1
00:00:16,090 --> 00:00:13,019
Johnson Space Center in Houston Texas

2
00:00:18,519 --> 00:00:16,100
thanks - on today's hangout I'm Brandi

3
00:00:20,339 --> 00:00:18,529
Jean with NASA public affairs and we're

4
00:00:24,849 --> 00:00:20,349
about 30 minutes away now from the most

5
00:00:26,230 --> 00:00:24,859
of orion's been delayed a bit this

6
00:00:27,669 --> 00:00:26,240
morning thanks to some issues with the

7
00:00:29,710 --> 00:00:27,679
support aircraft but we should be able

8
00:00:31,329 --> 00:00:29,720
to see the drop live at about noon

9
00:00:32,799 --> 00:00:31,339
eastern time here in just a few minutes

10
00:00:34,389 --> 00:00:32,809
and in the meantime we're gonna be

11
00:00:37,689 --> 00:00:34,399
taking your questions from social media

12
00:00:40,420 --> 00:00:37,699
under the hashtag Orion test so start

13
00:00:41,849 --> 00:00:40,430

sending those in now I'm sitting here in

14
00:00:44,319 --> 00:00:41,859
front of a mock-up of NASA's new Orion

15
00:00:45,610 --> 00:00:44,329
spacecraft which we're building to take

16
00:00:47,680 --> 00:00:45,620
humans farther into space than we've

17
00:00:49,270 --> 00:00:47,690
ever been before and what you see in the

18
00:00:51,430 --> 00:00:49,280
background we actually use for testing

19
00:00:53,229 --> 00:00:51,440
here at Johnson Space Center but in

20
00:00:55,150 --> 00:00:53,239
Kennedy Space Center in Florida they're

21
00:00:58,209 --> 00:00:55,160
building the Orion is actually gonna be

22
00:01:00,220 --> 00:00:58,219
launched into space December when it is

23
00:01:01,930 --> 00:01:00,230
launched it's gonna travel 3,600 miles

24
00:01:03,819 --> 00:01:01,940
into space which is the farthest that

25
00:01:06,400 --> 00:01:03,829
any spacecraft built for humans has been

26
00:01:09,010 --> 00:01:06,410
in more than 40 years and then returned

27
00:01:11,020 --> 00:01:09,020
to Earth and 20,000 miles per hour and

28
00:01:12,640 --> 00:01:11,030
during temperatures at 4,000 degrees

29
00:01:13,540 --> 00:01:12,650
Fahrenheit as it travels to the Earth's

30
00:01:15,880 --> 00:01:13,550
atmosphere

31
00:01:18,760 --> 00:01:15,890
it's going to help us be sure that all

32
00:01:21,400 --> 00:01:18,770
the critical systems in - space and

33
00:01:23,680 --> 00:01:21,410
eventually Mars on future missions are

34
00:01:25,570 --> 00:01:23,690
up to the challenge but sometime between

35
00:01:27,160 --> 00:01:25,580
hitting Earth's atmosphere at 20,000

36
00:01:29,260 --> 00:01:27,170
miles per hour and launching them in the

37
00:01:33,210 --> 00:01:29,270
Pacific Ocean we need to slow the

38
00:01:37,720 --> 00:01:33,220

vehicle down to about 20 miles per hour

39
00:01:46,780 --> 00:01:37,730
that we're standing by in Yuma Arizona

40
00:01:49,150 --> 00:01:46,790
on the US Army landing recovery systems

41
00:01:50,980 --> 00:01:49,160
functional manager and then here with me

42
00:01:53,920 --> 00:01:50,990
at Johnson Space Center we also have

43
00:01:56,530 --> 00:01:53,930
Molly white and Orion aerothermodynamics

44
00:01:58,350 --> 00:01:56,540
engineers tell us some more about other

45
00:02:01,420 --> 00:01:58,360
tests that Orion's been going through

46
00:02:03,370 --> 00:02:01,430
and I did what in here are gonna be

47
00:02:05,470 --> 00:02:03,380
getting back from that test flight in

48
00:02:07,270 --> 00:02:05,480
December so we're gonna start here with

49
00:02:09,450 --> 00:02:07,280
Stu but remember they'll be taking

50
00:02:12,390 --> 00:02:09,460
questions with the

51
00:02:14,220 --> 00:02:12,400
test hashtag and just a few minutes that

52
00:02:17,090 --> 00:02:14,230
first let's go to su and see how things

53
00:02:19,950 --> 00:02:17,100
are looking they're in Yuma do hey

54
00:02:23,390 --> 00:02:19,960
Lauren Brandi how do you hear me just do

55
00:02:27,270 --> 00:02:24,600
all right

56
00:02:29,720 --> 00:02:27,280
good hey thanks for joining us you can

57
00:02:31,950 --> 00:02:29,730
see we're getting ready for the test

58
00:02:34,260 --> 00:02:31,960
like you mentioned we had a short delay

59
00:02:37,290 --> 00:02:34,270
one of the chasey aircraft that we used

60
00:02:39,930 --> 00:02:37,300
photograph the parachute deployment

61
00:02:42,420 --> 00:02:39,940
events had an issue and so we had to

62
00:02:45,230 --> 00:02:42,430
sort a up another aircraft and that

63
00:02:47,820 --> 00:02:45,240

caused us that slight delay but they're

64
00:02:51,330 --> 00:02:47,830
making their approach runs now and so

65
00:02:53,100 --> 00:02:51,340
we're in close to a good test like you

66
00:02:55,860 --> 00:02:53,110
mentioned this is one of our most

67
00:02:58,140 --> 00:02:55,870
challenging test this is a number 14 and

68
00:03:02,280 --> 00:02:58,150
harder series of 17 development tests

69
00:03:04,860 --> 00:03:02,290
this one were primarily test objective

70
00:03:07,500 --> 00:03:04,870
is to look at how the jettison Florida

71
00:03:09,450 --> 00:03:07,510
Bay cover works we've done that once

72
00:03:13,260 --> 00:03:09,460
we've done it a few times on the ground

73
00:03:14,910 --> 00:03:13,270
up at the Lockheed Denver facility this

74
00:03:16,530 --> 00:03:14,920
one were we've set up the test

75
00:03:18,590 --> 00:03:16,540
conditions to let the vehicle fall

76
00:03:21,480 --> 00:03:18,600
faster get a higher dynamic pressure

77
00:03:22,980 --> 00:03:21,490
give us a more challenging test

78
00:03:25,350 --> 00:03:22,990
objective and there's a little observe

79
00:03:28,530 --> 00:03:25,360
how the cover comes off and then we'll

80
00:03:31,170 --> 00:03:28,540
also look at one other planned failure

81
00:03:32,430 --> 00:03:31,180
will us skip what we call a reefing

82
00:03:35,130 --> 00:03:32,440
stage on one of the three main

83
00:03:38,010 --> 00:03:35,140
parachutes that will help us to get

84
00:03:39,300 --> 00:03:38,020
better correlation of our predictions

85
00:03:43,650 --> 00:03:39,310
and our models for the parachute

86
00:03:45,240 --> 00:03:43,660
performance let me pause I'll let you

87
00:03:49,710 --> 00:03:45,250
ask me questions instead of me just

88
00:03:50,670 --> 00:03:49,720

talking well before we go to Molly why

89
00:03:53,880 --> 00:03:50,680
don't you tell us a little bit about

90
00:03:57,630 --> 00:03:53,890
where you're standing all right yeah I'm

91
00:03:59,880 --> 00:03:57,640
out in the southwestern part of Arizona

92
00:04:01,440 --> 00:03:59,890
and I don't think it's quite book and a

93
00:04:03,360 --> 00:04:01,450
hundred degrees yet this morning it will

94
00:04:07,170 --> 00:04:03,370
eventually be reviewing the proving

95
00:04:09,840 --> 00:04:07,180
ground we use we work with the with the

96
00:04:11,670 --> 00:04:09,850
Army and the you know I humor proving

97
00:04:14,340 --> 00:04:11,680
ground is our test facility as you know

98
00:04:15,750 --> 00:04:14,350
the being a large it helps to have a

99
