable science enabling discovery for new scientific methods so with that said we're studying antibiotic
resistance for a number of reasons one

is the astronauts have some immune

suppression issues in space and there's

specifically a type of e.coli that we're

flying today that will have a mutant and

a wild-type we have two different genes

in there and basically the genes are one

is has ability to show a stress response

and another one the other mutant is has

a deleted gene so the the knockdown

effect from the antibiotic is different

in both types and we'll compare from

basically up in space and microgravity

versus the 1g environment on earth so
we'll have a parallel experiment on the ground so the satellite itself the experiment was designed by dr. AC Mateen at Stanford University I'd like to put up some slides if we have those so here's the actual spacecraft the spacecraft itself is basically the size of two loaves of bread or and it's 23 pounds or 10 have kilograms so it has two communication systems on it one is a UHF radio which will be communicating with the ham radio community around the world and will have a system on it to do
outreach so ham radio operators can help

00:30:05,148 --> 00:30:09,768
us find the spacecraft in the first four
days of launch and that's a great program Santa Clara University will also
be communicating with it for us and doing mission operations so within this

00:30:14,148 --> 00:30:20,329
there one third of the spacecraft houses

00:30:24,980 -- 00:30:30,548
we have a micro fluidics card so like to show the next slide

00:30:33,169 --> 00:30:39,169
so this is the experiment cannister it's a one atmosphere cannister and basically

00:30:39,169 --> 00:30:43,788
has electronics that will do detection

00:30:42,349 --> 00:30:46,839
effect there'll be four three
48-hour phases of the experiment and

we'll be feeding them administering

antibiotic and then watching a stress

response with a indicator that measures

enzyme enzyme activity or a metabolic

change as enzymes are expressing with

the two different stress responses and

after the antibiotic is administered

next slide please

so within the canister we have a number

of items that it looks like a spaghetti

of it looks like a mess here but we can

compact that all down and there's a very

precise packing order so within that we
have a number of custom blood bags that we've developed and that houses the actual liquid Wilson sent through the system next slide so this is after the experiment has actually been activated and gone through a number of steps there's 20 steps in this experiment and it'll last about 150 hours if we could pan back to the desk here can the camera come back to me for a moment thank you so we have this canister and this is roughly the size of the laboratory that we'll be flying it connects up with the rest of the
spacecraft and the whole system operates off three to ten watts of power compared to your incandescent light bulb this is pretty amazing and it also maintains human body temperature to 37 degrees centigrade plus or minus 1 degrees C even with extreme environment of space so hundreds of degrees swing outside the spacecraft on the surface temperatures and we are able to maintain this at human body temperature still within that we have pumps and valves very precise circulation pumps and metering pumps where we actually mix the antibiotic in
the system and we administer the doses

00:32:47,009 --> 00:32:55,680
of high medium low and control which

00:32:50,519 --> 00:32:59,569
would be no antibiotic this is an

00:32:55,680 --> 00:33:02,519
example of a micro fluidics card and I

00:33:02,519 --> 00:33:08,430
know it's hard to see but it has 48 well

00:33:06,420 --> 00:33:10,259
plates and we have about 48 little

00:33:08,430 --> 00:33:13,170
experiment wells that are the size of an

00:33:10,259 --> 00:33:15,210
eraser head here and it contains

00:33:13,170 --> 00:33:18,720
different ecoli experiments which we

00:33:15,210 --> 00:33:20,850
have photo detectors and LEDs that shine

00:33:18,720 --> 00:33:22,589
through and basically the channels in

00:33:20,849 --> 00:33:28,409
here are so small that even the smallest

00:33:22,589 --> 00:33:30,119
ant would not be able to crawl through

00:33:28,410 --> 00:33:33,870
it so as we go on I'll just show you a

00:33:33,870 --> 00:33:38,339
little bit of a build up of what we do
so we have heaters that we add and this keeps a very even distribution of heat around the system and on and on we start building up more of the components and then you get to the valving system and all of this works with the circuit board with an automated program the system is autonomous and it will run every step of this experiment we will basically have Santa Clara University to intervene if there's any kind of issue but mostly their job is to download data which is similar to a sound a sound byte or song.
that you download often

