welcome to a Mission Control in Houston

my name is Pat Ryan I'm the public affairs officer on the orbit to shift

here in Mission Control today we've just finished up our live update on the activities onboard the International Space Station and happy to join you and get to tell you more about NASA and about the space station what's going on I've invited along another one of our flight controllers who works here ken nice is a Cronus specialist and we're going to find out what that is after we first find out about you what is it your
professional background how'd you end up

at NASA okay well I grew up in the Philadelphia area Philadelphia

Pennsylvania suburbs I was always proficient at taking things apart to my parents dismay they've labeled that breaking things but I always wanted to see how things worked and along the way

I had was very good at math and sciences so I pursued the field of engineering

when I went into college I went to Penn State University got my graduate undergraduate and my graduate degree at Penn State and at that point I got
recruited by NASA at one of the college fairs career fairs and ever been working ever since let's find out as I said we're going to find out what a Cronus does because I imagine that that's one of the first questions that we're going to find out what the kids in Little Rock have to say good morning my name is daily away and I'm a spray and I have a question for you there could you lay one or two conditions that could negatively affect operations or despite controls that is a really good question there are a couple
things that could negatively affect us

00:01:58,109 --> 00:02:05,478
down here the first is loss of

00:02:01,259 --> 00:02:08,159
communications one of our main ways to

00:02:05,478 --> 00:02:10,949
figure out how things are going on on

00:02:08,159 --> 00:02:13,530
the space station is via the telemetry

00:02:10,949 --> 00:02:16,310
with data receipt receive on the ground

00:02:13,530 --> 00:02:20,430
and by actually talking to the crew if

00:02:16,310 --> 00:02:24,030
we don't have those links then we don't

00:02:20,430 --> 00:02:26,760
have a way to talk to the crew to figure

00:02:24,030 --> 00:02:29,459
out what's going on or to interact

00:02:26,759 --> 00:02:33,149
intervene from the ground fix anything

00:02:29,459 --> 00:02:36,780
so it's really important for us to try

00:02:33,150 --> 00:02:39,569
to utilize our communication timeframes

00:02:36,780 --> 00:02:42,620
and as best as we can another thing that

00:02:39,569 --> 00:02:45,269
could negatively affect affect us is a
malfunction it's if something does go wrong everything that's scheduled for the day depending on how big the malfunction is the whole day could be wiped out so it really depends on what the malfunction is but and those are some of the big things that can really affect the ground controllers us us here on the ground the flight controller team and particularly for you for a Cronus officer explain what it is what systems you guys are charged with maintaining as acronis we are in charge of those communication pathways so the voice that
commands the data we get from the space station the video that we get down from the space station all the status health and status of our systems of our payload data our science data comes down through the systems that I manage so that's what we're in control of and it's a really fun job next question my name is Karl homes in eighth grade up a little with the flight controller down like the command history logs daily weekly monthly that's not very specific it has a very good question part of my discipline were
responsible for the computers and down 

we don't we down link detailed data from the main computer about once a week on a 

Sunday afternoon we get more detailed 

data from the cruise personal computers 

personal computers they used to command 

and receive data from the systems we 

down like that about once every month 

and behind me in the background we do 

get real-time command history data 

basically all the commands that we sent 

from the ground we get a log of that and 

we are constantly saving that so for 

historical purposes and to see what is

00:04:52,810 --> 00:04:59,038
what has happened good who's Nick

00:05:01,079 --> 00:05:07,089
hi my name is Jonathan Jordan and I'm

00:05:04,360 --> 00:05:08,889
currently in the eighth grade I have two

00:05:07,089 --> 00:05:11,709
questions I would like to ask me the

00:05:08,889 --> 00:05:14,439
first way where exactly are the

00:05:11,709 --> 00:05:16,839
multiplexer computers located on the

00:05:14,439 --> 00:05:22,449
international space ship or also known

00:05:16,839 --> 00:05:25,509
as ISS okay the multiplexer

00:05:22,449 --> 00:05:27,729
demultiplexer sorry it's a hard word

00:05:25,509 --> 00:05:29,110
basically our main computers are located

00:05:27,730 --> 00:05:31,000
all throughout the space does there are

00:05:29,110 --> 00:05:35,250
very many of them there are there over

00:05:31,000 --> 00:05:39,730
40 of them so we have three tiers of

00:05:35,250 --> 00:05:41,649
these main computers and some of them
located inside some of our outside some

