good afternoon my name is Dwayne brown

welcome to NASA headquarters today you will hear the latest update on the largest and most capable robotic machine going to the surface of another planet

NASA's Mars Science Laboratory otherwise known as MSL scheduled to launch from the Florida Space Coast this month and you hear the latest details on that information about this incredible mission is on www.nasa.gov / MSL and the press kit that has all of the detailed information on the mission and all of
00:00:43,079 --> 00:00:50,879
the other logistics is at HTTP colon

00:00:46,350 --> 00:00:54,058
slash slash go dancer gov / and missile

00:00:50,878 --> 00:00:56,399
press kit on one word what has short

00:00:54,058 --> 00:00:58,169
presentations from my speakers then

00:00:56,399 --> 00:01:00,660
we'll open it up for questions starting

00:00:58,170 --> 00:01:03,510
here in Washington on NASA centers in

00:01:00,659 --> 00:01:05,338
the phone line but we get started let me

00:01:03,509 --> 00:01:09,719
introduce you to today's speakers or

00:01:05,338 --> 00:01:11,760
stop double question director Mars

00:01:09,719 --> 00:01:19,079
exploration program NASA headquarters in

00:01:11,760 --> 00:01:22,710
Washington Ashwin Vasavada I'm sorry

00:01:19,079 --> 00:01:24,840
Ashwin Vasavada MSL deputy project

00:01:22,709 --> 00:01:28,828
scientist at NASA's Jet Propulsion

00:01:24,840 --> 00:01:33,180
Laboratory Pasadena California and Pete
tysinger msl project manager also at the
Jet Propulsion lab and with that I'll
prostate deduced kick us off thanks
plane boy it's great to be here it's a
momentous occasion but of course what's
really important is the last time I sat
at a press conference on MSL it was to
announce a slip this is where we really
want to be and it's fantastic to be
here I am very proud to say that msl l
has been assembled tested encapsulated
and stacked on top of the Atlas and is
ready to go 15 days to launch pretty
incredible it's not your father's Rover
this is a 2,000 pound machine that's

over six feet tall it's

truly as Duane said the largest and most

complex piece of equipment ever placed

on the surface of another planet truly a

wonder in engineering from Long Island

to California from New York to to

Florida we've employed thousands of

people in very high-tech careers for the

last six or seven years on this mission

and that's going to continue as we

cruise to the planet and actually get to

the surface and operate and do wonderful

science it's the best of us imagination

the best of us innovation and we
couldn't just do this alone we have a lot of partners with us we have France with us we have Canada we have Germany we have Russia and we have Spain in the u.s. of course to launch this we have united launch alliance in the kennedy space center in the united states air force of cape canaveral and of course we have the Department of Energy aboard so it's truly a spectacular mission with a lot of involvement worldwide can we have the first graphic please what you're looking at is a strategic integrated program of Mars exploration we began
this program back in to roughly in 2000

you'll see the operator operational

missions there still include Odyssey and

mro of course the the rover Opportunity

is still operating we have a partnership

on Mars Express Phoenix we flew in 2007

but ms l sits squarely in the middle of

the strategic to get decade-long

activity and what it does is it bridges

the gap from the past decade

scientifically to the next decade and

technologically scientifically from

understanding planet as being warmer and

wetter than we had previously believed
to the next decade to try to understand

if it was ever habitable and potentially

even seeking signs of life not life

it's not a life detection mission

technologically we move from airbag landings and small systems of a few kilograms of payload too much larger systems and putting that two thousand pound rover on the surface so msl is pioneering the challenges of high technology we have ever increasing payloads we've got more accurate landing capabilities we've got longer life systems on the surface with nuclear
power

and we have state-of-the-art instruments

aboard these are also techniques that are necessary as we move towards the ultimate goal of putting humans on the surface of Mars an extremely exciting time for the Mars program and for NASA this is the capstone of the year of the solar system the science that will be doing it you'll hear about from Aswan we couldn't even dreamed of doing 10 years ago at this scale and technology as well we've moved from Pathfinder to spirit opportunity to msl and you'll hear more about the technologies from Pete here
shortly but it's really pretty amazing