it so in scale I have a video to show today as well can we show that y-yeah there you go so this is us loading the actual experiment that will go up on this flight on tomorrow and the build up the satellite basically that this container has been loaded in at this point there are solar panels we add which produces the power for the mission and we have battery systems that help store that power we have a radio on the end there that's a patch antenna and we communicate down to Santa Clara
University this is on October 25th

actually loading into the NanoRacks deployer that you will be used on this

mission after that it'll be taken up to the space station in the Cygnus module

and unloaded by the astronauts they will put it through the gem airlock and after this they'll deploy it there's an animation of it deploying so ECAM sat will deploy and then it'll have four days stabilization phase and after those four days microgravity will be pristine enough for us to run our experiment it could happen
earlier but we have hysteresis rosin bag

permanent magnets to help with this this

is a teardown of the laboratory as well

and this is micro fluidics card as it

would sit we'll go through each one of

these wells and and ping each well and

store the data that here's the different

bags that will carry and nutrient Alomar

blue a buffer solution and then the

bacteria themselves will administer the

antibiotic and this is the most

important phase here so is the stress

response and antibiotic in their stress

response in general the e.coli stress

response to the antibiotic is something
we're specifically watching equal I are capable of kind of becoming of survival you know survival upping their survival capability when they're stressed so we're watching that mechanism genetically there's a gene called rpoS and specifically the immunologists at stanford he wants to target looking at this particular gene and if we find that it does something different in space we might find out that we would want to develop a countermeasure for that and understanding how to knock down an
infection this particular infection is called cystitis it's common to terrestrial cases it's a urinary tract infection so for that matter what we learn in space may allow us to key in on a specific pathway to help design more effective antibiotics and eliminate the antibiotic resistance effect with that said I'll stop here and ask for questions ok thank you again if you have a question in the room please raise your hand wait for the microphone and if you are following along on NASA social media are following along on NASA social media channels please use the hashtag ask NASA
hi my name is Christina and I'm from NASA social I had a question you talked about doing in the antibody research but have you done anything with Optimus I'm sorry have you been doing any research with optimizing to the ecole I know I'm I'm an engineer so that would be better answered by the the P I the principal investigator so he's a Stanford and I can direct you to him for that question so any other questions so that the question is are we determining the dosage amount and the effectiveness or yeah so we we have run this
experiment nine times on the ground and

00:38:34,179 --> 00:38:39,250
we look at the knockdown or knockdown

00:38:39,250 --> 00:38:40,740
effect on the e.coli and it's a response

00:38:40,740 --> 00:38:45,309
it's stress response and so we look at

00:38:45,309 --> 00:38:49,150
enzyme activity with this dye and if you

00:38:49,150 --> 00:38:56,230
notice in one of those photos there's

00:38:56,230 --> 00:39:02,440
kind of a pink color to the the card

00:39:02,440 --> 00:39:05,590
afterward and so we've specifically

00:39:05,590 --> 00:39:10,900
dialed in its micrograms of antibiotic

00:39:10,900 --> 00:39:14,590
for the size of the volume and yes it's

00:39:14,590 --> 00:39:19,300
roughly a teaspoon of volume or liquid
is pumped through the card and each step.

or phase when we put it through I believe Jeff Foust space news what's the benefit of doing this on a CubeSat versus a lab rack inside the station what can you do in the cube set you can't do in the station oh that's a great question I get asked this a lot so for that matter we could do this on the space station and so this canister we did talk about putting it in there very well me maybe you follow on mission I don't know that would include this canister on the space station but
There's advantages for the future when we go to past low-earth orbit in the radiation environment. We want to take the lowest mass system as possible in cube SATs. Will lend themselves to the future you would wanted to deploy CubeSat potentially with looking at the radiation effects in the future. So basically baseline how we do this in low-earth orbit and then move forward to send maybe the same experiment or with some add-ons and elope with a low-mass CubeSat to answer the questions with.
radiation added so there's a follow-on

