good afternoon and welcome to the Asura

Shrek's mission science briefing

osiris-rex stands for origins spectral

interpretation resource identification

security regolith Explorer and it's

nasa's first sample asteroid return

mission and we'll start off with

christina ricci from the cyrus recs

deputy program scientists at NASA

headquarters in Washington

Jason Dworkin the osiris-rex project

scientists at NASA's Goddard Space

Flight Center in Greenbelt Maryland

daniela dela Justyna the osiris-rex lead
image processing scientist at the University of Arizona in Tucson and we'll begin with Christina Thank You Nancy so in the mission briefing point for this you heard about the launch vehicle the spacecraft the mission jet objectives even got to hear about the weather so here what we're gonna be talking about is the science so I'm going to start off with talking about why we chose venue as the target asteroid jason is going to talk about the sample and the analysis that will be done and Danny is gonna talk to us about
the mapping that's going to occur so

let's go ahead and begin with talking about why Bennu so the ultimate goal of the osiris-rex mission is to collect a sample from an asteroid and bring it back to earth but why was venue chosen for this exciting endeavor well the science team selected been new after carefully taking into account three critical factors the accessibility of the asteroid the size such that it enables proximity operations and sample collection and the composition of that asteroid so let's get into each one of
these individually and we'll start off

00:02:10,360 --> 00:02:15,100
with accessibility go ahead and start my

00:02:12,430 --> 00:02:16,780
first graphic so we need an asteroid

00:02:15,099 --> 00:02:18,879
target that a spacecraft could fly to

00:02:16,780 --> 00:02:21,550
and then return to Earth within a few

00:02:18,879 --> 00:02:23,740
years time the closest asteroid stirreth

00:02:21,550 --> 00:02:26,170
are called near-earth objects and they

00:02:23,740 --> 00:02:28,240
come within 1.3 astronomical units of

00:02:26,169 --> 00:02:30,280
the Sun for those who don't speak in

00:02:28,240 --> 00:02:32,439
astronomical units on a regular basis

00:02:30,280 --> 00:02:34,180
one astronomical unit is the average

00:02:32,439 --> 00:02:37,090
distance between the Earth and the Sun

00:02:34,180 --> 00:02:38,950
it's about 93 million miles for a

00:02:37,090 --> 00:02:40,989
mission like osiris-rex the most

00:02:38,949 --> 00:02:41,979
accessible asteroids for a spacecraft to
reach are

kated between 0.8 and 1.6 a you the ideal ashtray destination also has an

earth-like orbit one that is fairly circular and low in inclination so it's in a similar plane to ours Bennu is and the new orbits between 0.9 and 1.36 au it orbits the Sun every 1.2 years and it passes by earth every 6 years with an inclination that's only six degrees different than ours so it really is optimal for accessibility for the spacecraft to go to and then return from the next criteria for selection was
finding an asteroid that was the right size to enable two critical portions of the mission the proximity operations close to the asteroid and the actual collection of the sample and go ahead and start my next graphic asteroids with small diameters rotate more rapidly than those with large diameters for an ashtray that has a smaller diameter than 200 meters it can rotate rapidly enough that some of the material on the surface will be ejected furthermore it's difficult to match the rotation speed of a rapidly rotating object so we need an
object that's at least 200 meters in diameter

Bennu is actually 492 meters in diameter at its equatorial bulge and it's rotation speed is only four point three hours so we'll be able to match the rotation speed of it and do a safe smooth slow high-five to collect that sample that we will then return to earth the final criteria that made been you the choice destination asteroid for us was its composition and go ahead and start my third graphic asteroids are categorized into different types based
on their observed chemical composition