how in a matter of 15 years we've gone

this far and again we bridge the gap

from follow the water to seeking the

signs of life well its spot will will

excite the nation will inspire the

nation we're going to show incredible

new vistas great new discoveries but

most important is the launch is just the

beginning we still have a little bit of

cruise but then the key is landing in

august of next year and that's going to

be exciting it's very challenging never

done it this way before but you'll hear
about that from Pete but we're we're just thrilled that we're at this point so we're going to do is turn it over to Oshawa and let him talk to you about the science all right so as it scientists on this project I can tell you that this is a Mars scientists dream machine we're so excited to have this Rover going to Mars this year it's going to be the virtual presence for over 200 scientists around the world to explore Mars and Gale Crater that will talk about this Rover is not only the most technically capable Rover ever sent to another planet but
it's actually the most capable scientific Explorer we've ever sent out and so with that you know we're just super excited it's about twice the size of previous Rovers has 10 very capable scientific instruments and on the first graphic here you can see that the rover like previous Rovers is a has six wheels it is much bigger though it's about six feet tall and what really dominates the design of this Rover is the fact that it has this ability to sample rocks and soils on Mars for the first time and so it has a big six-foot robotic arm and
the rover is partly that big because it holds two very capable scientific laboratories inside the rover so the one of the things that the rover does is to survey the landscape around Gale Crater so it does that with some HD cameras it also has that I on the on the top of the rover which shoots out a laser and can survey the chemical composition within 20 feet of the rover then another thing we do is monitor the environment so we have a very capable weather station for winds and pressure humidity that sort of thing we can sound below the rover to figure out if there's
any minerals that contain water below

the rover we also detect natural high energy radiation this kind of radiation

is critical to measure for the day that we do send humans to Mars and in fact this sensor is being flown by the human exploration part of NASA on the next graphic you'll see what really is the meat and potatoes of this mission when we deploy that arm and we put out a whole bunch of sensors on rocks or soils that are of interest to the science team we have some tools here where we look close up with a magnifying glass camera
we also have another sensor on the arm

which takes an even more detailed chemical look at the composition of the rocks and soils but the you know the crowning achievement scientifically of this Rover and technically is to drill into rocks and capture material from the insides of rocks which you've never done before on Mars and that's really where the science will come from and we drill in with a big jack hammer drill we've delivered that sample to the rover itself and analyze it with two very sophisticated instruments one of which
measures the minerals that are in those rocks and soils another which looks element by element which chemical elements are there and looks for any organic material that might be present so but before we can do any of this incredible science and and really wouldn't be worth doing we didn't have a spectacular landing site as well and so the next graphic shows a really nice image of the Sun rising over Mars and you can see the cratered Southern Highlands and the near part of the picture the smooth planes in the far
apart and right on that boundary in the
middle of the image here there's a

00:08:37,740 --> 00:08:41,519
crater with a mountain inside of it and

00:08:39,389 --> 00:08:42,958
that mountain inside the crater is what

00:08:41,519 --> 00:08:44,579
captured the eye of the scientists that

00:08:42,958 --> 00:08:46,829
have been studying Mars the last decade

00:08:44,580 --> 00:08:48,889
and resulted in being chosen for this

00:08:46,830 --> 00:08:51,810
mission if you go to the next graphic

00:08:48,889 --> 00:08:53,088
you'll see that Gale Crater is about 100

00:08:51,809 --> 00:08:55,128
miles across

00:08:53,089 --> 00:08:58,069
that yellow ellipse is where we will

00:08:55,129 --> 00:08:59,899
land curiosity and then we'll drive

00:08:58,068 --> 00:09:02,479
towards the mountain the mound itself is

00:08:59,899 --> 00:09:04,220
over three miles high and on the next

00:09:02,480 --> 00:09:05,769
graphic I'll tell you a little bit about
why this mound is so spectacular

scientifically it's actually composed of

layered rock and we see that from the

orbiters that are around Mars now

mapping the planet we've discovered that

the layers are flat which means probably

sediment at one point filled the entire

crater and now has been stripped away

but even more interestingly the layers

are made up of different material the

bottom layers are a mixture of clays and

sulfates then you go into layers that

are just sulfate salts and then you get

into some upper layers which are just
frankly uninteresting Martian dust and it's that change over time which the whole planet has experienced but what's incredible about Gail is it's all in one place here probably the entire early history of Mars is here for us to to drive out of that ellipse over several months and then start climbing this mountain with curiosity so we couldn't be more excited about that and before we do any of this we got to get there and so that's what a Pete Ising we will talk talk with you about Thank You Ashley as Doug mentioned we are in Florida we
are prepared on the vehicle and prepared to go. I want to show some pictures of the build up of the vehicle when you land on Mars when you go to land on Mars what you're really talking about is three vehicles not just one there is the vehicle that gets you to Mars there is the vehicle that actually penetrates the atmosphere and goes through the entry descent and landing portion of the mission and then there is the rover that eventually gets deposited on the surface and I'll show you some pictures of how we build up that vehicle and in that way.
honest in the first graphic is the rover