mission and NASA Ames called bio

Sentinel it's not exactly like this but

it uses a lot of things we learned here

there's other things with life detection

in the future we're talking about

lessons learned with these micro fluidic

systems may actually be key to going to

Enceladus in the future to do life

detection in examples like that so I'm

not saying it's exact copy

but what we're learning as researchers

and the creative minds that design this

system very well may have the answer for
doing life detection and another moons

in the solar system or other planetary bodies well have time for two more questions I believe we had one here in the front or in the middle in the room and we'll come back to and ask that's a question thank you hey my name is Daniel I was just curious if you guys are looking at gene transfer like through transduction or transformation and if you feel like those would be those processes would be any different in microgravity again this is better answered by the PI but we're specifically targeting this one gene so
imagine we've removed all the other variables here you know the human body's not involved here so what we learn from this mechanism without the immune system involved we look at the genetic response so in science sometimes you want to remove as many other variables that may be confusing the answers so this does that for that but specifically what you're talking about probably would be a holder and experiments designed so sorry I don't have a good exact answer for you but but dr. mitten at Stanford would be
able to answer that question came in through ask NASA it's by at fossil

locator what is the composition of the ECAM SATs casing it looks like solid
gold oh so I can guarantee you yes it is very flashy and it looks like gold probably wouldn't be able to pick it up like this if it was gold it is aluminum and we played it with gold for thermal properties so one of the many things that we have to do to the spacecraft is observe absorptance and emissivity characteristics on the spacecraft so for this challenge and we do thermal models
of up to six hundred and forty thousand
calculations on this particular mission
every minute of the missions modeled
this surface was picked so there's a if
you look at the actual original the
first image I showed on of the
spacecraft
you'll see a copperish look instead of
gold and that's because it is copper ish
and it you know they're different phases
and doing things I can't get into all
the details of how we do this but long
story short is we adjust thermal
properties and that's the reason it is
that color Thank You Stefan okay thank

956
00:43:35,949 --> 00:43:37,980
you

957
00:43:41,159 --> 00:43:46,239
next up we have Michelle Lucas who is

958
00:43:44,769 --> 00:43:48,880
the founder and president at higher

959
00:43:46,239 --> 00:43:50,439
orbits along with Abigail Jonker a

960
00:43:48,880 --> 00:43:56,650
student who participates in higher

961
00:43:50,440 --> 00:43:59,500
orbits well good afternoon we are so

962
00:43:56,650 --> 00:44:00,700
excited to be here as as mentioned my

963
00:44:00,699 --> 00:44:02,949
name is Michelle Lucas I'm with higher

964
00:44:02,949 --> 00:44:06,759
orbits we are a 501 C 3 nonprofit that

965
00:44:06,760 --> 00:44:09,880
uses space as a launchpad to get

966
00:44:04,599 --> 00:44:07,989
students more interested in STEM while

967
00:44:06,760 --> 00:44:09,880
building leadership teamwork and

968
00:44:07,989 --> 00:44:11,799
communication skills I'm also the

969
00:44:09,880 --> 00:44:14,559
program director for our gopher launch
program it's a 2 or 3 day event where students get to work with an astronaut for the entire events and they compete to have their experiment idea flown in space and we have some slides that'll pop up here with some photos from one of our events the experiment we're going to talk to you today about is because of a great sponsorship of orbital ATK they sponsored one of our divisions and what happens in a division is there are multiple events we pick a winner from each event the overall division winner has their experiment flown to space and
that is the Saguaro snakes experiment

for this the team actually has five team members I have a be here with me who's gonna speak next and if I could get Nicholas Jobson to stand up he is also one of the team members and you might see some of the others around this week so they are around for questions they are in these photos we work with space Tango to get the experiment built and manifested and for those of you who were asking questions about funding and programs like this this is somewhat of a standard summer camp where Johnny or
Susie can choose to attend we do run

these all across the country but we are

very beholden to the support of others

who are really big believers in STEM

such as orbital ATK for their

sponsorship and space Tango for their

work with us but you don't want to hear

from me you want to hear about the

science and as such I am really honored

to get to turn this over to miss Abby

Jonker who's going to tell you more

about the Saguaro snakes experiment

that's about to fly on oaa tomorrow as

Michelle said I'm Abigail Jonker and
part of I'm one of five high school

members from the Arizona swara snakes

I'm here speaking on behalf of my group as well as myself when I say that I'm greatly appreciative and extremely honored to be given the opportunity from Orbitz back in February when I met my noun group members for the first time we were given five hours of her two-day period designed a product to be tested in a market environment given the requirements and limitations of our experiment we started brainstorming and with the help of our stem teacher and the chosen 15 movie the Martian we came
up with the idea of plant growth in space we proceeded to brainstorm different and variables that we could test within the process of growing plants and we came across the process called nitrogen fixation you may be asking well what is hydrogen fixation and the answer is pretty cool the nitrogen fixation is the process in which plants that contain a bacteria that can fix nitrogen in the Earth's atmosphere and turn it into other usable compounds such as nitrate ammonia and nitrogen dioxide not only is this
process extremely important to keep in