101
00:04:28,598 --> 00:04:32,680
and the visible and infrared light

102
00:04:30,459 --> 00:04:35,319
minerals have unique signatures somewhat

103
00:04:32,680 --> 00:04:37,120
like fingerprints depending upon the

104
00:04:35,319 --> 00:04:40,209
features observed scientists are able to

105
00:04:37,120 --> 00:04:42,098
identify various organic materials the

106
00:04:40,209 --> 00:04:44,168
most primitive asteroids are carbon rich

107
00:04:42,098 --> 00:04:45,728
and are believed to have material

108
00:04:44,168 --> 00:04:48,609
preserved from about four-and-a-half

109
00:04:45,728 --> 00:04:51,519
billion years ago around the formation

110
00:04:48,610 --> 00:04:53,169
of our solar system these asteroids

111
00:04:51,519 --> 00:04:54,889
could contain organic molecules

112
00:04:53,168 --> 00:04:57,228
volatiles and amino

113
00:04:54,889 --> 00:04:59,389
that may have been the precursors to

114
00:04:57,228 --> 00:05:02,029
life on earth or elsewhere within our
00:04:59.389 --> 00:05:04.370
solar system telescopic measurement

00:05:02.029 --> 00:05:06.489
suggests that been new surface is rich

00:05:04.370 --> 00:05:08.780
in carbon thanks to extensive

00:05:06.490 --> 00:05:10.728
measurements in the visible and infrared

00:05:08.779 --> 00:05:13.188
as well as in the radar which is what

00:05:10.728 --> 00:05:14.930
this map of Benny was made off of Ben

00:05:13.189 --> 00:05:17.030
who is the best understood near-earth

00:05:14.930 --> 00:05:19.879
asteroid that has not been visited by a

00:05:17.029 --> 00:05:22.549
spacecraft and with the return to Earth

00:05:19.879 --> 00:05:25.580
of these pristine samples with a known

00:05:22.550 --> 00:05:27.968
geologic context we will enable precise

00:05:25.579 --> 00:05:30.258
analyses that simply cannot be

00:05:27.968 --> 00:05:35.389
duplicated by space-based observations

00:05:30.259 --> 00:05:37.310
or with studying meteorites so Ben whose
size primitive and carbon-rich composition in orbit make it one of the most fascinating and accessible asteroids and that is why it was ultimately chosen as the target asteroid for the aca Rex mission so Jason is now going to talk about the actual sample and what we're gonna be bringing back so thank you osiris-rex brings back a large bounty of sample four of the early solar system they have the first graphic please so you have heard about how Ben Yu is a fantastic target asteroid in turn we
have a purpose-built fantastic spacecraft the trucks of Osiris Rex is origins the first the origin of the solar system and of life itself and for that it's all about the sample meticulous testing and cleaning are necessary to collect and return a pristine sample with the well understood well characterized spacecraft from well understood well characterized asteroid the design of the Star Trek spacecraft instruments and operations all served return this organic rich sample safely with geologic context with the rest of
menu then allow comparisons with other

asteroids and with meteorites

after months of characterization

rehearsals the asara Trek spacecraft

autonomously descends to safely collect

at least 60 grams as much as 2 kilograms

of surface stones and dusts this is a

huge bounty after the sample is

collected is locked in the sample return

capsule until the spacecraft

deliberative to Earth in 2023 to keep

this precious sample safe there are no

other science operations after the

sample is stowed and this will will

allow us to
make sure that the sample is safe and

that the spacecraft is safe by not in

interjecting other possible risks the

formation of the solar system was a

violence but dimly recorded time well

the most director of the Asian Earth is

lost to the dynamic geology that shaped

our planet there are lines of evidence

that indicate that heavy bombardment by

debris from the formation of the solar

system around the same time helped form

the oceans and then a few hundred

million years later life the detailed

chemistry of what was on and delivered
to the Earth and Mars Europa and Enceladus cannot be found on earth rocks this history was recorded in the minerals compounds and isotopes from meteorites and their parent asteroids but meteorites land on the ground and we never know where they come from furthermore organic-rich meteorites quickly become contaminated with the compounds of life these compounds are the most important to understand our origins and meteorites and can only be understood by careful and tedious laboratory work if at all to
maximize the sample of our set of our
samples on Venu we have a very clean
spacecraft and well as a detailed record
of the materials used to process to make
it this script scientists who studied
the samples with the tools directly
verify what was discovered in benna's
rocks are not actually carried from
earth a scientist in my laboratory dr.
Jamie Isola recently led a team
to analyze from pollow samples to learn
the origin of their amino acids she was
not yet born when the sample was
collected use instruments not yet
invented and answered questions beyond
the reach of science at the time