are inside the lab module and various

racks some are in end cones some like I

said the lab no.2 no.3 airlock the pmm

and then there's a whole bunch outside

on the external trusses so they're

everywhere and they need to be

everywhere to do all the jobs that

they're responsible for and the

multiplexer demultiplexer computers is

there a way to characterize the the

level where they are they're not just

the standard laptops that the crew

interact with a lot these are the
computers than any that range from
directly directing traffic from the
sensors and effectors for the data we're
trying to gather to passing it up and
interfacing with other modules
or other international partners all the
way up to our prime computer which is
responsible for putting together all the
data being the crews interface and sent
and shipping that data where it needs to
be such as the ground or the crews
laptops okay next one and my second
question is how many channels does the
cube and communication systems have the
Cuban system right now we were able to get six downlink channel six downlink video either an HD or standard definition in addition to ability to talk by an IP phone Internet Protocol phone to the crew we can even send email through it we can ship live video for the to use and also bring down payload science data through that que un link and the six channels is is a fairly new developed is over the past less than a year early this year i should say march april time frame we expanded our
capabilities from for standard

00:07:29,528 --> 00:07:36,028
definition downlinks 26 combination

159
00:07:31,839 --> 00:07:36,028
high-def or standard definition video

160
00:07:36,089 --> 00:07:45,429
thank you you're welcome hi my name is

161
00:07:42,819 --> 00:07:48,189
the convoy and i want to ask you how

162
00:07:45,430 --> 00:07:53,769
many tracking and data relay satellites

163
00:07:48,189 --> 00:07:56,229
does the usf so the US has i believe

164
00:07:53,769 --> 00:07:59,709
eight of these satellites that we can

165
00:07:56,228 --> 00:08:01,899
use what the international space station

166
00:07:59,709 --> 00:08:04,718
uses for communications is only five of

167
00:08:01,899 --> 00:08:07,778
them so we have the option to use five

168
00:08:04,718 --> 00:08:10,509
which are located in various parts in

169
00:08:07,778 --> 00:08:12,959
relation to the earth so a five of eight

170
00:08:10,509 --> 00:08:12,960
we use

171
00:08:17,189 --> 00:08:21,990
I'm the names containing buttocks and my
question is why does the antenna have

the Malta clay beta good question um are

set it up for you yeah they did trying

to trying to stump me the antenna has to

move because of the design of the

systems basically we need to get high

rate of information high amount of

information down and the easiest way to

explain that is the higher the

information the smaller the beam width

the antenna can can radiate in given

direction so if we have a small beam

with a small area where you can actually

see or transmit the data then you have
to be able to move that small distance
to track the intent the satellite if we
don't need as big or if we don't need a
high amount of traffic we don't need as
big of a beam width we are so we can
have a bigger beam width and not have to
try move the gimbals further our
antennas and I believe part of the
reason that the intent is moved to has
to do with the TDRs satellites because
you have to point the antenna at the
satellite a cancellation is moving but
the satellites are not relative annually
as the tea dress is moving the station
is moving and it all has to be in sync

to lock up to each other we do have some parts of antennas that we can fail over
they're considered low rate that don't move their part they're like

omnidirectional almost omnidirectional

and it gets part of the sky but other than that if you want to transmit about higher amount of data you're going to have to track the satellites

hi my name is a plan bro i have one question for you how do you know where asteroids are coming to the ISS Wow yeah the asteroids are tough one we have a
specific flight controller in the room

00:10:28,960 --> 00:10:33,850
called topo they're in charge of all the

00:10:31,470 --> 00:10:37,180
monitoring and the trajectories of any

00:10:33,850 --> 00:10:40,000
types of debris or objects that could

00:10:37,179 --> 00:10:42,579
impact the space station and they talk

00:10:40,000 --> 00:10:45,809
to one of their counterparts called

00:10:42,580 --> 00:10:48,580
Stratcom and they're those two positions

00:10:45,809 --> 00:10:50,559
monitor all the time whatever is

00:10:48,580 --> 00:10:52,000
available to see they've got lots of

00:10:50,559 --> 00:10:55,089
radar and satellites that they can

00:10:52,000 --> 00:10:57,549
monitor this information and hopefully

00:10:55,090 --> 00:11:00,040
alert us if we have any potential

00:10:57,549 --> 00:11:02,229
asteroids coming now the smaller the

00:11:00,039 --> 00:11:04,899
asteroids the harder it is to modern the

00:11:02,230 --> 00:11:07,210
less notice we get hard a lot the harder
to see the bigger they are hopefully we
get enough notice to watch out and
they're watching not just for asteroids
but they're keeping track of all of the
the junk that's in space there's over
the course of 50 years or more as people
have flown in space and they have left
garbage up there there's more things
that are up there and so we have to keep
track of even small objects because if
they were to collide with the station
they could cause some damage you got to
understand that all those objects have a
trajectory and a speed and velocity so
it if we're going in a different direction than that it could have a real dire effect we're traveling really fast