the nitrogen cycle balance but we also

found out it's a natural fertilizer from

there instantly we were intrigued and we

thought to ourselves well this is a

naturally occurring process well

something happened to it what will

change if we put it in a microgravity

environment and the idea grew we thought

about testing the amount of nitrate that

gets put back into the soil and compare

it to something - the exact project

that's going on down here at Earth by

doing this we'll be able to have a
constant within our experiment and see

if gravity really plays a role in this

country and fixation process originally

we planned our project to be used with

peanut plants but due to the small size

of the cube lab and the help of space

Tango we altered it to using microbe

colors they both are nitrogen fix so our

outcome is unchanged for the cube lab

itself its wetted soil with several

spotted little clovers there's a video

later on it looks really cool there's

all kinds of required circuitry and

sensors and monitor visually the
plants and as well as the amount of nitrate in that's being put back into the soil along with all the sensors we have a camera which we originally didn't plan for but when we had our FaceTime call with space Tango again it looked really cool so my team and I just hope for this experiment is to eventually the fix plants to inhabit inhabitable planets at the moment we will we're striving to inspire future generations to help especially kids our age being exposed to this great programs like higher orbits I never dreamed of
spending sending micro clovers up to space to be tested for nitrogen soil like mix over there smiling he does the same thing it's absolutely amazing what we get to experience this week here on Wallops in DC and we are all just so honored so thank you higher orbits Thank You NASA and thank you orbital ATK and we do have a quick video that can just roll as we're answering questions we did test this all out on the ground and so you can see what its gonna look like when the 75 micro clovers start to grow this is obviously in a 1g environment
but the students are gonna be able to access this data from a home it does come down through space Tango but they are gonna be able to log in and get it themselves great and with that we will open it up to questions if you have a question in the room please raise your hand if you're following along on NASA's social channels use the hashtag ask NASA Jason Ryan with Space Flight inside are my questions for the young lady here how did you get started you your looks I mean I feel old so old looking at you you're you're so young what made you
decide to get started in this thank you

actually last year my geometry teacher saw this because it was hosted on my old high school and I had just started to get kind of interested in space thought it was pretty cool when I was talking him about it and as soon as I went to this camp I knew and I’ve been just so inspired and I want to be an aerospace engineer when I’m older so really just came through the exposure at my high school so follow up questions so when you got started in all this did you think you’d be coming to attended NASA
launch and that should be working with a

payload that would fly to the

International Space Station no I was

shocked when we won at the camp level

and then Nick and I started freaking out

little higher-level we are just so

honored I never saw myself doing this

it's absolutely crazy and really cool

thank you again if you have a question

in the room please raise your hand I

know we have one question now from

asknasa
	hanks the question is how can teachers

register their class to participate in

the CubeSat programs and so I can't
speak to cube SATs cube SATs are
definitely different than cube labs cube
SATs actually go and they orbit the
Earth coop Labs we work with inside the
space station for gopher launch they can
visit us at WWE battleground all across
the country but we are looking to have
programs and other locations look I was
a little girl who when I was three fell
in love with space and I got to go to
Space Camp and I worked at NASA for a
bunch of years and I wanted to be able
to bring space inspired stem events to
the backyards of students who might not
have otherwise realized how cool it was

I mean now I know Abby does want to go to Space Camp but originally she didn't know and so certainly we welcome new students and new teachers I think we have time for one more question in the room if you have a question please raise your hand

just a question on how the experiment is run inside the ISS is it monitored by anyone onboard or is it all done remotely and so this is one of the beauties of automation and things created by a space tango and the ability
to have a lot of experiments going that