00:04:18,120 --> 00:04:15,760
large footprint when you're doing the

100
00:04:21,060 --> 00:04:18,130
parachute test like this and so Yuma has

101
00:04:23,880 --> 00:04:21,070
a large multi-purpose test range

102
00:04:27,450 --> 00:04:23,890
and we partnered up with them and we're

103
00:04:29,760 --> 00:04:27,460
out here north of Yuma south of

104
00:04:33,510 --> 00:04:29,770
quartzite if anybody's out there looking

105
00:04:35,970 --> 00:04:33,520
on google map so we're out there and the

106
00:04:38,760 --> 00:04:35,980
test range is about a mile or two wide

107
00:04:41,760 --> 00:04:38,770
and at five or ten miles long so that

108
00:04:44,760 --> 00:04:41,770
gives us the large footprint outside of

109
00:04:47,460 --> 00:04:44,770
a populated area where we can safely run

110
00:04:50,490 --> 00:04:47,470
these tests we've been working with Yuma

111
00:04:52,290 --> 00:04:50,500
for quite some time now they are great

112
00:04:58,170 --> 00:04:52,300
hosts for us and we have pretty good

113
00:05:06,360 --> 00:04:58,180

partnership and everything is looking

114
00:05:07,230 --> 00:05:06,370
okay and aircraft aircraft issues

115
00:05:09,510 --> 00:05:07,240
cleared up

116
00:05:11,580 --> 00:05:09,520
it is a we're right at the border of our

117
00:05:14,280 --> 00:05:11,590
ground winds otherwise the weather is

118
00:05:15,900 --> 00:05:14,290
looking fine it's a clear and sunny it's

119
00:05:20,430 --> 00:05:15,910
a beautiful day out here just getting a

120
00:05:22,470 --> 00:05:20,440
little hot dry after after landing one

121
00:05:25,020 --> 00:05:22,480
of our landing or one of our test

122
00:05:27,720 --> 00:05:25,030
constraints is to have ground winds that

123
00:05:29,700 --> 00:05:27,730
are low enough to allow the the teams to

124
00:05:31,830 --> 00:05:29,710
safely recover the parachutes the

125
00:05:34,830 --> 00:05:31,840
parachutes are effective enough that

126
00:05:36,660 --> 00:05:34,840
they will want to they can will and will

127
00:05:39,600 --> 00:05:36,670
re-inflate on the ground and it makes it

128
00:05:41,520 --> 00:05:39,610
the hazardous for the recovery crews so

129
00:05:43,950 --> 00:05:41,530
we're we're just at our limit we're able

130
00:05:46,200 --> 00:05:43,960
to work underneath that so that'll be no

131
00:05:50,220 --> 00:05:46,210
be good each of these main parachutes is

132
00:05:52,170 --> 00:05:50,230
116 feet diameter and so they if you can

133
00:05:54,210 --> 00:05:52,180
one of these inflated it captures a lot

134
00:05:58,890 --> 00:05:54,220
of wind and puts a pretty good load on

135
00:06:01,470 --> 00:05:58,900
the on the cargo and you not not have

136
00:06:03,300 --> 00:06:01,480
them whipping around when you're trying

137
00:06:05,150 --> 00:06:03,310
to recover them we take these chutes all

138
00:06:08,370 --> 00:06:05,160

of our test hardware we were cover it

139
00:06:12,900 --> 00:06:08,380
take it back to the hangar investigate

140
00:06:18,390 --> 00:06:12,910
it look for the not so obvious anomalies

141
00:06:21,149 --> 00:06:18,400
that we might buy all those small things

142
00:06:21,149 --> 00:06:21,159
we find

143
00:06:28,109 --> 00:06:24,959
we modify our shoot design and improve

144
00:06:29,669 --> 00:06:28,119
it just make it that much safer for the

145
00:06:38,639 --> 00:06:29,679
astronauts it will use these sinking

146
00:06:40,559 --> 00:06:38,649
future missions you've been out to quite

147
00:06:48,449 --> 00:06:40,569
a few of these tests probably and your

148
00:06:50,070 --> 00:06:48,459
job I did what repeat that for me we had

149
00:06:52,199 --> 00:06:50,080
a small aircraft go over and I didn't

150
00:06:55,559 --> 00:06:52,209
hear you totally clear serious I didn't

151
00:06:57,119 --> 00:06:55,569
hear then I know that you've seen a

152
00:07:04,049 --> 00:06:57,129
number of these tests kind of describe

153
00:07:06,600 --> 00:07:04,059
what will be yeah so the short version

154
00:07:08,999 --> 00:07:06,610
of the test sequence and as you

155
00:07:12,239 --> 00:07:09,009
mentioned and we start slowing we use

156
00:07:16,409 --> 00:07:12,249
the parachute to slow us down to about

157
00:07:17,549 --> 00:07:16,419
20 miles an hour this desk will start at

158
00:07:19,829 --> 00:07:17,559
35,000 feet

159
00:07:23,999 --> 00:07:19,839
so the same altitude that a commercial

160
00:07:27,569 --> 00:07:24,009
airliners flying at will extract the

161
00:07:29,279 --> 00:07:27,579
vehicle from the the c-17 and will let

162
00:07:32,339 --> 00:07:29,289
it start to fall we have what we call

163
00:07:36,029 --> 00:07:32,349

programmer chutes that allow it to fall

164
00:07:37,739 --> 00:07:36,039
at a predetermined speed we'll cut them

165
00:07:39,480 --> 00:07:37,749
away and then we basically at that point

166
00:07:41,069 --> 00:07:39,490
get on testing

167
00:07:43,739 --> 00:07:41,079
well let the vehicle drop a little bit

168
00:07:45,540 --> 00:07:43,749
more to gain some more speed the forward

169
00:07:49,079 --> 00:07:45,550
Bay cover will be three forward Bay

170
00:07:50,639 --> 00:07:49,089
cover shoots will deploy for just for a

171
00:07:52,649 --> 00:07:50,649
second and a half and then we'll fire

172
00:07:54,749 --> 00:07:52,659
the thrusters jettison to the forward

173
00:07:57,269 --> 00:07:54,759
Bay cover as soon as it's out of the way

174
00:07:59,909 --> 00:07:57,279
the the drogue parachutes start to

175
00:08:01,169 --> 00:07:59,919
deploy we ride the vehicle or the

176
00:08:02,969 --> 00:08:01,179
vehicle rides down on those drogue

177
00:08:06,029 --> 00:08:02,979
chutes through its sequence the two

178
00:08:07,980 --> 00:08:06,039
drones cut away and then the three pilot

179
00:08:09,899 --> 00:08:07,990
chutes are mortar deployed from the

180
00:08:13,619 --> 00:08:09,909
vehicle and they pull the three big

181
00:08:15,029 --> 00:08:13,629
large main parachutes out and Rams got

182
00:08:18,689 --> 00:08:15,039
her we got our camera out here and he's

183
00:08:21,719 --> 00:08:18,699
going to do his best to track it down if

184
00:08:24,029 --> 00:08:21,729
if he manages to track the get a video

185
00:08:25,259 --> 00:08:24,039
shot of the payload coming out of the

186
00:08:29,159 --> 00:08:25,269
airplane it would be quite an amazing

187
00:08:29,609 --> 00:08:29,169
feat since he's you know got a 35,000

188
00:08:32,579 --> 00:08:29,619

foot

189
00:08:33,929 --> 00:08:32,589
altitude moving target to deal with but

190
00:08:34,750 --> 00:08:33,939
as soon as we get under main chutes

191
00:08:36,960 --> 00:08:34,760
he'll be able to

192
00:08:42,659 --> 00:08:36,970
video tape and you'll be able to watch

193
00:08:46,930 --> 00:08:42,669
watch the final phase of the deployment

194
00:08:49,180 --> 00:08:46,940
how long does it take from the time we

195
00:08:50,910 --> 00:08:49,190
come out of the airplane till we're on

196
00:08:53,260 --> 00:08:50,920