osiris-rex like to start us mission
before us will answer questions
anticipated at the time of launch even
questions we didn't design the or Star
Trek's to answer just as we've learned
from the Stardust comet sample return
mission before us and Hayabusa and
Hayabusa to missions and how to
rendezvous with comet collecting
returned samples to earth we've learned
from near rosette about how to maneuver
around the small body
samples of Benny will be studied by
science instruments too large too

power-hungry or too delicate and the

laboratories around the world we would I

set the sample to the atomic level to

better understand the origin of the

solar system in our place within it the

sample return capsule and for the earth

atmosphere to live or precious fragments

the Innova solar system to the Utah

desert in the morning September 24th

2023 since 75% of the sample be archived

for scientists to request a study

perhaps you your children or your

grandchildren grow up to study the
samples collected by the spacecraft

we're launching now now Danny would tell us more about how we choose the sample

Jason so Ben who is gonna be the first carbonaceous asteroid that NASA has had the opportunity to map the entire surface of and so this is very exciting can I get my first graphic please so mapping we'll begin by determining the shape of the asteroid and understanding the shape of venue is of incredible importance so that we understand how to safely navigate around this body navigation will have some challenges
because venue will be the smallest object that we've ever orbited a spacecraft around one of the primary tools that we will use for mapping the asteroid will be the osiris-rex camera suite or oak cams trio of cameras built by the University of Arizona in conjunction with Oh cams the four other instruments on the spacecraft will go ahead and map venue first globally and then locally by the end of our local mapping campaign we will be able to see an object the size of a penny on the size of venue next graphic please
so before sampling mapping will take place over a year and a half to a two year period and during this two years the osiris-rex spacecraft will be absolutely dedicated to finding the best place on the surface of venue to collect a sample from this is pretty incredible because at the end of this two year period scientists will know more about venue than we know about any other near-earth asteroids so we're collecting again an unprecedented data set the mapping will take place globally so that we first can characterize and understand the major properties of this small world
and then we'll move along to a local mapping phase in order to evaluate the suit of individual candidates sample sites so

the primary importance of mapping at venue is to find this great sample site and then subsequently go and collect a sample from it but once we have a sample of venue the maps will also provide critical context for that sample can I have my next graphic please so maps acquired during this year and a half to two year period will place the sample into critical context and the sample of
venue that will get returned to Earth is at a minimum going to be sixty grams so to get a visual for that that's about four tablespoons of packed brown sugar and because this represents a small portion of the overall asteroid the maps that we collect in the remote sensing data that we collect at the asteroid are going to provide that vital link that we need to connect this sample into the global context for the world that is venue so now that we've had a mission overview talked about the sample and the mapping back to you Nancy
Danijela so now we're ready to open the floor for questions please wait for the microphone and state your name and affiliation okay bill Gellin from we reports space a question on the mapping so that the global mapping if they determine through the are costly effect that eventually this thing would hit us then we have an opportunity 2135 when it passes between the Earth and the moon to have a close approach how will you save the maps well the global maps to be transmitted back to us and and saved in case we ever
have to figure out the geography of bana

in case we need to try and do something
to divert it that's a great question I
mean even security is one of the
osiris-rex mission objectives but also
from the the spectral interpretation a
portion of our acronym the data that we
collect and then eventually build into
maps for venue will be archived by
NASA's planetary data system and so nASA
has a long history of ensuring that data
is
preserved and archived for future
generations to examine and this
definitely includes the maps and all of
the instrument data that we will be collected by the spacecraft okay thank you right here