don't require crew time so that way we

can get a lot more science done so this

is going to be started with a command

from space tango that goes through

Marshall Space Flight Center and all of

course the appropriate channels and then

the video and the data just gets

downlink to space tango and so there

really is no need for crew interaction

other than the installation of the tango

lab when they take it out of Cygnus and

so we get 30 days of data without having

to impose on the crew time which is so
very precious we do have one more

1184
00:52:22,059 --> 00:52:27,460
question we're gonna open it up to

1185
00:52:23,559 --> 00:52:30,790
Camille to ask a question it's forever

1186
00:52:27,460 --> 00:52:33,460
yes so what would you tell a young woman

1187
00:52:30,789 --> 00:52:36,909
like yourself how they could be inspired

1188
00:52:33,460 --> 00:52:39,849
by science space and future engineering

1189
00:52:36,909 --> 00:52:42,190
don't be intimidated I walked into this

1190
00:52:39,849 --> 00:52:44,710
camp and I was one of two girls there

1191
00:52:42,190 --> 00:52:46,269
was like at least 50 other guys and I

1192
00:52:44,710 --> 00:52:49,449
actually applied for another camp

1193
00:52:46,269 --> 00:52:51,730
scholarship and now is it now yeah in

1194
00:52:49,449 --> 00:52:52,808
Alabama and for one of my essays I had

1195
00:52:51,730 --> 00:52:55,210
to write about an astronaut that

1196
00:52:52,809 --> 00:52:56,950
inspired me but I defined astronauts a

1197
00:52:55,210 --> 00:52:59,260
little bit differently I had to find
them as anyone who takes part helps and has a part in everything that goes into it and Mary Jackson one of the first black and women aerospace engineers is who I put down so you just can't be intimidated you can't be afraid you can't feel out of place because you do belong in this field you do belong in the world of science it's vast it's great so just don't be afraid and I have to just very quickly say it it was interesting this event was the only event where we've had such a low turnout of girls we
only had three we actually averaged between 35 and 40 percent female at all of our events and so Abby was a it was odd that you were one of the few girls but as you can tell she's an amazing young lady and all of the saguaros snakes are amazing individuals so I hope if you see them around here please do ask them questions I would love to chat with you thank you both and we have one final speaker Heath Mills is the CEO of space technology and Advanced Research Systems Incorporated all right thank you guys very much for
having us here today and an amazing

presentation rough to follow that one

see how it goes um so yes my name is

Heath Mills I am the CEO of stars these

I'm CEO of stars with space technology

and advanced research systems what we do

is we have a unique capacity to provide

a environment within the unite with in

the space station to present your

research into the microgravity

environments now this is done through

and as what was said before remote

access we do this so that we also limit

the amount of crew time that goes

1240
00:54:53,739 --> 00:54:57,819
forward and I have a set of slides I'd

like to start off with here to show a

little bit more about what we do and

what we can offer at stars we would go

to the first slide and as that comes up

in a few seconds there it goes right

there that is stars that is our motto

right there laid out before you if we go

to the next slide I want to just show

one key point now my background I'm

actually a molecular microbiologist I'm

not an engineer like everybody else and

so when we started this company we

viewed the International Space Station

as a field station as a mechanism to in
to do research in a new environment and

so with the next slide what you show on

here is that what we're trying to do as

a company is to move your advanced

research your research that you do here

on earth next slide

up to the International Space Station

and in doing so what we're trying to

build upon is a mechanism where you can

translate your research all of your hard

work all of your time spent here on

earth doing all the experiments that

you're doing into this new environment

to be able to provide connectivity
between

what happens on the International Space Station and what's happening in your lab

and with the incredible work that's being done here on earth next slide

please

and so to do this we have this stars one experiment facility now the stars one experiment facility is a locker insert for those engineers out there this fits into the US National Lab and provides us command and control capabilities on earth in a temperature controlled environment because as you know
controlling the temperature allows you to really constrain your experiments whether you're doing microbiology like I like to do or you're doing stem cells tissue culture plant biology biofuels whatever your experiment may be you have to make sure your environment is completely temperature controlled next slide please and a little bit of a close-up of the Stars one experiment facility you see two three main portions of it on the right side you see the static rack now the static rack this is where the
experiments are exposed to microgravity