00:10:42,860 --> 00:10:48,318
itself it you can see it's as Ashwin

00:10:46,610 --> 00:10:50,688
mentioned it's a sixth wheel what we

00:10:48,318 --> 00:10:52,729
call rocker bulky system you can see arm

00:10:50,688 --> 00:10:54,919
on the left with a turret assembly which

00:10:52,730 --> 00:10:57,019
has a several of the science instruments

00:10:54,919 --> 00:11:00,019
and you just barely make out in this

00:10:57,019 --> 00:11:02,089
photograph the mast above as Doug

00:11:00,019 --> 00:11:04,759
mentioned it's about 900 kilograms of

00:11:02,089 --> 00:11:06,410
roughly 2,000 pounds I could have the

00:11:04,759 --> 00:11:09,169
next graphic please

00:11:06,409 --> 00:11:11,028
as I'm as Doug mentioned it requires a

00:11:09,169 --> 00:11:13,909
new and novel system in order to get to

00:11:11,028 --> 00:11:17,419
Mars we're not landing like mer did on

00:11:13,909 --> 00:11:18,980
on the airbags we are landing propulsive
like Phoenix but we're landing a rover

and it's not a stationary Lander and so

what you see on the graphic is the
descent stage that we use to propulsive
ly lower the rover and the end itself to
the surface of Mars you can see the
eight large main landing engines and
then off to the right that large and a
surfboard shape picture future is the
landing radar which you use to measure
the velocity that we land at and the
altitude both very critical for this
particular landing system I could have
the next graphic please this shows the
rover underneath that descent stage you

can see the reddish elements are

protective covers around the main

landing engines they're used when we put

assembling things so that they don't get

damaged and you can see that the

composite of that the distance station

closed the rover is being put up inside

the back so that's the top half of the

entry of the entry vehicle if I could

have the next graphic please and now you

see that that assemblies is now up

inside the white back shell and below it

is the heat shield looks very much like
an Apollo entry capsule except in fact

is larger than an Apollo empty capsules

it is about four and a half meters

across at the bottom I could have the

next graphic this is the entire vehicle

that goes to Mars up the the part at the

top which has the white circumferential

banding is is the crew stage that is all

the equipment that we need to get to

Mars but we don't need at Mars it

includes telecommunications equipment

the solar rays for the interplanetary

transverse and and the propulsion system

to do the trajectory connection

00:12:21,980 --> 00:12:25,850
an Apollo entry capsule except in fact

00:12:24,019 --> 00:12:27,379
is larger than an Apollo empty capsules

00:12:25,850 --> 00:12:30,319
it is about four and a half meters

00:12:27,379 --> 00:12:32,990
across at the bottom I could have the

00:12:30,318 --> 00:12:37,188
next graphic this is the entire vehicle

00:12:32,990 --> 00:12:40,730
that goes to Mars up the the part at the

00:12:37,188 --> 00:12:44,389
top which has the white circumferential

00:12:40,730 --> 00:12:45,920
banding is is the crew stage that is all

00:12:44,389 --> 00:12:47,688
the equipment that we need to get to

00:12:45,919 --> 00:12:49,269
Mars but we don't need at Mars it

00:12:47,688 --> 00:12:51,759
includes telecommunications equipment

00:12:49,269 --> 00:12:55,308
the solar rays for the interplanetary

00:12:51,759 --> 00:12:56,930
transverse and and the propulsion system

00:12:55,308 --> 00:12:58,429
to do the trajectory connection

00:12:56,929 --> 00:13:00,528
maneuvers in order to get us navigated

00:12:58,429 --> 00:13:03,620
to the right place for entry when we

00:13:00,528 --> 00:13:04,639
launch this is actually upside down we

00:13:03,620 --> 00:13:06,889
actually launched with the heat shield

00:13:04,639 --> 00:13:10,430
up and the cruise stage down on top of

00:13:06,889 --> 00:13:12,829
the animals the next please and here you

00:13:10,429 --> 00:13:14,778
can see kind of the last picture of the

00:13:12,828 --> 00:13:16,549
vehicle as we could see it as a total

00:13:14,778 --> 00:13:18,649
vehicle before it was encapsulated in

00:13:16,549 --> 00:13:20,269
the fearing that shows the Atlas fearing

00:13:18,649 --> 00:13:21,980
which is then put around

00:13:20,269 --> 00:13:24,039
the vehicle and then the pherion plus

00:13:21,980 --> 00:13:26,659
the vehicle was transported to the

00:13:24,039 --> 00:13:28,579
realist integration facility at the

00:13:26,659 --> 00:13:31,339
launch pad if I can see the next graphic

please this shows the vehicle inside the

fairing being lifted to the top of the

of the Atlas I think that occurred on

the on the second of November and if I

can see the next graphic please that

shows the assembled vehicle as it

currently ahead is we're going to final

launch vehicle operations and we're

going through final electrical testing

on side the rover and we'll be all

prepared to launch on the twenty fifth

of November the friday after

thanksgiving of course once we launch to

them the vehicle to mars that is that is
only the first part of this of the of

the journey in order to get Auslan

scientist and risco place where you can
do science and I'll show you a an

animation now of the kind of the total

mission in two minutes so bear with us

we can start that please we inject on us

on the Centaur upper stage and we are
kicked off on the cruise trajectory it

takes eight and a half months for us to

get to Mars we are slow spinner and in

that Trevor's we arrive at Mars doing

about 12,000 miles an hour we kick off

the cruise stage and we enter the
atmosphere you can see the rustiness

thrusters that we use to do the precision landing that both Doug indicated in osh windshields Elena your