I'm Jim Siegel I'm with the celebration

news and spaceflight insider I'm intrigued by the dust materials that you expect to find on the asteroid for example what makes you think there's dust there what kind of evidence do you have her experience and then and secondly what would be the texture of this dust would this be like talcum powder or sugar or gravel or what so we have numerous lines of evidence that
tell us the texture of the surface of

the new both from the thermal inertia

where you can look at the the temperature of like a beach versus large

stones and the temperature changes from
day to night

quickly on smaller textures versus

slowly with large textures as well as

using polarized radar from the Goldstone

Arecibo telescopes to give us a size bin

of the surface of the rocks we know that

there are 1 centimeter sized stones

which is ideal for the the taksim device
to collect and based on a reasonable
size frequency distribution by looking at other asteroids including ethic Allah is visited by by Hayabusa we can understand how smaller and smaller pieces would would break up into dust and so we cannot see the dust from the earth but it almost cannot not be there but the stones that we need which are the high-value samples we have high confidence that they are present based on multiple lines of evidence thanks guys Mike wall from psycho space comm so so I'm just wondering it like with their puny advantages to trying to
get more than one sample or are you just

00:15:49,970 --> 00:15:53,120
going to get one sample and you're sure

00:15:52,100 --> 00:15:55,250
you've got it then you're going to go

00:15:53,120 --> 00:15:56,509
because there would be more risks

00:15:55,250 --> 00:15:59,269
involved going back to try to get

00:15:56,509 --> 00:16:01,490
something else so so if you're sure you

00:15:59,269 --> 00:16:03,019
have one I mean could you just kind of

00:16:01,490 --> 00:16:04,430
talk about are there any benefits to

00:16:03,019 --> 00:16:08,990
trying to get a second one if you could

00:16:04,429 --> 00:16:11,599
or is that just getting too greedy so

00:16:08,990 --> 00:16:13,730
I'll go and check that so what we're

00:16:11,600 --> 00:16:16,009
going to do is after we go out and do

00:16:13,730 --> 00:16:17,810
the slow five-second high-five maneuver

00:16:16,009 --> 00:16:19,519
with the nitrogen gas and collect the

00:16:17,809 --> 00:16:21,409
sample we're gonna actually maneuver
away from the spacecraft so that we can
rotate our spacecraft to measure the
mass once we know we have 60 grams in
there we're going to stow and move away
from the asteroid enough to where we
feel that our spacecrafts in a safe
position our priority is to bring back
at least 60 grams of pristine material
so once we have that we're not going to
try to touch that again we've got it
it's getting stowed it's getting ready
to come home so as the scientist I
always want more butts the science team
has been conditioned to understand how
to minimize risk and have respect for engineering reality and so I would love to have a spacecraft that is covered in sand return capsules a friend of mine likes to say Scott Sandford who's on the mission that if engineers designed spacecraft they would launch a bowling ball and get telemetry and declare mission success if scientists designs missions they would design a spacecraft that's too heavy with instruments to get off the pad so coming up with a middle ground where we can ensure we get one high value sample instead of risking at
all on getting to is just not worth the

chance one is a lifetime of data anyway

great thank you we're gonna go to the

phone lines and we have mark dodge on

the phone please

state your question

whose thank you for this informative

briefing this afternoon on this

historical mission of osiris-rex is

going to be incredible my questions are

this using the tag Sam to take the

sample from the carbon-rich

asteroid Bennu what will have to be seen

or detected by the visible light cameras
and spectrometer to indicate the exact

place of the sample of regolith to be

taken and how far from the surface of

Venu

will the sample location be able to be

detected okay so I can take the first

part of this question so one of the

instruments on the osiris-rex spacecraft

is called Sam cam and the purpose of Sam

cam is to watch the tag event and then

later on to verify that there has been

some sample collected by the tag Sam so

the tag Sam has it's a ring as we saw

some of the images earlier and there's a

little bit of you can think of it almost
like steel velcro at the edge of this annulus and that will also interface with the surface of venue and material.

will attach to it so we will not only watch the sampling event but we will also at some distance away from venue go ahead and turn the tag Sam so that we can look at it with Sam cam and verify that we have acquired some material.

questions from social media media please

Aries okay thanks

this question is from ad a quasar comm

and they want to know what is the added value of retrieving the sample instead
of analyzing it using onboard

instruments NASA has a history of developing fantastic onboard instruments such as the the great instrument suite on the Curiosity rover on Mars right now

the problem is that those instruments however fantastic they are the design has to be fixed years before launch to minimize risk of change and also to make

sure that the instruments are and robust to the launch environments and that they don't need frequent tune ups like laboratory instruments do in the case when you bring a sample back to
earth you can use laboratories the size of the spacecraft even the size of buildings like synchrotron facilities that were used to say the start of samples and you can take rocks and slice them up into tiny tiny fragments and put them into these beam lines and manipulate them using people that are that have the ability to adjust these objects in ways that robots can't and then interrogate in ways and finer detail than you ever could and of course as we mentioned people not yet born with ideas that we didn't have now can test
them in ways we couldn't even conceive