1298
00:56:56,260 --> 00:57:01,150
the wheel you see in the back left

1299
00:56:58,869 --> 00:57:02,949
corner what you're seeing here is a

1300
00:57:01,150 --> 00:57:04,420
center fuge so here it is this

1301
00:57:02,949 --> 00:57:07,059
experiment spent all this time to get up

1302
00:57:04,420 --> 00:57:09,730
to microgravity and we turn gravity back

1303
00:57:07,059 --> 00:57:11,559
on so those poor cells at poor biology

1304
00:57:09,730 --> 00:57:14,170
now who goes right back to a gravity

1305
00:57:11,559 --> 00:57:17,400
environment but this is key because now

1306
00:57:14,170 --> 00:57:20,829
any differences that your experiment

1307
00:57:17,400 --> 00:57:22,030
experiences in space in this environment

1308
00:57:20,829 --> 00:57:24,610
in our temperature controlled

1309
00:57:22,030 --> 00:57:27,490
environment we can limit the variable to

1310
00:57:24,610 --> 00:57:29,410
one thing gravity so any temperature

1311
00:57:27,489 --> 00:57:32,229
variances any radiation variances any
vibrational noise within the station you can check that out with gravity on or gravity off again focusing on and limiting the amount of variables allows you to have better results in your final experiment now for the experiment and we'll talk about a lot here in a few seconds right in the front bottom left corner you see an empty space this allows us to plug in larger cube labs advanced lab capabilities especially those that are produced by Space Pharma who I'll show you a couple slides on those in a second but that's the Stars
one experiment facility and that's what

we have currently on station and next

slide shows mr. peggy whitson plugging

in our our experiment facility into the

National Lab we had a successful launch

back on August 14

with SpaceX 12 Peggy was able to

successfully install our platform into

the national lab we were able to turn it

on communicate with it there was some

little bit of tense moments there we're

making sure everything checked out right

but we were extremely happy to see that

this thing plugged in turned on and we
are ready to start doing a lot of really

cool research so next slide please now
to do those we do have partner companies

we are working with both Airbus and with

Kaiser Italia provides us mechanisms to
do all kinds of experiments plant growth

experiments little mini aquariums closed

ecosystems to grow algae and different
types of cells in these next slide and

also we can even do mixing we can

provide an access to to mix different

fluids feed your cells feed your

experiments preserve your experiments

freeze those experiments as a background

1354
00:59:07,719 --> 00:59:11,618
in molecular microbiology I really

00:59:10,509 --> 00:59:13,480 want to make sure that when these

00:59:11,619 --> 00:59:15,400 experiments go up when they come back

00:59:13,480 --> 00:59:18,009 down the experiment is constrained

00:59:15,400 --> 00:59:19,690 properly so all this hard work that you

00:59:18,009 --> 00:59:21,608 have done over all these years to get

00:59:19,690 --> 00:59:23,079 ready for flight the experiment comes

00:59:21,608 --> 00:59:25,568 back the way you wanted it to come back

00:59:23,079 --> 00:59:28,839 and so we take really good effort in

00:59:25,568 --> 00:59:30,608 doing that without the need for crew

00:59:28,838 --> 00:59:32,078 interaction which means we get to fly

00:59:30,608 --> 00:59:33,518 more experiments we get to do more

00:59:32,079 --> 00:59:35,739 research and everybody gets to learn

00:59:33,518 --> 00:59:39,068 more about what microgravity has in

00:59:35,739 --> 00:59:40,989 store so with the next slide we
introduce space Pharma now we do have a couple individuals from space Pharma here today that has been working hard with us over the last week that has allowed us to produce a new cube lab and we the first time this lab has been flown inside the International Space Station it has flown externally as a free flying satellite and is currently flying right now due to a successful launch back in February but we are very very happy to have them and have this cube lab going into our new facility next slide please
and this is a quick little design of it

the cube lab is about the same size of

what you see up here with a solid gold

one wish it was you wouldn't be leaving

here with it but what this provides is

the mechanism to house unique

experiments within our experiment

facility in next slide please this shows

what it actually looks like before we

plugged it into the the transport

mechanism the Merlin to get it up to the

International Space Station next line

now this is where the key part of it

comes in to inside the experiment side
this speck inside the SP mg the space

farm of microgravity lab inside the SP

mg what you have is capacity to run four
different individual experiments again
totally autonomous you can mix different
fluids you can see how they interact but
the fun part is is it also has a
microscope and a spectrophotometer so
we're able to beam back data that allows
to be able to see in near real-time what
is happening to your cells what's
happening to that biology how it's
reacting responding to microgravity this
provides us really unique analytic
capabilities on orbit so yes we can

