hello everyone and welcome to today's update on the progress being made on the Orion spacecraft ahead of its first trip to space later this year here at Kennedy Space Center. Orion's heat shield was recently attached to the crew module and just last week it was stacked on top of the service module marking two significant steps towards its flight tests and developing the spacecraft that will eventually send humans to Mars to talk about the progress being made here and to highlight the upcoming flight test our NASA Administrator Charlie
Bolden Orion program manager Mark Guyer

Lockheed Martin's Orion program manager Cleon lacefield and Kennedy Space Center

Director Bob Cabana for those of you watching on TV or through the web today

we'll take questions from you via social media you can ask questions using the hashtag ask nasa and we'll start off

with a few opening remarks so Charlie if you'd like to start us off first of all

thanks very much for everybody coming

today this is a big deal for us and I was trying to think of how to relate this to something that that all of you

this to something that that all of you
can can wrap your minds around but as I look out there the unfortunate thing is that most of you are too young to be able to relate but how many of you remember alt does that ring a bell anybody know what alt was how about approach and landing test ok you remember out at Edwards Air Force Base when we took the space shuttle and we dropped it off the 747 because we wanted to make sure it could fly and it did pretty well well if you want to try to relate what's about to happen in December to something that all of
you can relate to this is sort of like

00:01:58,379 --> 00:02:06,060
the first of however many flights of alt

00:02:01,978 --> 00:02:08,310
that we're going to do with Orion right

00:02:06,060 --> 00:02:11,370
in front of behind me but in front of

00:02:08,310 --> 00:02:13,650
you is a tangible piece of our path to

00:02:11,370 --> 00:02:14,969
Mars and Orion spacecraft

00:02:13,650 --> 00:02:18,780
it's going to travel farther into space

00:02:14,969 --> 00:02:20,310
than humans have gone for 40 years over

00:02:18,780 --> 00:02:22,318
the past four years nASA has been

00:02:20,310 --> 00:02:25,110
implementing the NASA Authorization Act

00:02:22,318 --> 00:02:27,149
of 2010 which was enacted on a broad

00:02:25,110 --> 00:02:29,489
bipartisan basis I know you all find

00:02:27,150 --> 00:02:31,920
that hard to believe but it actually was

00:02:29,489 --> 00:02:33,450
enacted on a broad bipartisan basis and

00:02:31,919 --> 00:02:35,878
reflects agreements between the Congress
and the administration on the nation's next steps in space exploration flight
test-1 or eft-1 as we crawl it call it
is a critical part of that strategy and
a big step forward on the path to Mars
the tests demonstrates how Bob Cabana and the Kennedy Space Center team
continue to transform this Center into a multi-user facility capable of many
different kinds of launches and it's possible possibly the most significant human spaceflight milestone this year
pointing toward our return with humans
to deep space sustained investment in
NASA technology advances the agency's exploration capabilities and supports the innovation in the innovation economy.

We need to keep doing that in order to reach an asteroid and Mars and other destinations in the future as Mark Guyer can tell you about in great detail.

Orion's flight test will stress systems critical to safety including the heat shield parachutes avionics and attitude.

Control when was the last time you saw a vehicle that could reach a speed this is a question okay this is not rhetorical.