lips at 2,000 miles an hour I'm excuse me mock to about a thousand miles an hour we kick out the parachute drop off the heat shield at about 10 kilometers high and then about two kilometers high we drop off the descent stage and propulsively lower ourselves towards the planet when we're a couple hundred meters off the ground we actually lower the rover on what's called the sky crane
and and cut the bridle and then the

descent stage flies away and we have the

rover sitting on a stick wheels on the

surface we will then either do instead
to science if we have been landed

somewhere exciting or we will Traverse
to a science interesting science site

and you will see here going up to an

outcrop deploying the arm which contains

the drill which we use to collect

samples showing the depositing of that

sample in one of the science instruments

for its analysis it's a very complicated

Rover we will take our time when we get
to the surface the initial science will
probably not be coming very fast it will
take a lot of how good is the rover in
his condition what the science dreamlike
where the closest science targets how
does it really work really work on Mars
very difficult to test that on earth so
it'll be awhile to get the first real
samples back but it's a two year long
mission and we're expecting tremendous
results entry descent landing is always
a an exciting time in a challenging time
we're confident in our ability to do it

successively at the planet but it is
clearly not risk flee as you can as free
as you can see from the complexity in

the animation Dwayne okay thank you
gentlemen okay okay what we're going to
do is actually we want to go down to the

Kennedy Space Center where they're

preparing for the launch and hopefully

preparing for they lose your folks for

Thanksgiving dinner there so Kennedy

Space Center yeah you up first at bat

and let's have the first question please

hello this is Marcia Dunn of the

Associated Press I'm wondering could use
give a list of some specific signs of

life you might be looking for with the
rover and why not why didn't you just put some life detecting equipment on board to actually look for real signs of life sure I can answer that it's important to know that this mission is really has a purpose of setting us up for the day when we'll go to Mars and do the life detection experiments it turns out those are pretty hard to do and you actually need to know a lot about Mars to understand where to go to do those experiments so the goal of this as Doug mentioned is to look for habitable environments on Mars these would be
environments that are capable of supporting life we actually are pretty limited in our knowledge of where to look for those we have gale crater which is a very promising site because it has some things we can detect from orbit that would indicate a habitable environment for example it has some geologic evidence that water was around we hope in fact to search for organics with this mission that's another requirement for life as we know it but this mission is really about looking for those habitable environments and not detecting life itself another question
from Kennedy thank you and how might this Rover paves the way for future human explorers some how might it makes life easier for them that's a very good question many of the things that you need for humans to explore the planet involve obviously as Pete was talking about landing that's very complicated so we are shrinking Landing ellipses dramatically from a hundred kilometers or so down to a small circle of about 20 so that type of precision landing is a direct precursor the ability to manipulate and handle samples
robotically on the surface in other words all the sample handling that needs to be done to get it samples into ashwin's instruments is also something that would be useful in in getting humans to Mars larger masses to the surface you have to resupply astronauts on the surface as well as you know feed them and water and other kinds of supplies and so this is a good landing system to do that type of thing and just learning how to get through the atmosphere with much larger masses will take us to humans now the Aswan
mentioned a specific instrument is called red which is a radiation detector provided by the human exploration organization at NASA that actually is the first time we've taken measurements on the surface in great detail over several several earth years and maybe several Martian yrs if we're lucky and that is obviously going directly into the database to understand how much radiation would astronauts be exposed to on the surface over time and then how you can actually mitigate some of those effects so those are just a few of the
issues that could help with humans to Mars and before we take the next question in at Kennedy just a note for the media watching this in here the Kennedy Space Center will be issuing immediate visor II if they haven't already that pretty much lays out a virtual buffet of diverse briefings that talk about Mars get into the specifics of the sign and also a press briefing from the Johnson Space Center on the human future human exploration in the synergy between robotics and human exploration so stay tuned for that briefing and on the
website wws a gulf last msl you'll also see that coming out of the Kennedy Space Center and NASA headquarters next

question from Kennedy please thanks this is Todd alberson afford it today for Doug could you update us on negotiations with the Europeans in regard to the 2016 mission what the split of responsibilities would be and and whether you guys are going to actually have the money to do it and be able to come to an agreement with the Europeans Todd I'd like to keep this focused on MSL but I'll give you a
couple of second answer Here We certain have continued obviously our work with the Europeans obviously the US and ISA realized we may have some budget concerns in the future and so ISA has approached Russia about potentially providing launch vehicle and maybe be involved at this point since the 2012 budget isn't passed the 2013 budget is still in development it really can't talk about the budgets any further than that so I kind of like to leave it at that Todd and in a few months I think we'll have more that we can share and so
Dwayne I'd kind of like to keep it on MSL if you don't mind, Roger that didn't any other questions on MSL, yeah I won't ask about America's future programs at Martha and we'll just stick with MSL, I'm wondering you know the skycrane entry landing entry and landing scheme is quite different from anything you've ever done before and and to a lot of us have we sitting on the sidelines it it seems to be well scary I'm wondering if you can kind of describe our compared to some kind of mechanism on earth and exactly you know
whether you're going to be biting your