the ground and the shoots are deflated

197
00:08:55,630 --> 00:08:53,270
seven eight nine minutes something like

198
00:08:58,480 --> 00:08:55,640
that they vary from test to test because

199
00:09:01,050 --> 00:08:58,490
we modify our test objectives and so

200
00:09:04,180 --> 00:09:01,060
sometimes we let the vehicle for farther

201
00:09:06,610 --> 00:09:04,190
start and higher up if we fail a

202
00:09:08,650 --> 00:09:06,620
parachute will drop faster in this case

203
00:09:10,630 --> 00:09:08,660
we're under three parachutes and so our

204
00:09:16,840 --> 00:09:10,640
normal descent rate is 25 feet per

205
00:09:18,280 --> 00:09:16,850
second so last question for you for now

206
00:09:21,790 --> 00:09:18,290
why don't you tell us what your role is

207
00:09:24,490 --> 00:09:21,800
in all of this all right I'm as you said

208
00:09:27,700 --> 00:09:24,500
on the functional area manager so within

209
00:09:31,180 --> 00:09:27,710
the Orion program my your responsibility

210
00:09:33,310 --> 00:09:31,190
is all of the hardware that we build on

211
00:09:35,170 --> 00:09:33,320
the vehicle that is required for landing

212
00:09:38,440 --> 00:09:35,180
recovery so parachute systems the

213
00:09:40,690 --> 00:09:38,450

mortars the up writing bags that we use

214
00:09:42,490 --> 00:09:40,700
to make sure the vehicle gets into a

215
00:09:46,270 --> 00:09:42,500
proper position after we land in the

216
00:09:48,400 --> 00:09:46,280
ocean my role was its Technic it's a mix

217
00:09:54,340 --> 00:09:48,410
of technical as well as schedule and

218
00:09:56,340 --> 00:09:54,350
cost I'm try to balance our our desires

219
00:10:00,100 --> 00:09:56,350
to have the safest system we can have

220
00:10:02,080 --> 00:10:00,110
with the available funds we got and and

221
00:10:04,150 --> 00:10:02,090
within the schedule we have to support

222
00:10:06,550 --> 00:10:04,160
our mission so I'm always one of the

223
00:10:08,620 --> 00:10:06,560
ones one of the engineers that trade

224
00:10:12,660 --> 00:10:08,630
those different aspects of our design

225
00:10:15,640 --> 00:10:12,670
back and forth and work with the team

226
00:10:19,890 --> 00:10:15,650
make it as safe as we can within our

227
00:10:28,930 --> 00:10:19,900
within limits that we work under all

228
00:10:30,130 --> 00:10:28,940
right well thanks so much with me only

229
00:10:32,640 --> 00:10:30,140
why don't you tell us a little bit about

230
00:10:35,470 --> 00:10:32,650
what you do

231
00:10:37,660 --> 00:10:35,480
thanks brandy well you've been talking a

232
00:10:40,030 --> 00:10:37,670
lot about the parachute test which tests

233
00:10:42,640 --> 00:10:40,040
orion from tens of thousands of feet on

234
00:10:45,400 --> 00:10:42,650
down to the surface of the earth we also

235
00:10:48,760 --> 00:10:45,410
need to know how a ryan behaves from

236
00:10:51,040 --> 00:10:48,770
entry interface or 400,000 feet

237
00:10:53,170 --> 00:10:51,050
on down to when one sits on the shoots

238
00:10:55,780 --> 00:10:53,180

an Orion's first flight test this

239
00:10:57,490 --> 00:10:55,790
upcoming fall is going to tell us how a

240
00:10:59,920 --> 00:10:57,500
Ryan behaves in the actual flight

241
00:11:02,260 --> 00:10:59,930
environment once before it gets down

242
00:11:04,660 --> 00:11:02,270
onto those parachutes I work here at the

243
00:11:07,180 --> 00:11:04,670
Johnson Space Center for Orion Aero

244
00:11:09,220 --> 00:11:07,190
sciences and we predict the aerodynamic

245
00:11:11,800 --> 00:11:09,230
and aerothermodynamic environments

246
00:11:14,889 --> 00:11:11,810
around the Orion crew vehicle and the

247
00:11:17,110 --> 00:11:14,899
launch abort system for design we use a

248
00:11:19,510 --> 00:11:17,120
combination of computer simulations and

249
00:11:21,519 --> 00:11:19,520
Windtunnel testing to create those

250
00:11:23,710 --> 00:11:21,529
environments for design but we actually

251
00:11:26,199 --> 00:11:23,720
don't know how well we did until we get

252
00:11:27,880 --> 00:11:26,209
that flight test data back and once we

253
00:11:29,380 --> 00:11:27,890
get that flight test data back we

254
00:11:31,150 --> 00:11:29,390
compare it to what our computer

255
00:11:33,370 --> 00:11:31,160
predictions and our wind tunnel test

256
00:11:40,210 --> 00:11:33,380
data told us to see how well the two

257
00:11:41,860 --> 00:11:40,220
matched up so what exactly are you

258
00:11:44,350 --> 00:11:41,870
looking for in the wind tunnel test what

259
00:11:48,400 --> 00:11:44,360
what does that tell you that you need to

260
00:11:50,170 --> 00:11:48,410
know before we go fly yeah for wind

261
00:11:52,269 --> 00:11:50,180
tunnel testing we take scaled-down

262
00:11:54,819 --> 00:11:52,279
models of either the launch abort system

263
00:11:57,310 --> 00:11:54,829

or the Orion crew module you know

264
00:12:00,010 --> 00:11:57,320
anywhere from a couple of inches on to a

265
00:12:02,470 --> 00:12:00,020
couple of feet which is obviously not

266
00:12:04,240 --> 00:12:02,480
the real size of the vehicle and so we

267
00:12:06,790 --> 00:12:04,250
take temperature measurements pressure

268
00:12:09,610 --> 00:12:06,800
measurements we look at you know loading

269
00:12:12,100 --> 00:12:09,620
lift and drag and then we also look at

270
00:12:14,380 --> 00:12:12,110
heat transfer to the surface and we take

271
00:12:16,240 --> 00:12:14,390
those measurements and try and scale

272
00:12:18,730 --> 00:12:16,250
them we use various parameters and

273
00:12:21,130 --> 00:12:18,740
assumptions to scale them to flight we

274
00:12:23,170 --> 00:12:21,140
also use our computers to predict what

275
00:12:24,880 --> 00:12:23,180
we saw in the wind tunnels and we

276
00:12:26,769 --> 00:12:24,890
extrapolate that as well to fly it we

277
00:12:28,660 --> 00:12:26,779
say okay we did really well at

278
00:12:30,670 --> 00:12:28,670
predicting the wind tunnel test data so

279
00:12:32,470 --> 00:12:30,680
we'll probably do well at predicting the

280
00:12:34,210 --> 00:12:32,480
flight test data we don't know that

281
00:12:40,170 --> 00:12:34,220
exactly until we get the flight test

282
00:12:44,440 --> 00:12:40,180
data and all that's necessary before the

283
00:12:48,670 --> 00:12:44,450
before the actual launch in December

284
00:12:51,250 --> 00:12:48,680
right and one of the things that we're

285
00:12:53,170 --> 00:12:51,260
working on right now coming for the

286
00:12:56,380 --> 00:12:53,180
flight in December is we're getting all

287
00:12:58,660 --> 00:12:56,390
of our processing strips and everything

288
00:13:00,490 --> 00:12:58,670

and tools together to prepare for that

289
00:13:02,620 --> 00:13:00,500
flight test data because it's going to

290
00:13:04,930 --> 00:13:02,630
be a pretty short turnaround between

291
00:13:06,699 --> 00:13:04,940
when we get that flight test data and

292
00:13:08,970 --> 00:13:06,709