When was the last time that you saw us a
vehicle that could reach a speed of 87
20,000 miles per hour and a temperature of 4,000 degrees Fahrenheit when 1975 that's absolutely right Apollo saw use before Orion carries humans on missions to explore an asteroid and eventually Mars it gives us the chance to see how this vehicle will perform in the orbital environment as it faces some of the challenges that will endure on future missions to space that's incredibly exciting for me and I couldn't be happier to see the full system
The integration of Orion is proceeding so well while Orion Hardware has been tested extensively on the ground, putting the spacecraft through its paces in space. This provides data you just can't get here on earth right now. NASA's building on knowledge gained through the International Space Station and more than 50 years of human space flight experience solving difficult challenges that will enable humans to safely explore deep space. What you see here today is a critical part of that strategic work. It's not often you get this close to something that's bound for
space and we look forward to telling you more about Orion and our path to Mars and since i don't i'm not the detail guy and i probably couldn't answer the details if you tried me i have my trusty friend behind me and I'm going to ask mark Geyer the Orion program manager to step up and make a few remarks before we take your go on and a couple more remarks before we take your question so mark Thank You Charlie and thanks everybody for coming today it's a big day for us to actually stack these two elements together we'll finish now the
integrated testing between the two and then we'll send it off to get fueled and then stacked on the rocket it's Charlie said we're going to launch in less than six months so this spacecraft of course is the the first human exploration spacecraft developed in now over 30 years it's a big deal and it's the product of a very dedicated workforce that believes that keeping America first and space exploration is critical the launch itself coming up in six months is going to be very is going to be visible evidence that we are still exploring but
there's other visible pieces that you can see today that show us how we're feeding forward to the next launches when you come here and see the same event for e-m1 and e-m2 you would notice it's going to look remarkably similar and I don't mean just the outer mold line but actually the guts of the spacecraft that's because all of these systems that are flying on eft-1 were designed from the beginning to be human rated to be able to fly people on board and now we're actually not just drawings and PowerPoint but we actually put it
Assemble it and now we're going to fly. We will make some updates in some cases. We found things we can make it lighter, for example, the heat shield. It was a huge experience for us to build the first one. In some cases, we found ways to make it cheaper on the next one. For example, if you think about the cone at the top. We found a way to make that in fewer parts, so yes, this one could fly people but now we're going to update it and save money on the next unit things like the computer system that's on this bird will be.
exactly the same on the next flights

except we'll add another string of redundancy because on a test flight we

don't need it but when we fly people

will have three strings another thing to

think about is the software which is

always a challenge if you think about

the full software for flying people on

the manned flight we have but we've

written now half of that already half of

the software is done tested and will fly

on eft-1 so we have more work to go to

got to em1 and em2 but this flight not

just the launch in december but the work
that went into this design it sets us up very well for the next flights and four eventually getting people into space so now what I want to do is introduce Cleon lace field Cleon is the Lockheed program manager for Orion and a big part of why we are here today and he's going to describe more about the mission itself thank you yeah it's great to be here today with our vehicle getting so close to launch and what i thought i would do today is talk a little bit about the flight test that we're going to do with the Orion vehicle we're calling it
exploration flight test-1 and this is the first high orbital flight test of the Orion spacecraft this flight test is scheduled on December fourth of this year and so the countdown clock that we're seeing over here is two is the number of days to the December fourth launch during that flight Orion will travel 15 times further out into space than the space station is currently today and it's further than humans have gone like Charlie said in the last 40 years so we talked about a little bit Charlie
talked about what we're getting out of

the flight with the check out of all the systems the computers the software the guidance and control the separation events the heat shield and as Mark said this is is the spacecraft that we will be building for the exploration missions one and two that are coming up later in this decade this flight will be an uncrewed launch on a delta for heavy it will launch from pad 37 at Cape Canaveral Air Force Base and it will travel 3,600 miles beyond low-earth low-earth orbit and reenter at approximately 20,000 miles per hour and
splashdown on in the Pacific Ocean where

the US Navy and and NASA ground personnel will recover the spacecraft

the entire flight will take about four hours in 25 minutes as far as the timeline goes the launch will occur at

approximately sunrise on December 4th which is right around 8am five and a half minutes later there's service model

modules bearings will jettison those are

those big white bearings that are that are shown right behind us over six minutes into the flight the launch abort system is jettisoned and about the
two-hour mark the upper stage second stage engine burns and raises Orion into the orbit to create the high reentry velocity at three hours in 45 minutes the crew module will separate from the service module in the upper stage at four hours 15 minutes the crew module begins to encounter Earth's atmosphere and at four hours and 20 minutes the Ford bay cover is jettison allowing the chutes to deploy which happens about two seconds later in about four hours and 25 minutes the vehicle splashes down into the Pacific Ocean and it is recovered by
00:10:54,429 --> 00:10:59,849
the Navy and NASA ground operations