nails during that descent Mentry I think

entering any entry descent landing on

Mars is a place where you will you take

pause and bite your nails a little bit

it it's not a risk-free environment when

when the agency decided the objectives

for this mission and and the suite of

instruments that would be required to

perform the science and we and we saw

that we had to develop a very large

Rover it was very clear that that was

beyond the scale of airbags to be able

to land successfully and so we had to

land in a propulsive way on the planet
and if you think about it there's only two ways to put to land the rover propulsive Lee on the planet that's to put the rover on top of the propulsion system or put the rover under the propulsion system if we put the rover on top of the propulsion system kind of a traditional way that you've seen it looks I mean without a rover but you've seen voy a Viking and then and in Phoenix you've got to get a 2,000 pound rover off the top and that was a daunting thing to do in examining this we said well we already
have a system is capable of contacting

the surface interacting with the surface

a landing gear is it will that's the

six-wheeled rocker bogie system so the

challenge is really to just simply is

not shouldn't they simply is to put it

there softly enough in a controlled

enough fashion and and I don't want to

say that that we looked at this

flippantly because there were an awful

lot of people that had exactly your same

reaction of you've got to be kidding but

we did an awful lot of independent

reviews we went to an awful lot of non
NASA control specialists the people

actually fly helicopters sky cranes we

got them in the game to talk about

whether or not this was not only an

achievable design system but whether or

not we could put together a test program

that would verify it to add adequately

enough and we convinced ourselves and we

review several times by the agency that

we were able to do that and and so

that's the system that we've put

together we have done a tremendous

amount of entry descent landing reviews

and tests you can't do the test and into

and
n sense because you can't land on Mars

00:24:16,909 --> 00:24:20,240
on the earth but you can do the test and

00:24:19,190 --> 00:24:22,700
a peaceful I sense

00:24:20,240 --> 00:24:24,440
so we have done deployments of the sky

00:24:22,700 --> 00:24:28,640
crane with test equipment and we have

00:24:24,440 --> 00:24:30,920
done a surface contact testing to do the

00:24:28,640 --> 00:24:33,950
landing we have done radar testing on

00:24:30,920 --> 00:24:36,170
Hilla copters an f-18 jets out at Dryden

00:24:33,950 --> 00:24:38,330
to do basically test all the components

00:24:36,170 --> 00:24:39,740
of the skytrain system so we're

00:24:38,329 --> 00:24:42,409
confident that we've done our due

00:24:39,740 --> 00:24:44,900
diligence and and you know Mars may

00:24:42,410 --> 00:24:46,340
interfere with us but or there may be

00:24:44,900 --> 00:24:48,470
something we haven't caught that's

00:24:46,339 --> 00:24:49,939
always the element of risk but to the
extent that we've been able to think of

it we've attacked all the problems and
done all the testing we can do before we
go to Kennedy again just a reminder we
do have briefings that will start on the
river 21 whole series of briefings so
we're going to keep this briefing and we
have a limited time to MSL questions
only and if there are other questions on
other related topics please contact 20 2
my office and we can get you
the appropriate folks so Kennedy another
question please

hi dan billow from w es HTV would you
talk a little bit about an extended mission... how long do you think that that this... could last and and I may have missed it but would you talk a little

bit about its speed on the planet how much faster if any faster can it can it go over the planet surfaced and the other Rovers its speed is about a tenth of a mile an hour which is about the same as the mars exploration rover we should be able to do better in terms of a daily how far can we go in a given day for two reasons one we're basically limited for safe driving on how far
ahead we can see reliably and the
rover senses taller will give us a
better a better vision in that
standpoint also an advantage that we
have now that we didn't have with the
mars exploration rover benefit of the
Mars program is we have Mars
Reconnaissance Orbiter in place and the
high-rise instrument is able to do 30
centimeter photography of the surface
and has extensively covered our landing
site and will continue to do so so we'll
be able to basically lay out the track
far ahead of our daily traverses with
looking at rocks that with good enough

671 00:26:48,690 --> 00:26:53,850 resolution so we could see things that

672 00:26:50,220 --> 00:26:55,500 might get in our way and so that's the

673 00:26:53,849 --> 00:26:59,069 diverse question Oh a lifetime question

674 00:26:55,500 --> 00:27:01,109 well I'm the project manager so my

675 00:26:59,069 --> 00:27:04,048 warranty expires that the day after the

676 00:27:01,109 --> 00:27:06,599 level one requirements but we do test

677 00:27:04,048 --> 00:27:09,480 all the mechanism equipment for three

678 00:27:06,599 --> 00:27:12,829 times its normal life there is no life

679 00:27:09,480 --> 00:27:15,569 limiting consumable per se on the design

680 00:27:12,829 --> 00:27:17,009 the the power source will last a great

681 00:27:15,569 --> 00:27:20,069 number of years we will not have the

682 00:27:17,009 --> 00:27:22,079 dust issues that we had with mer will be

683 00:27:20,069 --> 00:27:25,109 able to handle winter a lot better than

684 00:27:22,079 --> 00:27:27,658 we are on mer so so on the face there's
nothing you know varying we're out and