when we're going to need to apply it for

293
00:13:14,110 --> 00:13:08,980
our design for Orion second flight test

294
00:13:15,939 --> 00:13:14,120
after that okay well tell us a little

295
00:13:20,220 --> 00:13:15,949
bit about your background how did you

296
00:13:22,269 --> 00:13:20,230
how did you come into this job well I

297
00:13:24,430 --> 00:13:22,279
did my undergrad in aerospace

298
00:13:27,550 --> 00:13:24,440
engineering at Iowa State University and

299
00:13:29,710 --> 00:13:27,560
while I was an undergrad I got a co-op

300
00:13:31,689 --> 00:13:29,720
or kind of intern opportunity here at

301
00:13:33,550 --> 00:13:31,699
the Johnson Space Center and I worked

302
00:13:35,379 --> 00:13:33,560
with the branch that I currently work

303
00:13:36,999 --> 00:13:35,389
with here at Johnson Space Center and I

304
00:13:38,920 --> 00:13:37,009
love the work that they do it was very

305
00:13:41,530 --> 00:13:38,930
exciting they were working on designing

306
00:13:44,259 --> 00:13:41,540
a real spacecraft to go farther than

307
00:13:46,449 --> 00:13:44,269
we've ever gone before in space and

308
00:13:48,309 --> 00:13:46,459
carry astronauts there and do missions

309
00:13:49,840 --> 00:13:48,319
and eventually go on to Mars and so I

310
00:13:52,240 --> 00:13:49,850
was really just enthralled and caught up

311
00:13:54,550 --> 00:13:52,250
in that and they offered me a job when I

312
00:13:55,990 --> 00:13:54,560
graduated and I was ecstatic to accept

313
00:14:00,730 --> 00:13:56,000

it and come work here at the Johnson

314
00:14:04,139 --> 00:14:00,740
Space Center what's been the the funnest

315
00:14:09,069 --> 00:14:07,420
probably one of the most exciting or fun

316
00:14:10,840 --> 00:14:09,079
things other than this upcoming flight

317
00:14:12,189 --> 00:14:10,850
test which I can't even imagine what its

318
00:14:14,650 --> 00:14:12,199
gonna feel like once we get that data

319
00:14:17,139 --> 00:14:14,660
back was a wind tunnel test that we did

320
00:14:18,670 --> 00:14:17,149
where we took a scaled-down size of the

321
00:14:21,699 --> 00:14:18,680
Orion crew module like what you see

322
00:14:24,370 --> 00:14:21,709
behind me only it was about 12 inches in

323
00:14:26,740 --> 00:14:24,380
diameter so a lot smaller and we took

324
00:14:28,860 --> 00:14:26,750
measurements where we created the

325
00:14:31,929 --> 00:14:28,870
reaction control system which fires

326
00:14:33,340 --> 00:14:31,939
plumes and gases outside of the vehicle

327
00:14:35,410 --> 00:14:33,350
to orient it during reentry

328
00:14:37,150 --> 00:14:35,420
we fired those in the wind tunnel test

329
00:14:39,129 --> 00:14:37,160
and took measurements and that was a

330
00:14:40,960 --> 00:14:39,139
really complicated really extensive test

331
00:14:42,910 --> 00:14:40,970
and getting those measurements back

332
00:14:45,460 --> 00:14:42,920
looking at that data and trying to apply

333
00:14:47,470 --> 00:14:45,470
it for the real vehicle was exciting it

334
00:14:51,280 --> 00:14:47,480
was a probably about a year your two

335
00:14:52,960 --> 00:14:51,290
year-long project that does sound cool

336
00:14:54,579 --> 00:14:52,970
but I guess probably you're really

337
00:14:59,710 --> 00:14:54,589
looking forward to the to the launch in

338
00:15:02,050 --> 00:14:59,720

December definitely I get kind of giddy

339
00:15:03,939 --> 00:15:02,060
a little bit thinking about it and it's

340
00:15:07,509 --> 00:15:03,949
gonna be something like we've never seen

341
00:15:09,129 --> 00:15:07,519
before all right well I think we've

342
00:15:11,230 --> 00:15:09,139
gotten still about 15 minutes left

343
00:15:12,699 --> 00:15:11,240
before we get to see the drop test but

344
00:15:14,199 --> 00:15:12,709
in the meantime we're gonna be taking

345
00:15:16,509 --> 00:15:14,209
some questions from social media don't

346
00:15:16,840 --> 00:15:16,519
forget you can send them in here on

347
00:15:19,710 --> 00:15:16,850
Google

348
00:15:22,509 --> 00:15:19,720
Plus or to twitter using the hashtag

349
00:15:24,400 --> 00:15:22,519
orion test so send in your questions and

350
00:15:26,170 --> 00:15:24,410
we'll we'll see if how many we can get

351
00:15:28,629 --> 00:15:26,180
answered before the drop test actually

352
00:15:34,780 --> 00:15:28,639
starts and i think we'll start with one

353
00:15:37,689 --> 00:15:34,790
from twitter it's why why does NASA's

354
00:15:40,059 --> 00:15:37,699
spacecraft not use the dragon

355
00:15:41,680 --> 00:15:40,069
landing technique of using rocket

356
00:15:42,910 --> 00:15:41,690
boosters to slow down the spacecraft so

357
00:15:45,600 --> 00:15:42,920
I'm guessing that's probably a good one

358
00:15:48,460 --> 00:15:45,610
first do do did you uh probably that

359
00:15:53,499 --> 00:15:48,470
yeah repeat it one more time for me real

360
00:15:56,290 --> 00:15:53,509
quick make sure I got it all why doesn't

361
00:15:58,930 --> 00:15:56,300
Ryan use that thrusters to slow down and

362
00:16:00,910 --> 00:15:58,940
land instead of parachutes okay yeah

363
00:16:04,300 --> 00:16:00,920

thank you actually we looked at that so

364
00:16:07,360 --> 00:16:04,310
I've worked on Orion since 2006 and 7

365
00:16:11,319 --> 00:16:07,370
and early in the program we looked at

366
00:16:12,519 --> 00:16:11,329
that when we had when we were early in

367
00:16:14,860 --> 00:16:12,529
the program we thought about land

368
00:16:18,249 --> 00:16:14,870
landing and we traded land landing

369
00:16:19,449 --> 00:16:18,259
versus water landing and for the types

370
00:16:21,759 --> 00:16:19,459
of missions that we're doing for deep

371
00:16:23,170 --> 00:16:21,769
space missions where mass is at a

372
00:16:25,870 --> 00:16:23,180
premium and we try to make the vehicle

373
00:16:29,170 --> 00:16:25,880
as light as we can it turned out that a

374
00:16:32,379 --> 00:16:29,180
land landing was going to be about 1,500

375
00:16:35,259 --> 00:16:32,389
pounds heavier for the vehicle and so we

376
00:16:37,720 --> 00:16:35,269
chose to go away from a land landing

377
00:16:40,030 --> 00:16:37,730
capability as a nominal capability to

378
00:16:42,309 --> 00:16:40,040
save that mass when we were looking at

379
00:16:45,759 --> 00:16:42,319
it thrusters were an option just like

380
00:16:49,269 --> 00:16:45,769
dragon uses just like the Soyuz uses we

381
00:16:51,460 --> 00:16:49,279
evaluated that we evaluated airbags and

382
00:16:53,559 --> 00:16:51,470
some of some other concepts as well but

383
00:16:56,740 --> 00:16:53,569
at the end of the day the trade was more

384
00:17:02,410 --> 00:16:56,750
of a decision to save save the up mass

385
00:17:03,939 --> 00:17:02,420
and apply it to science and cargo why

386
00:17:14,439 --> 00:17:03,949
don't you explain why the mass is so

387
00:17:15,069 --> 00:17:14,449
important to us hardware the low-earth

388
00:17:18,850 --> 00:17:15,079

orbit

389