okay next question

hi my name is Rafael Acosta I'm instead been great have you ever sent a video to space

have I ever sent a video to space I can't say that I have sent a video to

space we ship the astronauts video all the time me personally no we are probably shipping them video as we speak

right now during the crew off-duty day we can ship them live TV as long as we
have that that link that we talked about

between the satellite and the space

station but no I have never sent video

of the closest I've gotten to sending

video is sending a picture up to the

astronauts when my daughter was born in

December and that they were pretty

stoked about seeing that and they gave

me some congratulations but we do send

video to the crew all the time as Ken

says they get video that is is training

video that helps teach them how to do

things they get video live video from

their families they get a chance to have
weekly video conferences with their
families that usually on the weekends
they can get video from in this room
sometimes of events that happen in this
room that gets sent up to them so it
happens a lot yes it does
hello my name is sandra williams and the
question i have for you today is what
would happen if there was a malfunction
in the ia is internal audio system
during the emergency and you said that
in during the internal audio system
during emergency yeah interesting
question so what would happen during an
emergency it would depend on the
malfunction of the audio system normally

during an emergency we alert the crew

that there is an emergency if they

weren't the ones detected it via the

tones that are produced by the audio

system to let them know hey there's

mirchi need to take some actions if

there's emergency and they note about it

and there's an audio malfunction they're

trained on the in responses it's almost

ingrained we train the emergency

response very hard and very often so

they'll just go on muscle memory they'll

go to their procedures and they'll just
go perform the actions if we don't have

a link if we don't have audio with the crew hopefully the the failure would be one where we still have audio with the cruiser audit or dated tones but it would impact the ability for the team on the ground to be able to follow the crew and for the crew to be alerted with all their normal signatures your question to rely on the data that's still coming down but without the ability to talk to a glee okay thank you

do my name is Isaiah Perry and I am in the seventh grade we know that NASA suffered
budget cuts in the past will promise the

affected by those which cuts well

Crohn's be affected by the budget cuts

probably in some ways we have already

merged with some we originally were

communication systems and one discipline

and computer and data systems in on

discipline we have since merged into

Cronus to combine that I don't foresee

any additional impacts the budget cuts

but it's too early to tell I think I

think we're pretty stable okay next

question

oh my name is Gail Brianna and my
question to you is what is the machinery you use to see your point

the machinery you use to see your point

information to ISS you said the

machinery used to point to transmit

information I'm not sure can you repeat

the question what is the machinery you

use to see if the point information to

Isis tours okay to transmit and receive

information that's a good question we

use various pieces of equipment on the

ground our main interface as a flight

controller is our Linux workstations you

can kind of see one in the background

here it has command interfaces in data

interfaces and interfaces with the
ground systems so it puts together what we want to do it sends it off and puts it into the data stream and the command stream and at some point it well it adds the audio information from the voice channels that we talked to the crew and then it gets encrypted and combined and shipped up the satellite to shipped over to the space station and receives its been shaved by a satellite dish on our space station called the radio frequency gimble rfg so at that point it brings into s-band system gets pulled out into it gets decrypted first and then gets
pulled out into audio data which goes to audio system and the systems data command data that goes into the main computer and main computer will then ship it whoever needs to go simple as that I simple as that thank you my name is Christina and my question is how are commands and data sent between MCC and ISS how are commands router between MCC and ISS we talked a little bit on the previous question but the commands are we have a set list of commands that we can choose from we've tested in various settings
and we can choose it among or linux