that could be any time you want to

figure we should be good for klein

distributed period of time okay i'd see a

couple of folks here in the audience in

our studio so if you give your name and

affiliation thank you

I'm Joe pelka from NPR and I've got a

question for Oshawa a question for Pete

you want me to do them serially or in

parallel okay well start without I found

in the in the in the last set of

missions we were waiting for signs of

water and there were press conferences
when we saw some chemical reaction that gave us a sense of finding it in this mission I know you don't know what you're going to find till you get there but what kinds of things would be oh this is worth a press conference because we found X well as Doug was mentioning that you know the program's kind of transitioned from following the water and these as you mentioned the rover's that are currently on Mars an opportunity spirit they both found evidence for water in different forms water that that is interacted with the
soil in form minerals that require water
evidence for actually flowing water on the surface so that is sort of in the rearview mirror now and we moved on to this evidence of habitable environments so the kind of things that would I think generate excitement for us is really confirming first of all confirming what we saw from orbit so there's evidence from orbit for these clay minerals and the clay minerals in particular are fascinating because they do require water a lot of water to interact with rock over some time to form these
minerals and it's done through

00:28:59,159 --> 00:29:02,549
spectroscopy from orbit there could be

00:29:00,960 --> 00:29:04,558
some errors it could be some things we

00:29:02,548 --> 00:29:07,108
don't understand about the data but we

00:29:04,558 --> 00:29:09,148
will have a definitive knowledge of the

00:29:07,108 --> 00:29:11,158
minerals with this Rover so

00:29:09,148 --> 00:29:13,798
understanding that clay environment and

00:29:11,159 --> 00:29:15,509
actually trying to figure out what sort

00:29:13,798 --> 00:29:17,608
of the the rest of the environmental

00:29:15,509 --> 00:29:20,548
conditions on Mars were that caused that

00:29:17,608 --> 00:29:22,528
clay to form what the weather was like

00:29:20,548 --> 00:29:24,418
three billion years ago what the

00:29:22,528 --> 00:29:26,249
temperatures were like and that gets at

00:29:24,419 --> 00:29:28,919
this whole issue of creating a habitable

00:29:26,249 --> 00:29:30,419
environment so you know we can't wait to
drive across the ellipse over several months and get to that first clay outcrop and then we'd go up the hill and look at the sulfate salt area which should represent a different environment and so I think you know we have a lot of steps that will go through really we're reading the history of early Mars and several different environments and if any of those look defendant in any way I know if I won't say definitively but any of those really scream out that this was potentially habitable environment we tell you enjoy elevation yeah well for
Pete um in my experience with engineers they always have a list going somewhere

in their heads of the things they're most concerned about I'm wondering what things are at the top of your list in terms of what you're concerned about and also in the MER experience there was a lot of testing and getting ready right through the cruise stage because there was the timeline was such that there was still a lot to go now you had two years extra on this mission so maybe you're not quite as up against it with some of the software but wonder if you could
talk about what's at the top of your concern list and will you be doing additional testing of equipment on the cruise day on the cruise phase I think the thing at the top of my concern list is what I don't know you know these things are very complicated beast and you test the heck out of them but you can't test all their interactions you can't test them for the length of time of the mission you just can't do all that kind of intensity of things and so there's always going to be surprises sometimes engineer's call them
features and and and what you worry

00:31:01,288 --> 00:31:07,408
about is that there's something there

00:31:02,669 --> 00:31:09,600
that's really serious you know when we

00:31:07,409 --> 00:31:11,159
launched we had done what we thought was

00:31:09,599 --> 00:31:13,798
a conference was a comprehensive test

00:31:11,159 --> 00:31:15,299
program but that we had for surprises

00:31:13,798 --> 00:31:17,629
after we launched that we had to fix

00:31:15,298 --> 00:31:19,589
operational and we were able to do that

00:31:17,630 --> 00:31:21,270
which that's what you worry about that

00:31:19,589 --> 00:31:23,490
there's something in the design that you

00:31:21,269 --> 00:31:24,720
haven't caught yet that's something in

00:31:23,490 --> 00:31:26,279
the interaction with the Mars

00:31:24,720 --> 00:31:28,860
environment that you're not able to test

00:31:26,279 --> 00:31:30,750
on earth that there's something in

00:31:28,859 --> 00:31:33,298
long-duration exposure that you're not
able to do that something like that will