00:17:20,799 --> 00:17:18,860
cargo end or astronauts depending on the

390
00:17:22,840 --> 00:17:20,809
the vehicle you're sitting on you have

391
00:17:25,210 --> 00:17:22,850
some I'll say some other flexibilities

392
00:17:28,810 --> 00:17:25,220
in your design and your trade space to

393
00:17:31,470 --> 00:17:28,820
to choose how much structure you put in

394
00:17:34,470 --> 00:17:31,480
how much we use it

395
00:17:38,880 --> 00:17:34,480
and when you're looking at a deep-space

396
00:17:41,549 --> 00:17:38,890
mission as we our mass is more of a

397
00:17:43,890 --> 00:17:41,559
premium you want to maximize the amount

398
00:17:46,020 --> 00:17:43,900
of cargo astronauts and science that you

399
00:17:47,370 --> 00:17:46,030
can take to whatever that destination is

400
00:17:50,880 --> 00:17:47,380
right you've still got to lift it off

401
00:17:52,590 --> 00:17:50,890
the surface of it of the earth and so it

402
00:17:55,650 --> 00:17:52,600
ends up being a function of you know

403
00:17:58,040 --> 00:17:55,660
what what's your primary goal back and

404
00:18:00,930 --> 00:17:58,050
forth the lower Earth orbit which is a

405
00:18:03,480 --> 00:18:00,940
challenging mission in itself but a deep

406
00:18:06,299 --> 00:18:03,490
space mission puts a different different

407
00:18:08,220 --> 00:18:06,309
priority on taking mass out of your

408
00:18:10,350 --> 00:18:08,230
vehicle so you can maximize what you

409
00:18:14,880 --> 00:18:10,360
have to what you can carry with you for

410
00:18:17,370 --> 00:18:14,890
your longer duration missions that makes

411
00:18:21,780 --> 00:18:17,380
it so we've got a question from Anthony

412
00:18:23,730 --> 00:18:21,790
age entry and who asked in fact even

413
00:18:26,370 --> 00:18:23,740

though I Ryan is designed to land on the

414
00:18:34,440 --> 00:18:26,380
ocean if it could land on land if it had

415
00:18:37,320 --> 00:18:34,450
to yes you know the the you'll see in

416
00:18:42,990 --> 00:18:37,330
about 15 minutes we clearly can and you

417
00:18:45,870 --> 00:18:43,000
certainly can the landing loads are are

418
00:18:47,640 --> 00:18:45,880
different but landing on land versus

419
00:18:49,710 --> 00:18:47,650
landing on water from a structural

420
00:18:53,990 --> 00:18:49,720
perspective isn't is it massively

421
00:18:57,570 --> 00:18:54,000
different we still have you designed for

422
00:19:00,090 --> 00:18:57,580
hitting soil or you have to design for

423
00:19:03,840 --> 00:19:00,100
hitting into a wave and so in either

424
00:19:08,010 --> 00:19:03,850
case and we we take that into our design

425
00:19:11,540 --> 00:19:08,020
trades and protect for that will target

426
00:19:14,700 --> 00:19:11,550
the land off the California coast and so

427
00:19:16,890 --> 00:19:14,710
in general it would take a take a fair

428
00:19:20,640 --> 00:19:16,900
number of failures for us to go long on

429
00:19:22,140 --> 00:19:20,650
our entry and land have a land landing

430
00:19:23,910 --> 00:19:22,150
so it you know will land off the coast

431
00:19:26,100 --> 00:19:23,920
of the west coast and if something were

432
00:19:28,500 --> 00:19:26,110
to come up and we had what we call a

433
00:19:30,180 --> 00:19:28,510
ballistic entry we would end up coming

434
00:19:33,390 --> 00:19:30,190
up short and landing further out in the

435
00:19:35,160 --> 00:19:33,400
ocean but the capability exists how's

436
00:19:39,120 --> 00:19:35,170
that my parachutes don't care whether we

437
00:19:39,560 --> 00:19:39,130
land on land or land on water I'm

438
00:19:41,090 --> 00:19:39,570

getting

439
00:19:42,770 --> 00:19:41,100
a little easier for us to target an

440
00:19:46,310 --> 00:19:42,780
ocean landing since it's such a big

441
00:19:48,650 --> 00:19:46,320
ocean and and noble living in it that's

442
00:19:51,770 --> 00:19:48,660
true and I went back to that first

443
00:19:53,570 --> 00:19:51,780
question one of the one of the reasons

444
00:19:55,610 --> 00:19:53,580
that land landing is a is amassed

445
00:20:01,160 --> 00:19:55,620
penalty is again when you're coming back

446
00:20:03,380 --> 00:20:01,170
from the deep space location if you have

447
00:20:07,970 --> 00:20:03,390
an issue you still have to protect for

448
00:20:10,550 --> 00:20:07,980
the ability of landing on and so you've

449
00:20:20,990 --> 00:20:10,560
got to carry both systems and so that

450
00:20:23,240 --> 00:20:21,000
was another reason we shifted to some

451
00:20:26,480 --> 00:20:23,250
detail I think you've been we can quiz

452
00:20:28,370 --> 00:20:26,490
you on this - he wants says he's got I

453
00:20:30,500 --> 00:20:28,380
think that entering the atmosphere slows

454
00:20:32,390 --> 00:20:30,510
our Ryan down a lot but how much what

455
00:20:37,100 --> 00:20:32,400
what's people the vehicle be going out

456
00:20:52,280 --> 00:20:37,110
when the let's see we we start our

457
00:20:54,020 --> 00:20:52,290
sequence parachute sequence starts and

458
00:20:56,780 --> 00:20:54,030
so we as you mentioned we enter it

459
00:21:00,350 --> 00:20:56,790
around 3 ft 1 will enter at 20,000 miles

460
00:21:02,900 --> 00:21:00,360
an hour and and come through the

461
00:21:04,130 --> 00:21:02,910
atmosphere and that friction of sliding

462
00:21:07,130 --> 00:21:04,140
down through the atmosphere will have

463
00:21:09,500 --> 00:21:07,140

slowed us down at that point that's

464
00:21:12,170 --> 00:21:09,510
assuming you know myoh he's got to get

465
00:21:13,760 --> 00:21:12,180
all of her predictions right for me but

466
00:21:15,350 --> 00:21:13,770
as soon as mildly bitter did her work

467
00:21:17,240 --> 00:21:15,360
and she's pretty smart so I'm assuming

468
00:21:22,790 --> 00:21:17,250
she's got her her numbers right we're in

469
00:21:25,160 --> 00:21:22,800
the range of 350 when we deploy okay and

470
00:21:27,950 --> 00:21:25,170
kind of a related question and we have a

471
00:21:30,490 --> 00:21:27,960
handle on Twitter and asking on behalf

472
00:21:33,470 --> 00:21:30,500
of his 11 year old son who's watching

473
00:21:37,850 --> 00:21:33,480
how heavy will Orion be when the

474
00:21:43,430 --> 00:21:37,860
parachutes deploy we have a landed mass

475
00:21:45,680 --> 00:21:43,440
in it it varies a little bit but that's

476
00:21:48,530 --> 00:21:45,690
a good round number keeping your head

477
00:21:52,950 --> 00:21:48,540
and it's the 20,000 pounds is generally

478
00:21:58,450 --> 00:21:56,440
okay great let's see we've got still

479
00:22:00,010 --> 00:21:58,460
about nine minutes I think before the

480
00:22:02,380 --> 00:22:00,020
test and we'll keep going keep sending

481
00:22:06,430 --> 00:22:02,390
your questions in with a hashtag Orion

482
00:22:08,860 --> 00:22:06,440
tests our next one from in ever eaten

483
00:22:11,889 --> 00:22:08,870
this question is is the forward Bay

484
00:22:14,409 --> 00:22:11,899
cover recoverable or reusable and it