258
00:10:57,129 --> 00:11:02,590
personnel the vehicle will be

259
00:10:59,850 --> 00:11:04,750
transported back here

260
00:11:02,590 --> 00:11:08,170
and we will actually reuse this vehicle

261
00:11:04,750 --> 00:11:12,820
for an asset aboard flight test prior to

262
00:11:08,169 --> 00:11:16,629
e m2 and with that I'd like to turn turn

263
00:11:12,820 --> 00:11:23,310
over the discussion to the center

264
00:11:16,629 --> 00:11:26,470
director mr. Bob Cabana thanks Cleon

265
00:11:23,309 --> 00:11:29,259
well for the first time since we went to

266
00:11:26,470 --> 00:11:31,990
the moon we're stacking a vehicle in

267
00:11:29,259 --> 00:11:34,269
this high bay that will allow us to

268
00:11:31,990 --> 00:11:35,950
explore beyond our home planet in one

269
00:11:34,269 --> 00:11:38,590
day put boots on Mars and that's pretty

270
00:11:35,950 --> 00:11:41,020
darned exciting this is a world-class

271
00:11:38,590 --> 00:11:43,840
manufacturing facility with a

00:11:41,019 --> 00:11:45,759
world-class team operating it and I want

00:11:43,840 --> 00:11:47,710
to thank the state of Florida for

00:11:45,759 --> 00:11:50,019
helping to make it possible and I

00:11:47,710 --> 00:11:52,200
commend the Lockheed Martin team on the

00:11:50,019 --> 00:11:55,269
outstanding job that they've done

00:11:52,200 --> 00:11:58,240
manufacturing and processing Orion for

00:11:55,269 --> 00:12:00,789
its flight test this December we are

00:12:00,789 --> 00:12:05,919
well on our way to establishing a human

00:12:00,789 --> 00:12:07,480
leave planet earth to do it we're going

00:12:05,919 --> 00:12:09,490
to be leaving from right here at the

00:12:07,480 --> 00:12:11,379
Kennedy Space Center I couldn't be more

00:12:09,490 --> 00:12:13,659
proud of this team in what we're doing

00:12:11,379 --> 00:12:15,700
in the path that we have going forward
so to everyone thanks for your outstanding support and go Orion okay we're going to take questions from those here and as a reminder for those who are going to be up at the mic please be sure to state your name and affiliation and direct your question to a particular person if you can and then for those watching from afar as a reminder you can ask your question on social media using the hashtag ask NASA first question go ahead Irene thanks Irene Klotz with Reuters and space news um for mr. Litchfield a win is that asset and abort
test scheduled for the ascent aboard is

scheduled in 2018 and it has to happen

before am too because as part of the

certification before we have

the astronauts on board the vehicle

thanks and how many capsules is Lockheed

Martin currently under contract to build

we will be building this one and two

others hi dan billow from w/e sh t V a

question for general Bolden what what

year will the first astronaut climb

aboard one of these ships as far as you

know and is it is it a little hard to

sustain momentum for a for a grand
mission to asteroids and Mars when

you're not flying people very often we

had conversation about that this morning

with some of the young leaders here as

well as the the senior leadership and

it's not hard to maintain momentum among

the workforce the the momentum that's

difficult is among many of you the you

know the general public people who don't

who on around this every single day that

in terms of the specific year that will

actually fly I assume that's what you

mean a human launch is in the 2019-20 20

timeframe if i remember correctly 2021

mean a human launch is in the 2019-20 20
but we have already had humans in the

00:14:30,070 --> 00:14:35,500
spacecraft and we've got Doug Hurley

00:14:33,039 --> 00:14:37,539
and Rex Walheim who are back here in the

00:14:35,500 --> 00:14:40,929
blue suits and they're here to answer

00:14:37,539 --> 00:14:42,189
all the hard questions but they can you

00:14:40,929 --> 00:14:44,409
know I would recommend that when you

00:14:42,190 --> 00:14:46,600
have an opportunity to talk to them ask

00:14:44,409 --> 00:14:48,069
them about what kind of training or what

00:14:46,600 --> 00:14:49,420
kind of preparations going on in the

00:14:48,070 --> 00:14:51,790
astronaut office how do they get

00:14:49,419 --> 00:14:53,319
prepared so they're probably going to be

00:14:51,789 --> 00:14:55,449
the ones that tell us when they're ready

00:14:53,320 --> 00:14:57,640
to start getting fully integrated into

00:14:55,450 --> 00:15:00,280
the system itself but but the 20 20 20

00:14:57,639 --> 00:15:05,220
21 timeframe is when we hope to fly the
first the first human rated mission okay