00:20:45.970 --> 00:20:52.269
of with that so 60 grams is the smallest

00:20:50.470 --> 00:20:54.490
amount that we're intending on returning

00:20:52.269 --> 00:20:56.889
but that's still going to be the largest

00:20:54.490 --> 00:21:00.370
sample return since the Apollo era so

00:20:56.890 --> 00:21:03.639
this really is a sample return mission

00:21:00.369 --> 00:21:03.640
that's going to be the gift that keeps

00:21:00.369 --> 00:21:03.640
on giving 25 percent of this sample will

00:21:03.640 --> 00:21:08.559
go towards the science team in order to

00:21:05.669 --> 00:21:10.870
fulfill their objectives and then 75

00:21:08.558 --> 00:21:12.548
percent is going to be stored in our

00:21:10.869 --> 00:21:14.558
curation facility at Johnson Space

00:21:12.548 --> 00:21:16.990
Flight Center in order to allow future

00:21:14.558 --> 00:21:18.160
generations of scientists to use

00:21:16.990 --> 00:21:20.829
instruments that haven't even been
invented yet so as Jason mentioned

earlier one of his colleagues at Goddard is still working on the Apollo samples

now so this sample return of cyrus rex is going to keep giving back to future and future generations of scientists it's really going to help us understand the solar system so it's fantastic to

the next question we had which is how could this mission have an impact on future emissions and which future missions we're willing to share the answers here so we're really actually going to be
able to the technologies that we have developed are gonna help with several different types of missions to say small bodies in the future the first of which is going to be doing those close proximity operations being in that low gravity near the actual small body our mission has been specifically designed for that and our our type of research and design that we've done can be implemented towards future missions the actual tag Sam arm and then the sample return capsule which was from Stardust previously so we used a design
that we know is tested and in well validated and works we will continue to keep using that design as we move forward so it's it's really the great thing about osiris-rex is the instrumentation onboard the spacecraft is at the forefront of technology the sample return is at the forefront of technology the fact that we're able to actually be in low gravity around this small body and still maneuver and operate is at the forefront of technology so all of that from NASA is going to continue moving forward into
more and more net missions afterwards hi

00:23:07,779 --> 00:23:11,678
Kim Kramer for universe today on the

00:23:09,519 --> 00:23:17,079
North East astronomy forum I have a

00:23:11,679 --> 00:23:19,300
question for Jason and Christina Jason I

00:23:17,079 --> 00:23:20,649
think you mentioned after you collect

00:23:19,299 --> 00:23:25,269
the samples you're not going to do any

00:23:20,650 --> 00:23:27,940
more science um no no imaging is that is

00:23:25,269 --> 00:23:29,679
that why why would that be we moved to

00:23:27,940 --> 00:23:31,390
after we collect the samples we move to

00:23:29,679 --> 00:23:34,000
a safe distance from the asteroid and

00:23:31,390 --> 00:23:34,960
all the primary objectives have already

00:23:34,000 --> 00:23:36,789
been done we've already thoroughly

00:23:34,960 --> 00:23:39,759
mapped an image and characterized the

00:23:36,789 --> 00:23:42,190
asteroid it's all about keeping that

00:23:39,759 --> 00:23:47,500
precious sample safe doing nothing that
can possibly jeopardize it there we need to make sure that we can return the sample and not undergo any risk by getting closer to get better images we already have everything we need we need to show the same restraint that we have all along the program has kept us on schedule under budget to make sure that we don't grow our scope and do things that we don't really need to do only what we have to do and that's for a few weeks or a few months it depends on exactly when we collect the sample there's a window but it could be several
months okay for Christina can can you show with your asteroid model they're roughly how how will we be doing how you'll be doing the sample collection with the spacecraft what what's the approach the asteroid it's probably our spacecraft is gonna go into the rotation period with it it's gonna do lots of detailed mapping and then eventually when we feel safe and ready we're going to walk in and we're going to come down and do a very safe smooth high-five and then we're going to back away from the asteroid make sure we have the mass we
need and then we are gonna stow that