485
00:22:17,110 --> 00:22:14,419
might be a good question to jump off of

486
00:22:20,919 --> 00:22:17,120
and talk about what all we might be able

487
00:22:24,240 --> 00:22:20,929
to reuse online so the format cover is

488
00:22:32,820 --> 00:22:24,250

recoverable when we land in the ocean

489
00:22:35,380 --> 00:22:32,830
the expectation maintain enough buoyancy

490
00:22:39,250 --> 00:22:35,390
will clearly recover here after the test

491
00:22:41,649 --> 00:22:39,260
today it's not intended to be reusable

492
00:22:44,740 --> 00:22:41,659
the parachutes that take it off are

493
00:22:47,350 --> 00:22:44,750
sized to be just big enough to get it

494
00:22:49,810 --> 00:22:47,360
off and do that job they're not sized to

495
00:22:52,269 --> 00:22:49,820
give it a soft landing so the cover hits

496
00:22:54,460 --> 00:22:52,279
it around 50 miles an hour and so we

497
00:22:59,860 --> 00:22:54,470
would expect it to get some damage when

498
00:23:02,409 --> 00:22:59,870
it lands and then just globally we will

499
00:23:06,220 --> 00:23:02,419
reuse a lot of our computers and other

500
00:23:08,370 --> 00:23:06,230
avionics again early in the program we

501
00:23:11,169 --> 00:23:08,380
considered reusing the structure and

502
00:23:12,669 --> 00:23:11,179
again since this is a human vehicle if

503
00:23:15,399 --> 00:23:12,679
you're going to reuse your structure you

504
00:23:17,350 --> 00:23:15,409
need to inspect it make sure that after

505
00:23:19,060 --> 00:23:17,360
a landing that all of your welds and

506
00:23:22,710 --> 00:23:19,070
other structural components are still

507
00:23:25,870 --> 00:23:22,720
intact and the the effort to inspect it

508
00:23:29,080 --> 00:23:25,880
is is a lot of work and is almost as

509
00:23:31,919 --> 00:23:29,090
much work as knocking out a new piece of

510
00:23:34,060 --> 00:23:31,929
structure and building up around

511
00:23:36,100 --> 00:23:34,070
primarily it's our avionics which are

512
00:23:40,029 --> 00:23:36,110
some of the high dollar value items that

513
00:23:41,169 --> 00:23:40,039

are being reused okay there was a second

514
00:23:44,320 --> 00:23:41,179
part to Ben's question he said if we

515
00:23:48,460 --> 00:23:44,330
weren't going to reuse it why why give

516
00:23:50,260 --> 00:23:48,470
it parachute the the parachutes and

517
00:23:53,159 --> 00:23:50,270
there are there are three parachutes and

518
00:23:55,539 --> 00:23:53,169
three thrusters and they they work in

519
00:23:59,710 --> 00:23:55,549
partnership to make sure you can get the

520
00:24:01,139 --> 00:23:59,720
cover off the cover the job of the cover

521
00:24:02,820 --> 00:24:01,149
all through the mission

522
00:24:06,269 --> 00:24:02,830
to protect the forebay which includes

523
00:24:09,749 --> 00:24:06,279
the rest of the parachutes from thermal

524
00:24:10,769 --> 00:24:09,759
environment mmod other just all the

525
00:24:13,499 --> 00:24:10,779
other environments that we have to

526
00:24:15,060 --> 00:24:13,509
protect for and so it's got to get off

527
00:24:17,820 --> 00:24:15,070
and get out of the way for the rest of

528
00:24:19,919 --> 00:24:17,830
the shoots to do a job I liken it to the

529
00:24:24,060 --> 00:24:19,929
first domino has to fall in the Train of

530
00:24:26,190 --> 00:24:24,070
dominoes and so it's from what from the

531
00:24:28,639 --> 00:24:26,200
data that I've seen parachutes alone

532
00:24:31,200 --> 00:24:28,649
could probably take the cover off

533
00:24:32,879 --> 00:24:31,210
thrusters alone could probably take it

534
00:24:34,469 --> 00:24:32,889
off but we put them together to make

535
00:24:38,719 --> 00:24:34,479
sure that it gets off and gets out of

536
00:24:42,709 --> 00:24:38,729
the way and stays and I just kind of

537
00:24:44,940 --> 00:24:42,719
think for two minutes and start the test

538
00:24:47,430 --> 00:24:44,950

few minutes I'm starting the test okay

539
00:24:50,969 --> 00:24:47,440
well while we're waiting on that another

540
00:24:53,869 --> 00:24:50,979
question that we had was what what

541
00:24:56,639 --> 00:24:53,879
happens if one of the parachute fails

542
00:25:00,509 --> 00:24:56,649
well we actually designed that in and

543
00:25:02,639 --> 00:25:00,519
certain tests we will plan those landed

544
00:25:06,180 --> 00:25:02,649
and we'll demonstrate that the the

545
00:25:08,759 --> 00:25:06,190
vehicle assumes of Engineers that design

546
00:25:10,919 --> 00:25:08,769
the structure assume that one of our

547
00:25:12,690 --> 00:25:10,929
main parachutes will feel to fail and so

548
00:25:14,879 --> 00:25:12,700
they build the structure strong enough

549
00:25:17,609 --> 00:25:14,889
to survive a landing under two

550
00:25:19,379 --> 00:25:17,619
parachutes all of our parachutes have

551
00:25:21,989 --> 00:25:19,389
redundancy built into them we call it

552
00:25:23,759 --> 00:25:21,999
fault tolerance and so if only one for

553
00:25:25,649 --> 00:25:23,769
Bay cover if before they cover chute

554
00:25:29,909 --> 00:25:25,659
doesn't work they'll still deploy if one

555
00:25:32,729 --> 00:25:29,919
of the two drugs fails to to deploy will

556
00:25:37,379 --> 00:25:32,739
still get on mains properly so that's

557
00:25:40,560 --> 00:25:37,389
part of our design activity we are very

558
00:25:42,829 --> 00:25:40,570
close to certain the tests okay we'll

559
00:25:46,680 --> 00:25:42,839
keep watching them just for the viewers

560
00:25:49,859 --> 00:25:46,690
you're with us that'd probably be a bit

561
00:25:51,539 --> 00:25:49,869
of a challenge for us to lock on to it

562
00:25:54,719 --> 00:25:51,549
but it looks like we see the crack there

563
00:25:57,060 --> 00:25:54,729

and that's what I Ryan or the test

564
00:25:58,709 --> 00:25:57,070
version of Orion is inside of right now

565
00:26:02,430 --> 00:25:58,719
and we'll be pushed out the back up for

566
00:26:04,139 --> 00:26:02,440
the test and I'll just give you a call

567
00:26:09,630 --> 00:26:04,149
as I can watch it if you if you'd like

568
00:26:19,950 --> 00:26:15,930
we're out of the airplane a good initial

569
00:26:24,750 --> 00:26:19,960
extraction the test vehicle the PTV is

570
00:26:41,879 --> 00:26:24,760
away from its lid I'm coming down under

571
00:26:49,599 --> 00:26:43,719
we're still falling out of the

572
00:26:50,829 --> 00:26:49,609
programmers just we've got the

573
00:26:54,989 --> 00:26:50,839
programmers away we're gonna let

574
00:27:00,070 --> 00:26:56,919
it's to tell us that given look that

575
00:27:02,019 --> 00:27:00,080
freefall this freefall allows gravity to

576
00:27:05,529 --> 00:27:02,029
do its job and allow us to accelerate to

577
00:27:08,409 --> 00:27:05,539
our test condition and the faster we let

578
00:27:09,969 --> 00:27:08,419
the vehicle fall you know the more it is

579
00:27:13,089 --> 00:27:09,979
able to accelerate and give us a more

580
00:27:15,669 --> 00:27:13,099