I kalorama with WKMG can you talk about

the cameras attached so we could talk

about the views that you'll get in orbit

yes you can so we we thought about that

quite a bit some of it is so that we can

make sure that with the public a lot of

it is for engineering data so we can see

things so we'll have cameras that watch

the separation events of the fairings

coming off the side these big fairings

on the side we have cameras that will

watch the launch abort system ogive

separate will have cameras that watch
the parachutes unfurl we have cameras out the windows so we'll see some of those events and probably some during entry so we get we have a lot of good views of this flight hi Steven Clark with spaceflight now first for mr. guy or mr. Lee's plays field can you tell us what it's going to look like inside the spacecraft when it flies on eft-1 and have another follow-up as well yes so this inside it will look exactly the avionics Bay which is where all the computers and all the cooling system will look exactly like it will look on
the manned flight when we actually put people inside but it's basically once you come in the hatch there's a platform that you would step on to below that is where the computers are attached and then connected on the inside eventually when we fly people though they'll obviously be the seats the other stowage areas and then the displays and controls on this flight though we do fly some what we call mass simulators so we actually have a mass similar for the displays in control panel so you looked in there there'd be
this metal thing that represents a
display and control panel because we
need to understand in the environments
we see how that mass reacts with the
structure so we fly the real one we know
it but obviously it doesn't need the
switches and all the other stuff that's
a part of that for administrator bolden
I wanted to get your thoughts on whether
you think it's time for America to
invest in a new rocket engine to replace
the rd-180 I think it's premature to
think about investing in a new rocket
engine we've also been discussing this
quite a bit you know what we encourage
people to do is think about what it is you want to do and our focus is on access to space how do we provide routine reliable access to space and so if you get focused on a specific engine you may ask yourself then okay what do we what vehicle are we going to put it on everything else so NASA's approach is let's focus on access to space we've decided that for low Earth orbit and to make a sustainable low Earth orbit infrastructure that we're going to need for the future flights of Orion on sls to go to deep space that's why we work
with our industry partners to develop

Commercial Crew and cargo capability

because they're the ones that provide

the routine access to low-earth orbit so

that we have a place that we can go and

provide the vehicle that can that can

give us access to deep space and that's

why our focus on SLS and Orion right now

with our international partners we

continue to work with them. I think most

of you know that the service module for

Orion is going to be prepared by the

European Space Agency. You know Lockheed
Martin as the prime contractor for Orion is working with them already so we're looking at all of those kinds of things but we're focused on access and not specific specific vehicles if you will or engines to get us there that's not our focus right now it sounds like you got a you know quite a lot of capability in this vehicle ready to go I'm just wondering if you can discuss a little more why is it going to take so long to get to that
first crude flight is it more a function of waiting for SLS or you know why does it take seven more years minimum to get from this stage to your crew ready.

lot on this vehicle so in this vehicle we do as I mentioned the parachutes the structure the heat shield those are big risk items you can think of schedule risk items but we still have a lot of work in the service module area some of which east is going to do which takes time they just finished their PDR we also have to work then on the the rest of the equalist life-support system the
crew displays the crew seats all those

kind of internal things and then the

other part that is a little hard to
describe but we have a qualification

program where you take the unit and you

actually test it to the extremes we're

actually all your acoustics loads all

the other thermal environments that
testing program on the test unit takes

time and money to do and you want to

make sure you've tested it on the ground

before you actually put the people in

space so what's the combination of all

those pieces and the end up and the flat
00:20:02,029 --> 00:20:07,149
line budget and some of our fixed costs