01:01:21,730 --> 01:01:28,599
bring it back down because and there's

01:01:24,010 --> 01:01:30,490
extreme advantage to doing work inside

01:01:28,599 --> 01:01:33,429
the station you can bring the samples

01:01:30,489 --> 01:01:35,589
back down and analyze them so with that

01:01:33,429 --> 01:01:37,779
we can bring it back down you can do

01:01:35,590 --> 01:01:39,070
your metabolomic s-- is what one of the

01:01:37,780 --> 01:01:41,769
experiments we'll be doing here shortly

01:01:39,070 --> 01:01:43,840
you can do the morphology experiments

01:01:41,769 --> 01:01:45,699
but you can also look at it in real time

01:01:43,840 --> 01:01:47,559
using the microscope and the

01:01:45,699 --> 01:01:49,149
spectrophotometer and that's what the

01:01:47,559 --> 01:01:50,590
four chambers at the top show up there

01:01:49,150 --> 01:01:53,139
and that's what we were able to do so

01:01:50,590 --> 01:01:54,850
next slide and yes we do have a little
bit of fun and I get to embarrass some of the space Pharma guys by putting their face on TV now but we did process everything here at Wallops and I want to thank the groups at Wallops that really helped us get the labs ready to get everything ready to get the facilities here ready to be able to produce the amount of science and the style and the high level of science that we're trying to do I would like to thank them for allowing us to have the facilities here to process our samples in nextline and eventually hand those over to the
Coldstone and as a biologist kind of creeps me out when it whether it's 37 degrees or it's four degrees it's still cold stow not my rules but having the ability then to plugging in to and secure it within Merlin which is shown on the right side over there we are one of the powered spots on orbital it will be temperature controlled at 37 degrees for the entire asset portion of it it will be plugged into the Stars one experiment facility kept at 37 degrees and we will feature three different big experiments on these and two of those I
want to talk about now one is done by

Dr. Oliver Ulrich and his lab out of the University of Zurich. Dr. Ulrich and the team that has been here for the past week with us here in Chickity. They're looking at microphon cells. These microphon cells are those that are going in with your immune system and affect your immune system. This is understanding what happens with the human immune system when you get to microgravity. How does it change? How does it respond? There's astronauts come back and complain of sickness. Complain of ill.
effects of being in microgravity well

01:03:27,889 --> 01:03:32,659
what are the morphological changes to

01:03:29,960 --> 01:03:35,239
these key cells in your immune system

01:03:32,659 --> 01:03:37,129
during spaceflight we'll be able to beam

01:03:35,239 --> 01:03:38,778
back data for them to be able to look at

01:03:37,130 --> 01:03:42,289
these images and see how these cells

01:03:38,778 --> 01:03:44,239
change during microgravity exposure to

01:03:42,289 --> 01:03:45,559
microgravity because they're coming back

01:03:44,239 --> 01:03:48,469
they're also be able to look at some of

01:03:45,559 --> 01:03:50,569
metabolomics what the cells produce what

01:03:48,469 --> 01:03:52,579
this cells move and how they change

01:03:50,568 --> 01:03:53,630
their environment when they're growing

01:03:52,579 --> 01:03:55,789
we'll be able to detect that and

01:03:53,630 --> 01:03:57,559
determine that during the return mission

01:03:55,789 --> 01:03:59,119
so that's one of the experiments that
are happening I have a short video coming up next that will also show a little bit about one of these other experiments they're being hosted by the SP mg and there's audio [Music]

when the stars won't EF is able to do is provide a stable environment for temperature controlled experiments to be conducted on the International Space Station a researcher from NASA is looking at how Staphylococcus aureus grows in microgravity what her data has shown is that in microgravity
Staphylococcus loses its pathogenicity

so if I can understand now we can talk

about new drugs some new therapeutics

the possibilities aureus without

fumbling so what this experiment is and

dr. Sarah Wallace from JSC is the lead

p.i on this experiment what she's doing

is and what her experiment her work over

the past six years has shown is that

microgravity has unique effect on

Staphylococcus aureus

so staph staph aureus staph infections

Staphylococcus aureus affects about 30

orders currently resident on about 30
percent of the population in all times

on your skin on your neighbor beside you

everybody slides a little further apart

now what staph aureus does is it's an opportunistic pathogen if you scratch

your skin if you have a cut if you have a boo-boo on your hand the staph aureus can get into your skin and cause an infection hospitals have a very big issue with staph infections one thing that sarah has been able to show over the last six years is that microgravity has an effect on staph aureus by reducing the pathogenicity of staph
aureus interesting so if you can find a