workstations or lunch workstations has

an application interfaces with the

command system we choose a command we

hit you you know basically hit everyone

to send it it gets added to the stream

it gets combined with the audio system

it gets encrypted so you know only the

command that we want to send and get it

get it on to the space station it gets

added to a radio frequency signal it

gets embedded into that and it gets

shipped out in my white sands to

satellite the satellite will then relay


the command the entire stream over to

00:18:50.559 --> 00:18:55.750
the s-band system and i'll get you know

00:18:53.410 --> 00:18:57.310
pulled out from there and shipped along

00:18:55.750 --> 00:18:59.769
where it needs to go the main computer

00:18:57.309 --> 00:19:02.679
will detect whether or not the command

00:18:59.769 --> 00:19:04.450
is valid and send it to where its

00:19:02.680 --> 00:19:07.210
destination is which is part of the

00:19:04.450 --> 00:19:09.160
header in the command field and it'll go

00:19:07.210 --> 00:19:11.049
from there we can ship commands to all

00:19:09.160 --> 00:19:13.330
different parts of the space station we

00:19:11.049 --> 00:19:15.909
can even ship information between

00:19:13.329 --> 00:19:19.839
modules between segments and so forth

00:19:15.910 --> 00:19:21.610
and despite the tearing those commands

00:19:19.839 --> 00:19:23.079
apart into the pieces so you know they

00:19:21.609 --> 00:19:24.909
go where they need to go i think it's
interesting to note too as you said that

the path that information takes to get

from here to the station is not a

straight line now it's not straight goes

from here to New Mexico to the satellite

to the station that's correct

hello my name is plattener pulp and we

know that there are double country

directing together with the ISS we want

to know how do they work together how do

we work the other there are a lot of

countries that were working with with

the ISS right now how we work together

is we had lots of meetings lots of a lot
of get togethers within with our partners sometimes we talk to them over the phone sometimes we talk over in Mission Control to them via telephone systems is what's called device behind us we can listen to dozens of loops at any given time and these are patched into Moscow that patched into Japan they're patched into Europe I patched into Alabama it can be patched almost anywhere so we could talk to them real time via those methods and we have a pretty good relationship with all our partners some partners the Russians
require extra translation because that

we speak English they speak Russian so

it requires an extra person involved and

both teams have sets of translators that

assist us so we make sure we communicate

the correct information to both sides

and the other side receives the correct

information but we have a pretty good

symbiotic relationship between all the

countries working together and that's as

you say it's 16 different countries now

that are involved and the the device

that you talked about you I know you

can't see it too well on television but

00:21:24,829
from this panel right here we can punch

buttons and through the headsets that we're wearing we can talk to not only everybody else in this room but other people in this building and in Russia and in Germany and in Japan and this is the same system that certain people can talk to this astronauts up in space

talk to this astronauts up in space

right right next question

okay did we have some more I know something you had put two questions do any of you have any additional questions to ask all right if I may I'd like to ask a question and that is what different career fields aren't everyone
thinks of NASA they think of astronauts and things like that what are some of the different career fields available at NASA I'm glad you asked that question I forgot to tell you my backstory I'm actually I didn't alluded to it but I'm an engineer and I actually worked in the field starting the field of electrical engineering communication systems there are a lot of Engineers here a lot of engineers a lot of electrical engineers or aerospace engineers that work here some some people that work here are pure scientists so pure science is either
research or researcher payload type

signs other fields are medical fields

there's a lot of medicinal diamond

requirements doctors the doctor year of

there are writers there are people who

know about business operations and

finance there are people who run the

buildings there are all kind of

occupations who are needed working in

NASA yeah it really takes a whole

plethora of different types in different

fields to work at NASA even Johnson

Space Center and its really diverse

background okay I we have time for one
more question if you've got it there

okay it looks like we have a few shine

guys okay one question all right we're

got again very long

my question is cool design is is and why

who design diocese and why another good

backstory question please correct me if

I'm wrong and the short version the

short version is is that we were

building a space station called Space

Station freedom we start we were

planning on one and Moscow Russia had

partially built space station Mir 2 and
Europe had proposed a certain module

00:24:14,119 --> 00:24:18,529
Columbus and we all kind of decided to

00:24:16,220 --> 00:24:21,289
pull our resources and create an

00:24:18,529 --> 00:24:22,700
international space station but a lot of

00:24:21,289 --> 00:24:24,980
people were working on different things

00:24:22,700 --> 00:24:28,250
and it started to come together as a

00:24:24,980 --> 00:24:29,930
group back in the 1990s yes and I think

00:24:28,250 --> 00:24:32,000
that's about the time we have Ken I want

00:24:29,930 --> 00:24:33,830
to thank you for for joining us here and

00:24:32,000 --> 00:24:35,420
some for some interesting answers and

00:24:29,930 --> 00:24:33,830
to thank you for for joining us here and

00:24:33,829 --> 00:24:37,429
learning about what's what's going on

00:24:35,420 --> 00:24:39,620
here and we'll send it will send it back

00:24:37,430 --> 00:24:42,039
to the DLN thank you everybody great

00:24:39,619 --> 00:24:42,039
questions