once we have it so stowed ready for departure do you think it is more likely from the equator or from another area

you know we're gonna actually do detailed mapping of the entire surface of been you as Danny described and so what we're gonna do is narrow that down to twelve different selection sites I'm not going to say definitively where any of those sites are because the great news is is we have the instrumentation on board to be able to be definitive about that after we do the detailed
mapping if you hit the jackpot with tag

00:25:40,329 --> 00:25:43,269
Sam instead of getting that minimum 60

00:25:42,069 --> 00:25:46,029
grams you end up with several hundred

00:25:43,269 --> 00:25:47,470
grams do you change how you apportion

00:25:46,029 --> 00:25:49,210
the sample once you return it to earth

00:25:47,470 --> 00:25:51,429
you're still going to set 75 percent of

00:25:49,210 --> 00:25:53,470
side or were you set aside more or less

00:25:51,429 --> 00:25:56,440
of that for future study if you end up

00:25:53,470 --> 00:25:58,210
with much more than 60 grams right now

00:25:56,440 --> 00:26:00,539
is for 25 percent for the science team

00:26:00,539 --> 00:26:10,240
yeah we also have and 0.5 percent it's

00:26:08,048 --> 00:26:12,759
going to J AXA we have an agreement with

00:26:10,240 --> 00:26:19,980
the Hayabusa to mission as well as also

00:26:12,759 --> 00:26:19,980
yeah okay let's go back to social media
okay and so now this question comes from CJ Steuben 9 and they want to know what instruments will be used to measure the riccati effect on venue and how so I can take this one so we heard a little bit about the arc offski effect in the last press briefing and this is that small force that causes the orbit of the asteroid to change in a way that's difficult to predict and this comes from sunlight basically turning the asteroid into something with small solar solar sails this is a way to think about it so we have two two antennas on
the spacecraft we have a high gain and
low gain antenna and we will use those
to track the position of the asteroid as
we're flying in formation with it and so
any any deviation any small changes from
what we anticipate the orbit of Benn to be versus what we're tracking will be
used to to measure that that small
Yarkovsky effect
hi Jared Hayworth for we report space
had a question what's the ultimate fate
of the spacecraft after the sample
return canisters been detached and sent
home so the the spacecraft goes to
heliocentric orbits after the these SR

seed goes to earth and remains in orbits

and could be a very healthy spacecraft

could be in assets should NASA wish to use this but after the after that point

the Sark's mission of ceases operations

with the spacecraft thanks James day in Florida today a couple questions first I

you know if her first u.s. sampling

mission with her reference to Phil I and I Busa Apollo I just wonder if they could you know kind of put clearly in context how unique or rare of omission

of an event is this to not only you know
to touch an object like that and and

bring the sample home and secondly I'm

just wondering if you know regarding

that whatever sample you get you know I

know I know you're carefully gonna pick

the right spot but is there any outcome

that would could be kind of

disappointing if it doesn't contain you

know certain compounds that you're

hoping to find that would leave

questions more open about origins or is

anything a good a good sale which is I

think that anytime we get a surprise it

leads to more questions and that's
fantastic as a scientist you can't help but want to have more questions in the end so one of the great things about exploring and about going to a really an unknown place is that you get to learn something new so I think that we're fairly confident that we know this is going to scribe and rich asteroid we're fairly confident that there's going to be some of these organic compounds there but until we get it back down to earth you know we won't have those definitive answers and so we're looking forward to that in terms of
context with other nations Jason do you want to take that sure yeah so again we have multiple lines of evidence that tell us this is a carbon-rich asteroid but if it isn't that means that we have to we have to rewrite the textbooks on how we understand those lines of evidence and that's exciting too so but as far as learning from other missions we draw the spacecraft from the juno and maven heritage we've learned a lot from nears encounters with asteroid eros we have exchanged information with JAXA on Hayabusa
operations we've exchanged team members with JAXA for Hayabusa to operations and
we work closely with ISA for Rosetta operations to learn how to operate around a small objects understand the thermal properties of asteroids and try and get every piece of information we can to understand this strange environments and use as much engineering logic as we can from as I said these other missions as well as of course Stardust on how to bring a sample back from space hi I'm Stacy severance star talk radio
just a question we keep hearing about