catch you and and and it'll be a

software thing more than likely that's

that's what you're worried about more

than anything else you ask the second

question and I up yeah well it would

nice to be say that the two years

allowed it to be completely done on the

friday after thanksgiving but that's not

true we have a lot of work to do to

characterize the sample handling a

sample processing system is Auslan

pointed out one of the things we've

discovered within the last year of
testing is the interaction with the rock system with the rocks very dependent on temperature very dependent on the composition of the rocks so we're laying out a very comprehensive test program that basically lay out for us what are going to be the operational rules of the road and as we interact with rocks what we have to do to do first time activities what we say and to be able to do those things so so that's a test program that we've got laid out we
will continue to do development for

increased sent landing in the sense of

running the software again and again and
gain and testing all the corners of the

environmental box to make sure that it

very robust in terms of what Mars could

throw at us from an atmosphere or dust

storm sense we don't expect dust storms

we're in the wrong season but we'd like

to be prepared for everything and then

and then we've got some software

development for the surface mission to

engage in so we're a little bit thankful

mer was a seven-month cruise we're

mer was a seven-month cruise
thankful we have eight and a half we'll

00:32:59,700 --> 00:33:04,759
use it all but we will be we will be

00:33:02,339 --> 00:33:07,500
busy over the cruise period for sure

00:33:04,759 --> 00:33:10,650
okay now we're going to transition to

00:33:07,500 --> 00:33:12,450
the telephone lines and we're going to

00:33:10,650 --> 00:33:14,370
wrap up after the phone lines but let's

00:33:12,450 --> 00:33:16,680
see if we can take a few questions then

00:33:14,369 --> 00:33:23,759
I believe first up is Irene Klotz from

00:33:16,680 --> 00:33:26,090
what is irina either yes I'm thanks

00:33:23,759 --> 00:33:28,410
doing I have two questions the first

00:33:26,089 --> 00:33:31,230
there's I think that there was another

00:33:28,410 --> 00:33:33,450
instrument added with the delay in the

00:33:31,230 --> 00:33:37,710
Mars Science Lab launch that actually

00:33:33,450 --> 00:33:39,960
was very much targeted to looking at the

00:33:37,710 --> 00:33:41,970
types of organics if any are found which
is maybe a little closer than what you've described so far as far as being able to assess life can you um can you talk about that a little bit and then I do have a related question thanks sure there is one of the real cornerstone laboratories that it's located inside the rover has been with the mission since its inception in fact the mission was really designed partially or the rover was really designed around this instrument it's the workhorse laboratory is called Sam sample analysis at Mars as a suite of instruments that analyzes
that powdered rock or soil sample and

even the air as well and looks element

by element what the composition is and

it also has the cave

related to detect any organic material

that's in the rocks or soil now we

consider that kind of a science home run

that sort of gets that Joe's question to

that is something you know we that would

make the papers but we're also not

banking the mission on that we don't

know if Mars has the ability to retain

any organic material even if it's there

so part of this mission also is
understanding you know now looking at ancient Mars 3 billion years later what sorts of evidence does Mars preserve for us to study today from when it was probably more habitable in the past so we do have a fabulous organics detection capability on the rover and if we find something it's a home run I like to call our is Clara Oscar wits thanks very much and i think the other questions for doug has Russia requested any assistance from NASA and trying new track or do anything to recover the phobos-grunt mission we have offered assistance and if they need
it we will provide to the best of our