representative chest condition the

581
00:27:17,879 --> 00:27:15,679
closer is more closely matches the

582
00:27:35,829 --> 00:27:17,889
flight injury that we'll see during ft-1

583
00:27:38,589 --> 00:27:35,839
and we better under drugs so we've had a

584
00:27:40,719 --> 00:27:38,599
good for debate cover separation I'm

585
00:27:46,859 --> 00:27:40,729
just tracking the the PTV the test

586
00:28:02,079 --> 00:27:53,109
and we just cut away three pilots out

587
00:28:03,819 --> 00:28:02,089
the means that started inflating just

588
00:28:06,539 --> 00:28:03,829

heard the pop from the chute inflating

589
00:28:08,859 --> 00:28:06,549
one of I know a fred has this on camera

590
00:28:11,409 --> 00:28:08,869
one shoots inflated the other two are

591
00:28:13,529 --> 00:28:11,419
not yet this was one of our other

592
00:28:16,989 --> 00:28:13,539
players just objectives which was

593
00:28:19,569 --> 00:28:16,999
simulating well good yeah and so that's

594
00:28:22,239 --> 00:28:19,579
simulating what happens if one of the

595
00:28:25,619 --> 00:28:22,249
reefing stages opens prematurely for

596
00:28:28,209 --> 00:28:25,629
some reason and if it skips a stage

597
00:28:31,899 --> 00:28:28,219
because we designed this assuming that

598
00:28:34,479 --> 00:28:31,909
the parachutes here the reefing yeah

599
00:28:39,430 --> 00:28:34,489
thank you yeah reefing is is a way to

600
00:28:45,009 --> 00:28:39,440
open the the parachute in in gently or

601
00:28:47,649 --> 00:28:45,019
softly if you went full open its think

602
00:28:49,329 --> 00:28:47,659
of going extremely fast and hitting your

603
00:28:52,589 --> 00:28:49,339
brakes really really hard you put a lot

604
00:28:54,490 --> 00:28:52,599
of energy into things right it's it's a

605
00:28:56,230 --> 00:28:54,500
dumps a lot of energy

606
00:28:59,260 --> 00:28:56,240
into the structure of the vehicle and in

607
00:29:01,899 --> 00:28:59,270
the parachute and so we have ropes that

608
00:29:04,409 --> 00:29:01,909
constrain the diameter of the parachute

609
00:29:08,409 --> 00:29:04,419
and they have pyrotechnic timers that

610
00:29:11,020 --> 00:29:08,419
allow them to open up say 10% initially

611
00:29:12,970 --> 00:29:11,030
and then I think finally remembers the

612
00:29:14,470 --> 00:29:12,980
exact number I think it's 10 and then 20

613
00:29:15,850 --> 00:29:14,480

percent and then we go full open and

614
00:29:19,840 --> 00:29:15,860
that allows you to open up the chutes

615
00:29:22,120 --> 00:29:19,850
gracefully and kind of more slowly

616
00:29:24,220 --> 00:29:22,130
spread the energy into the parachutes

617
00:29:25,870 --> 00:29:24,230
and end of the vehicle again by reefing

618
00:29:29,520 --> 00:29:25,880
you kind of control and manage that

619
00:29:32,049 --> 00:29:29,530
energy and it allows you to not design

620
00:29:36,850 --> 00:29:32,059
and carry quite as much mass in the

621
00:29:38,730 --> 00:29:36,860
system well it looks great from here

622
00:29:42,010 --> 00:29:38,740
we're seeing really good do you think so

623
00:29:44,140 --> 00:29:42,020
we're getting that for us yes while we

624
00:29:46,299 --> 00:29:44,150
watch it make its way down to the ground

625
00:29:48,640 --> 00:29:46,309
we can take a few more questions we

626
00:29:51,039 --> 00:29:48,650
actually won four we're Molly from nick

627
00:29:52,600 --> 00:29:51,049
lopez and this is what kind of

628
00:29:55,090 --> 00:29:52,610
temperatures do you predict you'll see

629
00:29:59,470 --> 00:29:55,100
during entry based on your wind tunnel

630
00:30:01,510 --> 00:29:59,480
testing well we don't get up to the

631
00:30:05,080 --> 00:30:01,520
actual temperatures that we're gonna see

632
00:30:07,149 --> 00:30:05,090
in in flight in the wind tunnel test but

633
00:30:09,159 --> 00:30:07,159
for eft-1 we're predicting a peak

634
00:30:11,409 --> 00:30:09,169
surface temperature of around 4000

635
00:30:14,200 --> 00:30:11,419
degrees Fahrenheit that's two times the

636
00:30:16,930 --> 00:30:14,210
temperature of molten lava and that's

637
00:30:18,490 --> 00:30:16,940
just for our Orion's first flight test

638
00:30:21,430 --> 00:30:18,500

which isn't going to completely stress

639
00:30:23,649 --> 00:30:21,440
the system as as far as Orion will once

640
00:30:25,690 --> 00:30:23,659
we actually dry Orion's real missions

641
00:30:27,190 --> 00:30:25,700
out to the moon and beyond for those

642
00:30:30,610 --> 00:30:27,200
missions we're going to be seeing peak

643
00:30:37,299 --> 00:30:30,620
surface temperatures upwards of 5,000 to

644
00:30:38,649 --> 00:30:37,309
50 to 100 degrees Fahrenheit so that

645
00:30:41,710 --> 00:30:38,659
brings up another question if it gotten

646
00:30:44,560 --> 00:30:41,720
from Philip online and he has how can

647
00:30:48,330 --> 00:30:44,570
the module be adapted for finish they

648
00:30:51,220 --> 00:30:48,340
need to change before the next spikes

649
00:30:53,799 --> 00:30:51,230
certain parts the vehicle or have

650
00:30:55,149 --> 00:30:53,809
already changed between the first flight

651
00:30:58,990 --> 00:30:55,159
test and what we're going to be flying

652
00:31:01,180 --> 00:30:59,000
on future missions but the material that

653
00:31:02,169 --> 00:31:01,190
surrounds the vehicle we call it it's

654
00:31:05,230 --> 00:31:02,179
thermal protection

655
00:31:07,090 --> 00:31:05,240
that's what protects it from those high

656
00:31:09,249 --> 00:31:07,100
temperatures on the surface it's an

657
00:31:11,590 --> 00:31:09,259
insulated layer it's also designed to

658
00:31:15,100 --> 00:31:11,600
burn away and take that energy away from

659
00:31:17,159 --> 00:31:15,110
the surface that thickness of that

660
00:31:20,739 --> 00:31:17,169
material can change depending on your on

661
00:31:23,169 --> 00:31:20,749
your mission and then also we'll learn a

662
00:31:25,509 --> 00:31:23,179
lot from the excavation flight test-1 or

663
00:31:27,369 --> 00:31:25,519

Ryan's first flight test and that will

664
00:31:29,919 --> 00:31:27,379
feed into design for the future flight

665
00:31:32,200 --> 00:31:29,929
tests we might need to adjust certain

666
00:31:35,320 --> 00:31:32,210
thicknesses or adjust what material is

667
00:31:36,639 --> 00:31:35,330
used for certain regions and those are

668
00:31:38,950 --> 00:31:36,649
the design changes that will go into

669
00:31:43,480 --> 00:31:38,960
between the first flight test and the

670
00:31:46,180 --> 00:31:43,490
second flight sighs great it looks like

671
00:31:48,549 --> 00:31:46,190
we've got the vehicle touched down now

672
00:31:52,720 --> 00:31:48,559
on the desert in Yuma everything looking

673
00:31:55,210 --> 00:31:52,730
good - yes if you see this I'm assuming

674
00:31:58,049 --> 00:31:55,220
Brad's got the shot you see two of the

675
00:32:02,259 --> 00:31:58,059
three parachutes and they're just

676
00:32:03,669 --> 00:32:02,269