00:20:04,910 --> 00:20:09,679
that drive the the schedule to the right

00:20:07,150 --> 00:20:12,590
is enter your question sure okay and

00:20:09,679 --> 00:20:15,679
could you talk about about what else

00:20:12,589 --> 00:20:18,980
scene is going to be needed to again get

00:20:15,679 --> 00:20:20,210
from this first crew vehicle to what

00:20:18,980 --> 00:20:21,890
other systems are going to be needed to

00:20:20,210 --> 00:20:23,360
enable a Mars type mission obviously

00:20:21,890 --> 00:20:26,929
it's not just this little capsule that's

00:20:23,359 --> 00:20:29,750
going to make that journey how much more

00:20:26,929 --> 00:20:33,400
is needed to do a mission to Mars or

00:20:29,750 --> 00:20:36,169
land anywhere a good question so Orion

00:20:33,400 --> 00:20:37,929
can fit in all these architectures the

00:20:36,169 --> 00:20:40,040
party it provides really is the
providing a safe place for the crew to operate and it gets them out of Earth orbit and then eventually back safely on the ground so that's the part it provides and it provides a capability to support the crew for certain number of days for people for 21 days gives you a sense but when you're going all the way to Mars which can be you know nine months to a year one way you're going to need a bigger hab module obviously more supplies and bigger propellant systems to do that so that's the part that would need to be added
later yes yes let me add another thing

James it's really important to me as administrator in order to get humans to Mars that's hard so we need to we need to we all need to agree with that whether you accept my statement there or not is immaterial to be quite honest it's hard to do this we have to be able to guarantee that we can safely get humans through the environment of radiation and everything else and we have a we work with a matrix two matrices as a matter of fact one of them deals with a human body with our human performance and human survival and our
matrix is that using the International Space Station is the dominant platform for development of procedures and protective devices and the light we're probably out to 2026 before we buy down enough risk that we're willing to ethically put humans on a spacecraft and try to send them to Mars we're probably out the 2025 20-26 from a technological perspective before we have we have the knowledge on the environmental system because unlike space station where if an ammonia pump breaks we put it on a you know something on a spacex dragon or a
Cygnus or a progress and we send up a component we can't do that on the way to Mars so Mark's got to have I've got to give him a capability to build a much more resilient environmental control and life support system than we have today. we don't have it yet it's in development and a lot of its being tested on the International Space Station so that's the part of those of us who are here on this side of the line we recognize the challenges we have ahead and that's why there's not this loss of momentum that you asked about earlier.
but for the outside you want to okay i

see this vehicle why can't we just put

humans in it next week because it's not

ready it is it is we don't have that all

the technology that we want and need nor

do we have the knowledge that we want

and need to make that trip survivable by

a human so

so there are a lot of gaps that have to

be filled between now and then we're

also getting a lot of good questions

from social media I've got a couple here

at christie Marshall asked what data

will be collected during the test flight

will be collected during the test flight
and in a related question at tech guy

557 00:23:30,130 --> 00:23:34,060
King asked what the cat will the capsule

558 00:23:32,529 --> 00:23:40,629
carry more sensors than a normal flight

559 00:23:34,059 --> 00:23:44,319
so for for eft-1 and we're looking at

560 00:23:40,630 --> 00:23:47,530
for the first two exploration mission

561 00:23:44,319 --> 00:23:49,689
vehicles for eft-1 we're flying 1200

562 00:23:47,529 --> 00:23:52,509
additional sensors from the nominal set

563 00:23:49,690 --> 00:23:55,049
that we would look at on each of our

564 00:23:52,509 --> 00:24:00,339
vehicles so we're heavily instrumented

565 00:23:55,049 --> 00:24:02,049
in vibration in temperatures to make

566 00:24:00,339 --> 00:24:05,859
sure that we understand the environments

567 00:24:02,049 --> 00:24:07,480
and all of the event timing to make sure

568 00:24:05,859 --> 00:24:08,709
all of the events happen when they're

569 00:24:07,480 --> 00:24:11,259
supposed to be happening so we're

570 00:24:08,710 --> 00:24:13,829
heavily instrumented for this vehicle
and that has taken up quite a bit of the computer space we've actually added some development flight instrumentation computers just to handle the volume of the data that will be receiving hi I'm have a question for mr. Guyer is Orion's still considered a backup for commercial crew and if so at what point in the testing program will what you need to do to prepare for a space station mission kind of diverge what you're doing for the primary whole of the spacecraft which is to do the deep space exploration mark off the hook no Orion
is not considered a backup for commercial vehicles for a number of reasons one is we made a commitment to industry that we would not compete with them if we had if we had said we're going to keep Orion as a backup there were serious doubts as to whether industry would have made the investment at all in a commercial crew vehicle because their assumption was okay if NASA is going to build a vehicle to go to low-earth orbit what is NASA going to want to use naturally they're going to want to use their own vehicle so Orion
while it can

and we'll be capable of going to the international space station is not designed to do that not intended to do that and in no way do we intend to compete with our industry partners and it's a bad bad day when we have to send Orion to the international space station because it means either we've lost each of the vehicles that was designed to do that some through some accident or they failed or something so we don't want to have to rely on Orion to do that it means industry it means American
industry has failed and I don't think