mechanism to turn off the pathogenicity

of staph aureus wouldn't that be a good

thing and so by understanding the

molecular mechanisms that happen within

the cell to turn off staph aureus

pathogenicity you're talking about drug

discovery you're talking about new

therapeutics you're talking about new

medicines that may be able to be

produced because you understand the

molecular makeup of these cells the only

way to do it is to go to space the only

way to do it is to go to space properly

constrain the experiment bring it back
down and analyze the molecular content of that cell.

that's what Sara is trying to do and that's what we're trying to help her do while facilitating her research on station so that's what we're doing on this experiment we really think orbital for the chance to do this we think cases for the opportunity and the funding to help get these experiments to space and we'd like to thank our team and the staff the staff our guys the space Pharma guys back here for helping us get the cube
built this week and dr. Rich's croute

for being here for loading their cells

and getting everything together and

especially the Wallops crew for helping

us on site to get the labs in shape and

ready to go for us to have a successful

turnover last week so thank you very

much thank you we have time for a few

questions in the room we'll start here

and also if you are following along on

NASA social channels ask your questions

using the hashtag ask NASA

hey there I'm Sarah with the NASA social

crew today so for the investigations
that do require crew intervention how do

you get directions to them do you send

them a book do you video with them ahead

of time or how do you ensure that

they're going to be conducted within the

parameters that you need so we have a

lot of interaction leading up to the

mission there is multiple meetings that

we have with the crew with the crew

office with with members at Marshall

that manage the payload systems and we

provide ops controls and ops plan for

NASA and at Marshalls to Marshall to be

rated up or beamed up to the crew or

rated up or beamed up to the crew or
directed with the crew everything every
directed with the crew everything every
directed with the crew everything every

directed with the crew everything every

directed with the crew everything every

directed with the crew everything every

1583
01:08:02,489 --> 01:08:08,459
single bit is scripted with photographs

1584
01:08:05,460 --> 01:08:10,710
with instructions verbal ins are written

1585
01:08:08,460 --> 01:08:12,599
instructions so the crew knows every

1586
01:08:10,710 --> 01:08:14,070
single piece of movement that we need

1587
01:08:12,599 --> 01:08:17,449
them to do to be able to properly

1588
01:08:14,070 --> 01:08:19,440
execute the experiments they are very

1589
01:08:17,449 --> 01:08:21,000
intrigued with some of the experiments

1590
01:08:19,439 --> 01:08:22,798
that we're providing them they're having

1591
01:08:21,000 --> 01:08:24,088
fun up there they enjoy doing these

1592
01:08:22,798 --> 01:08:26,789
experiments at least that's what they

1593
01:08:24,088 --> 01:08:29,039
tell us but they enjoy doing this and

1594
01:08:26,789 --> 01:08:31,528
understanding it the proper way because

1595
01:08:29,039 --> 01:08:33,210
for them they understand that there's

1596
01:08:31,529 --> 01:08:35,580
been a lot of effort put into these
experiments both in the ground by the
pis from the payload developers that's
us and so they really want to take a lot
of time to do the experiments properly
so they're interested in it they want to
learn so we interact with the payload
providers and the developers and then
Marshall to make sure the instructions
are correctly processed to the crew do
we have another question in the room we
have a question from ask NASA this will
be our final question as questions from
at CBS underscore space news it's I'm
confused about the total number of cube
SATs on board Cygnus

I know 14 will be deployed after unberthing but how many will go inside for launch from the Kibo airlock all right so total cube sets 14 on the outside and then we are launching 2 on the inside and those two will join three more which launched on SpaceX 12 I guess you were there too and they will be deployed from the Kibo airlock and hopefully this month thank you for coming back and if I could say one more thing real fast the transduction question that was done earlier talk to
me later I'd love to do that experiment

so whoever said that let's talk thank you thank you very much thank you

everyone for joining for asking great questions we're excited for tomorrow's launch 7:37 a.m. Eastern Standard Time

NASA TV coverage starts at 7:00 a.m.

follow along at nasa.gov slash live

[Applause]

you

you