the carbon richness and I wondered if

there were any other objects that we

know of that are as carbon rich that we

might think of studying was it just the

trajectory and the orbit of this that

made it most attractive so we we heard

earlier during the the last press

briefing about there the small handful

of objects that were suitable both

because they had favored favorable

orbital characteristics but also because

these asteroids had the right

composition this this carbon rich

material so actually another great
candidate was an object called ju3 and

that is coincidentally the object that

Hayabusa to the JAXA Japanese Space

Agency that that's become their target

asteroid for a sample return so there

are a small handful of objects in the

solar system and in fact in near-earth

space that did have the right

characteristics but ultimately Bennie

was so well characterized that we we

wanted to go there because we already

had enough data to help us start

mitigating risk okay we're gonna go back

to the phone line mark Koch do you have
a question yes mark Koch historical

aerospace news another question once

though Cyrus met-rx mission has been

launched the rocket going forward once

the final stage has gone through and the

spacecraft enters into space the fairing has been shed it going forward what is

the distance from the planet Earth -

Benno and will it be traveling it will

be traveling on rocket fuel going

forward on that distance can you also

tell me how solar power will play into

this mission can answer some of those

for you off of my head so the the the
The majority of the push we get is from the launch vehicle from the boost turn from the Centaur. The central gives us most of the push we need to get to been knew the center itself goes into heliocentric orbit becoming another pseudo asteroid if you wish the the spacecraft uses hydrazine mono propellants and we undergo a deep-space maneuver in January of next year followed by the earth gravity assist a year from now to put us in the same plane as Bennu the solar arrays are used.
to power our electronics it's not a solar electric spacecraft so again a mono prop we have both the main thrusters and a large number of other thrusters for very fine maneuvering around such a small object but we have plenty of power margin depending on where we are either closer to the Sun or further from the Sun because Ben is on is on an elliptical orbit then it was chasing the earth right now and will soon catch up but I don't recall the distance today believe the total distance of this mission that it will have traveled is four-and-a-half billion
miles so it's got its got a ways to go

but we're really excited about that

yeah okay we're gonna take one more

question from social media and then

we're gonna wrap up okay this question

is from at cran addy and the question

does NASA have osiris-rex twin and like

the Mars rovers do I think that

questions for Jason because you know we

have a lab at Goddard um I used to joke

that ideally we would launch two

identical spacecraft one collect the

sample and one be a blank to do proper

do double-blind study when the sample comes
813
00:34:47,530 --> 00:34:50,909
back

814
00:34:48,800 --> 00:34:53,220
that's really had it how to do the

815
00:34:50,909 --> 00:34:55,710
mission right but no one would believe

816
00:34:53,219 --> 00:34:56,789
me and and that that would drive our

817
00:34:55,710 --> 00:34:58,800
costs considerably

818
00:34:56,789 --> 00:35:02,849
like I said scientists want always want

819
00:35:02,849 --> 00:35:05,940
more there we built one spacecraft for

820
00:35:05,940 --> 00:35:08,400
me built it right we have this is a PIL

821
00:35:08,400 --> 00:35:10,650
ed cost cat mission and we built within

822
00:35:10,650 --> 00:35:11,970
that cost and there's not margin to

823
00:35:11,969 --> 00:35:16,250
build a second just in case my

824
00:35:16,250 --> 00:35:18,509
spacecraft no matter how much I want one

825
00:35:18,510 --> 00:35:20,309
that was used here to develop further

826
00:35:20,309 --> 00:35:22,920
missions in the future so we look

827
forward to potential future missions

you know NASA's still here it's alive

and strong so we're to keep on going

okay right great thank you Christina

Jason and Daniela this concludes today's

briefing thank you for joining us