614 00:26:01,480 --> 00:26:05,860 any of us wants to see that so so ghetto

615 00:26:03,849 --> 00:26:07,449 Ryan going to the International Space

616 00:26:05,859 --> 00:26:09,789 Station out of your mind I don't care

617 00:26:07,450 --> 00:26:13,059 what anybody says that is not our intent

618 00:26:09,789 --> 00:26:15,549 it's not being built that way it would

619 00:26:13,059 --> 00:26:17,740 be a waste of the taxpayers money you

620 00:26:15,549 --> 00:26:19,599 know for me to ask mark to configure

621 00:26:17,740 --> 00:26:24,000 Orion to go to the International Space

622 00:26:19,599 --> 00:26:24,000 Station just bluntly okay

623 00:26:28,049 --> 00:26:32,970 I have a question for Colonel Cabana

624 00:26:30,390 --> 00:26:34,770 could can you address the safety of

625 00:26:32,970 --> 00:26:37,019 Orion as a former Space Shuttle

626 00:26:34,769 --> 00:26:39,259 commander how much safer would it be

627 00:26:37,019 --> 00:26:42,119 than one of the shuttles that you flew
I'd fly on it on this four-hour flight if it would get me out of a few meetings but it is safe in many ways you know one of the things that we looked at after Columbia and the team here just did a phenomenal job we were talking this morning how clean Atlantis was after it came back after the final space shuttle mission but having the capsule up on top of the rocket out of that debris environment having an escape system on the capsule that can get the crew from any time from liftoff to main engine cutoff safely back to earth with no
black zones this is going to be a much
safer vehicle in the launch environment
than the the shuttle was so I think the
team is just doing an outstanding job
and I'd fly on it tomorrow we have time
for one more if there's one last
question I'll narrow 2-1 a general
Bolden Justin zooming in the context of
the discussion about Orion as a
potential backup vehicle can can you say
as NASA committed to multiple Commercial
Crew words coming up this summer how
many should we expect and let me without
getting in trouble here in trying to get
into bill Gerstenmaier job bill

Gerstenmaier is the head of human

exploration is the source selection

official so I won't even venture to try

to guess our desire is to have multiple

providers why because it it maintains

competition so it holds the cost down it

gives us reliability and redundancy if

we only have one u.s. provider then

we're back to where we were before where

we have shuttle and saw use and we know

what that's like we don't want to be

there so our commitment is to try to

have more than one provider the budget
will determine that to a great extent

671 00:28:37,829 --> 00:28:44,309
and more than one doesn't mean

672 00:28:41,660 --> 00:28:45,930
fractions like we've seen somewhat so

673 00:28:44,309 --> 00:28:48,269
far right i mean it's either full or

674 00:28:45,930 --> 00:28:51,660
it's not right and you're getting into

675 00:28:48,269 --> 00:28:54,960
you're getting into what do we call this

676 00:28:51,660 --> 00:28:57,570
I don't want to go there let me let me

677 00:28:54,960 --> 00:28:59,549
not do that because i don't know i will

678 00:28:57,569 --> 00:29:02,519
i will infringe upon something that's

679 00:28:59,549 --> 00:29:05,069
going to get me in in legal problems but

680 00:29:02,519 --> 00:29:08,099
let's just say more than one provider

681 00:29:05,069 --> 00:29:10,519
means when we start flying humans on

682 00:29:08,099 --> 00:29:14,099
commercial spacecraft like in 2017

683 00:29:10,519 --> 00:29:16,829
ideally I would like to have two people

684 00:29:14,099 --> 00:29:19,980
at least who can provide transportation
for our crew either today or pretty soon

after that so that's all I'm going to say and stay out of acquisition

and procurement problems okay and I hope you I hope you appreciate the the subtle

tea there alright yeah ok well I would like to thank our participants for talking today and also thank you all for joining us you can follow net Orion's progress at ww na sa govt / Orion and for information on all the progress we're making to send humans on the path to Mars you can visit w WN haces gov / exploration thanks