ability with our space communications

network I that's a different

organization than ours I'm not sure if

they've asked for the assistance but we

have offered it okay thank you I

apologize Irene knob that you have a

follow-up okay now we can go to clara

moskowitz space.com well yes hi this is

a question for anybody who wants to take

it um you know based on all you know

right now just how likely do you think

it is that you're going to find evidence

that Mars was habitable and just how

likely is it that you think Mars had
ever had life I'm not sure than any of

us want to take that you can add to this

okay sure it's that's kind of a request

for speculation and I really kind of

hate to do that let's take em er as an

example nobody would have expected to

see the blueberries that we see that we

see by the millions and and that was a

huge discovery Mars Reconnaissance

Orbiter has found evidence in

mid-latitudes actually little higher

latitudes than we'd ever thought of a

briny waters that could

actually be liquid on the surface for
short periods in certain seasons so

every time you turn around there's

something that Mars does for us or shows

us or reluctantly hands to us that maybe

we're looking for it maybe we're not

looking for but it's always exciting and

it always feeds the science so I really

don't want to speculate on how likely it

is that will find these things because

we may not find those we find some

something completely different so it's a

little tough to speculate now let our

scientists speculate for just a second

first thing I'll do is clarify for the
for the people new to Mars exploration

that we didn't find blueberries on Mars

yeah those are hematite crystals but

they're fabulous things but I'll just

say I was going to say the same thing as

the caveat was that that would be sort

of in the realm of speculation but you

know on the positive side the reason

we're excited about Mars exploration and

going to Gale Crater is that when we

look in the distant past for the early

billion or two years of Mars history

we've known now for decades that there's

evidence for rivers on flowing and


possible lakes even a possible evidence

00:37:48,858 --> 00:37:52,608
of a lake in the crater we're going to

00:37:50,449 --> 00:37:54,019
not sure about that but that's why we're

00:37:52,608 --> 00:37:56,598
going there we're trying to find out if

00:37:54,018 --> 00:37:59,958
there were these habitable environments

00:37:56,599 --> 00:38:02,419
which would involve liquid water and so

00:37:59,958 --> 00:38:04,009
you know we're targeting I guess the

00:38:02,418 --> 00:38:05,478
best way to say it as you know through

00:38:04,009 --> 00:38:06,528
the science community through hundreds

00:38:05,478 --> 00:38:08,598
of scientists that have helped select

00:38:06,528 --> 00:38:11,239
this landing site we've chosen the best

00:38:08,599 --> 00:38:12,919
possible place to discover a potentially

00:38:11,239 --> 00:38:16,818
habitable environment and we'll see if

00:38:12,918 --> 00:38:18,679
we find one oh we find blueberries uh

00:38:16,818 --> 00:38:24,288
with me so i can write the press
releases there you go okay like that all

right next caller dan lyon from face

news Danny right here thanks a question

for anybody who wants to tackle it we

know that the planetary science budget

was going to go down anyway and now we

know to save James Webb it's going to go

down a little bit more

what contingency plans if any have you

made to support the primary MSL science

objectives and in the likely situation

that the budget for this division is

going to fall off a cliff a little bit

next year anybody who’d like to take it
yeah I'll take that msl is an incredibly important flagship mission for this agency we've been in the build and test phase four years it is that bridge mission and it's as important to this agency i would personal opinion little biased maybe as hubble the funding for msl is stable the agency pmc the administrator has signed the the curve budget estimates that we've got for it that money is set aside if there are funding reductions in the 2012 budget once it gets passed by Congress and in the curb budget uncertainties who knows
But if there are the MSL operations funding is safe okay we have time for a couple more questions from my phone lines and then now would take one last question from our studio audience let's go to Rafael Jeffers and I'm sorry I'm having problems with names to today Daffy Mr. Jaffee I'll take that news that if there are something is they are you there we are okay all right I'll tell you what let's uh let's see if we can come back here too good Kitty Felde with KPCC public radio in Los Angeles could you talk a little bit about the
propulsion system since you're not using

the solar panels that the earlier Rovers

had used because if you say nuclear

people seem to have a problem with that

you talk about the safety issues of

launching nuclear fuel into space let's

see we're using the power sources on

multi-mission radioisotope e thermal

generator uses plutonium dioxide in

in-center cylinders and then bricks

inside of a cylinder and order generate

electricity using thermocouples it's a

direct heritage of designs for such

standard generators that have been used

on a lot of deep space missions and in
fact used on on Apollo on for science

missions on the moon it is designed with safety in mind to withstand severe environments including reentry there is a process we go through that perhaps doesn't speak more to where we go through a very sophisticated safety analysis involving launch vehicle people in doe and independent reviewers to define the environments and to look at the safety of this device with the environment and to make a judgment as to whether it's safe to go and we've been very safe using these kinds of
generators for the past 50 years and this program is no different in the sense of the process we have used a nature to judge its safety and commit to issues and let me add that we we expect a safe and successful launch and as you said they've been flying these power sources for 50 years and if you have any more details you're like we'll get you with the appropriate department of energy officials on their power source let's go back to Kennedy and to Marcia Dunn thank you just a couple of quick factoid questions I think you
mentioned a couple hundred meters above

the surface of Mars for the skycrane to

start operating do you have anything

more precise than that how high will the

rover be when the sky crane pops out

secondly how deep into the rock or dirt

will the drill go when they're looking

for samples and lastly if you lose a

wheel or two can the rover still go

along the surface and do some science

thank you contact rings office I'll get

you the actual hard number for the

deployment of the sky crane I don't have

it on the tip of my tongue the drill
goes I believe five to six centimeters

into the rock surface and you had one

more oh if I lose the wheel I'm I'm
certainly fine if we lose able

this is a situation a little bit better

than M ER because we actually have we
can release the the breaking of the of

can release the the breaking of the of

the motors on on on this vehicle and

we're not able to do with so much on ma

are so we don't have to drag the wheel

like we had to do an Emmy are we can

actually free wheel the wheel we
certainly are okay if we lose one

depending on the terrain where we're

probably okay if we lose to each of the
wheels has its own drive motor so we have six drive motors and the four corner wheels have independent steering motors so a lot of flexibility in able to in order to maintain mobility in any event of a of a motor gearbox failure.

okay folks what I'm going to do here we're going to wrap this up and I again want to remind you of the series of detailed briefings that will be coming out of the Kennedy Space Center on launch week in summary right now we're Green across the board to go back to Mars please go to www.nasa.gov slash MSL.
Florida here we come let's go back to

Mars thanks for joining us