starting now starting to deflate and

677
00:32:06,999 --> 00:32:03,679
things that the ground winds here today

678
00:32:09,519 --> 00:32:07,009
are in the seven eight nine not range

679
00:32:11,499 --> 00:32:09,529
and these parachutes are very effective

680
00:32:13,989 --> 00:32:11,509
and so one of the things that we have to

681
00:32:16,060 --> 00:32:13,999
do is make sure we get them deflated and

682
00:32:18,609 --> 00:32:16,070
there these the last two are hanging on

683
00:32:21,580 --> 00:32:18,619
for a little bit but the vehicles down

684
00:32:23,230 --> 00:32:21,590
it was a good test and I saw the for

685
00:32:26,529 --> 00:32:23,240
debate cover we obviously had a good

686
00:32:30,820 --> 00:32:26,539
clean separation it's down on the ground

687
00:32:34,060 --> 00:32:30,830
already yeah so what what would be

688
00:32:36,009 --> 00:32:34,070

happening now if this were the the test

689
00:32:38,200 --> 00:32:36,019
flight in December and we were on the

690
00:32:40,779 --> 00:32:38,210
ocean what what would the recovery team

691
00:32:44,950 --> 00:32:40,789
be doing the recovery team once the

692
00:32:48,700 --> 00:32:44,960
vehicles down and once any all the other

693
00:32:52,180 --> 00:32:48,710
objects like are clear so they know that

694
00:32:55,509 --> 00:32:52,190
there's no hazards the recovery crews

695
00:32:57,999 --> 00:32:55,519
will take off out of the the Navy ship

696
00:32:59,470 --> 00:32:58,009
that's in the in the landing area and

697
00:33:02,680 --> 00:32:59,480
we'll be heading out in some small boats

698
00:33:05,049 --> 00:33:02,690
and zodiacs to go and recover the for

699
00:33:07,239 --> 00:33:05,059
debate cover and then go and recover the

700
00:33:11,279 --> 00:33:07,249
the vehicle itself and so they'll come

701
00:33:14,019 --> 00:33:11,289
out to it in the boats and attach some

702
00:33:15,890 --> 00:33:14,029
flotation to that the vehicle floats on

703
00:33:17,810 --> 00:33:15,900
its own but some extra

704
00:33:20,060 --> 00:33:17,820
device is dead just to help stabilize it

705
00:33:21,310 --> 00:33:20,070
and prepare to pull it back into the

706
00:33:24,350 --> 00:33:21,320
well deck of the ship

707
00:33:27,890 --> 00:33:24,360
but the they hold for a few minutes just

708
00:33:30,380 --> 00:33:27,900
like our test team holds here the the

709
00:33:33,590 --> 00:33:30,390
mortar deployed parachutes have lids on

710
00:33:35,300 --> 00:33:33,600
top of them and and so and the to drill

711
00:33:38,660 --> 00:33:35,310
mortars for example are about the size

712
00:33:41,420 --> 00:33:38,670
of a nice big trash can and you've got

713
00:33:43,790 --> 00:33:41,430

to let the lids from those parachutes

714
00:33:45,980 --> 00:33:43,800
get out of the air and get down on the

715
00:33:48,320 --> 00:33:45,990
ground so that you don't have to worry

716
00:33:49,880 --> 00:33:48,330
about a risk for the recovery crew to

717
00:33:52,340 --> 00:33:49,890
have one of these things come falling

718
00:33:55,190 --> 00:33:52,350
out of this guy so all these smaller

719
00:33:56,960 --> 00:33:55,200
parachutes and parts have to we verify

720
00:34:00,170 --> 00:33:56,970
that they're down on the ground using

721
00:34:10,610 --> 00:34:00,180
radar and an optics and then we go out

722
00:34:16,010 --> 00:34:10,620
and start recovering the vehicle one

723
00:34:18,139 --> 00:34:16,020
more question and we've got are the

724
00:34:22,190 --> 00:34:18,149
parachutes usable in any type of weather

725
00:34:24,649 --> 00:34:22,200
or condition yeah actually they are I

726
00:34:28,460 --> 00:34:24,659
mean they would we would not

727
00:34:31,340 --> 00:34:28,470
intentionally land in a bad weather

728
00:34:34,280 --> 00:34:31,350
situation but the parachutes themselves

729
00:34:38,360 --> 00:34:34,290
will will operate you know they have

730
00:34:40,070 --> 00:34:38,370
temperature restrictions that you know

731
00:34:42,710 --> 00:34:40,080
you don't want to land you don't want to

732
00:34:44,240 --> 00:34:42,720
put them out too hot that's why we have

733
00:34:47,510 --> 00:34:44,250
the the thermal protection system out

734
00:34:49,550 --> 00:34:47,520
there but outside of that on a on a

735
00:34:51,280 --> 00:34:49,560
cloudy day or a rainy day they would

736
00:34:53,540 --> 00:34:51,290
still they would they would be fine

737
00:34:58,160 --> 00:34:53,550
they'll still inflate and do there and

738
00:34:59,600 --> 00:34:58,170

do their function okay well I think

739
00:35:01,490 --> 00:34:59,610
that's just about all we have time for

740
00:35:04,190 --> 00:35:01,500
but before we go I wanted to do to get

741
00:35:05,690 --> 00:35:04,200
you to tell us about what's left to test

742
00:35:07,160 --> 00:35:05,700
now I know we've got another test coming

743
00:35:10,280 --> 00:35:07,170
up in August what we'll be looking at

744
00:35:13,550 --> 00:35:10,290
then and then in our August test will

745
00:35:16,220 --> 00:35:13,560
well first there will plan to do a what

746
00:35:17,510 --> 00:35:16,230
we a to parachute main test we're gonna

747
00:35:20,330 --> 00:35:17,520
simulate one of our main parachute

748
00:35:21,860 --> 00:35:20,340
failures we look at some of our other

749
00:35:25,070 --> 00:35:21,870
design improvements we're putting in the

750
00:35:27,110 --> 00:35:25,080
system and and if we learn anything as

751
00:35:28,850 --> 00:35:27,120
we look at the hardware today and over

752
00:35:31,670 --> 00:35:28,860
the next couple of weeks it needs to

753
00:35:33,620 --> 00:35:31,680
worked into the test in August we'll

754
00:35:36,680 --> 00:35:33,630
blend that in and then we have two more

755
00:35:39,320 --> 00:35:36,690
after that that complete our development

756
00:35:41,150 --> 00:35:39,330
series and once we're done with those

757
00:35:43,940 --> 00:35:41,160
we'll take all of the lessons that we've

758
00:35:47,000 --> 00:35:43,950
learned and start building the final

759
00:35:52,130 --> 00:35:47,010
design that will go into the vehicle for

760
00:35:53,960 --> 00:35:52,140
em1 and for our future human missions we

761
00:35:56,600 --> 00:35:53,970
can't wait to see all of that I think

762
00:35:58,130 --> 00:35:56,610
we're gonna wrap up there so thanks so

763
00:35:59,900 --> 00:35:58,140

much for joining us for the Hangout and

764
00:36:02,360 --> 00:35:59,910
for sending in your questions they were

765
00:36:03,650 --> 00:36:02,370
great and especially thanks to sue and

766
00:36:07,930 --> 00:36:03,660
Molly for taking time to talk with us

767
00:36:12,080 --> 00:36:10,370
progress that Orion's been making this

768
00:36:13,790 --> 00:36:12,090
year and the preparations for December's

769
00:36:15,350 --> 00:36:13,800
launch as well as some of what the Space

770
00:36:17,660 --> 00:36:15,360
Launch System and ground systems

771
00:36:19,370 --> 00:36:17,670
development operation programs have been