
#SLSFiredUP
SOCIAL
SOCIAL
NASA
NASA'S JOURNEY TO
MARS

1
00:00:20,070 --> 00:00:19,029
t minus 12 11

2
00:00:21,029 --> 00:00:20,080
10

3
00:00:22,070 --> 00:00:21,039
9

4
00:00:23,189 --> 00:00:22,080
8

5
00:00:24,230 --> 00:00:23,199
7

6
00:00:25,269 --> 00:00:24,240
6

7
00:00:26,390 --> 00:00:25,279
5

8
00:00:27,670 --> 00:00:26,400
4

9
00:00:28,630 --> 00:00:27,680
3

10
00:01:42,149 --> 00:00:28,640
2

11
00:01:45,670 --> 00:01:43,749
good afternoon i'm john yeper with

12
00:01:47,990 --> 00:01:45,680
nasa's office of communications and

13
00:02:01,590 --> 00:01:48,000

welcome to the nasa social for the first

14
00:02:04,709 --> 00:02:03,749
so what is sls or the space launch

15
00:02:07,510 --> 00:02:04,719
system

16
00:02:09,270 --> 00:02:07,520
it is nasa's next heavy lift vehicle it

17
00:02:11,270 --> 00:02:09,280
is going to be the largest most powerful

18
00:02:13,510 --> 00:02:11,280
rocket we've ever built and it's going

19
00:02:15,350 --> 00:02:13,520
to take astronauts further space than

20
00:02:17,990 --> 00:02:15,360
ever before to destinations such as an

21
00:02:20,309 --> 00:02:18,000
asteroid to mars and beyond

22
00:02:22,390 --> 00:02:20,319
and what exactly is a nasa social

23
00:02:24,550 --> 00:02:22,400
and nasa social is an event that takes

24
00:02:25,910 --> 00:02:24,560
the online experience offline where we

25
00:02:28,790 --> 00:02:25,920
invite our social media followers to

26
00:02:30,790 --> 00:02:28,800
come out to nasa go behind the scenes

27
00:02:33,030 --> 00:02:30,800
and share with their friends and

28
00:02:34,710 --> 00:02:33,040
followers their experience

29
00:02:38,070 --> 00:02:34,720
and tomorrow

30
00:02:39,030 --> 00:02:38,080
at 9 30 a.m mountain time 11 30 a.m

31
00:02:40,470 --> 00:02:39,040
pacific

32
00:02:43,750 --> 00:02:40,480
eastern time rather

33
00:02:45,830 --> 00:02:43,760
uh right out here about a mile away from

34
00:02:47,270 --> 00:02:45,840
where this we're standing right now uh

35
00:02:49,350 --> 00:02:47,280
the uh

36
00:02:52,229 --> 00:02:49,360
booster test is going to occur and it's

37
00:02:54,229 --> 00:02:52,239
going to fire it up and it's going to

38
00:02:56,229 --> 00:02:54,239

it's going to be a monumental test for

39
00:02:57,030 --> 00:02:56,239
us but tomorrow isn't just about the

40
00:03:00,309 --> 00:02:57,040
test

41
00:03:01,750 --> 00:03:00,319
it's also about our journey to mars

42
00:03:03,589 --> 00:03:01,760
we're going to be we're in a path to

43
00:03:05,270 --> 00:03:03,599
mars right now that is going to take

44
00:03:06,630 --> 00:03:05,280
humans uh

45
00:03:08,630 --> 00:03:06,640
we're developing the capabilities is

46
00:03:09,509 --> 00:03:08,640
going to take humans to mars in the near

47
00:03:10,790 --> 00:03:09,519
future

48
00:03:12,390 --> 00:03:10,800
to tell us a little bit more about that

49
00:03:14,229 --> 00:03:12,400
we have some panelists here today

50
00:03:15,509 --> 00:03:14,239
they're going to go through and tell us

51
00:03:17,990 --> 00:03:15,519
all about the different paths we're

52
00:03:19,270 --> 00:03:18,000
doing including sls including our orion

53
00:03:20,550 --> 00:03:19,280
spacecraft

54
00:03:21,990 --> 00:03:20,560
and all the different technologies are

55
00:03:24,550 --> 00:03:22,000
needed to get us there

56
00:03:28,550 --> 00:03:24,560
so tomorrow at uh our tv broadcast

57
00:03:30,309 --> 00:03:28,560
starts at 9 a.m mountain time 11 a.m

58
00:03:33,750 --> 00:03:30,319
eastern time and you can watch it on

59
00:03:35,830 --> 00:03:33,760
nasa tv www.nasa.gov

60
00:03:37,910 --> 00:03:35,840
nasa tv and you can participate in the

61
00:03:40,710 --> 00:03:37,920
conversation here with us today with the

62
00:03:42,390 --> 00:03:40,720
hashtag sls fired up and journey to mars

63
00:03:45,430 --> 00:03:42,400

and for those at home if you have a

64
00:03:46,949 --> 00:03:45,440
question you can use the hashtag

65
00:03:48,070 --> 00:03:46,959
ask nasa

66
00:03:50,149 --> 00:03:48,080
so let's get started with our first

67
00:03:51,430 --> 00:03:50,159
speakers we have with us today

68
00:03:54,229 --> 00:03:51,440
charlie precourt

69
00:03:56,949 --> 00:03:54,239
who is the general manager for um

70
00:03:58,630 --> 00:03:56,959
propulsion systems for orbital atk

71
00:04:00,869 --> 00:03:58,640
and bill gerstmeyer the associate

72
00:04:03,190 --> 00:04:00,879
administrator for human exploration

73
00:04:04,309 --> 00:04:03,200
operations mission directorate for nasa

74
00:04:06,630 --> 00:04:04,319
charlie

75
00:04:08,710 --> 00:04:06,640
thank you i appreciate that john

76
00:04:10,470 --> 00:04:08,720
welcome to all of you we're very excited

77
00:04:11,750 --> 00:04:10,480
to have you here

78
00:04:13,509 --> 00:04:11,760
big day for us tomorrow and the

79
00:04:15,110 --> 00:04:13,519
culmination of

80
00:04:17,110 --> 00:04:15,120
many years of

81
00:04:18,550 --> 00:04:17,120
experienced work uh during the shuttle

82
00:04:20,789 --> 00:04:18,560
program that we've transitioned out of

83
00:04:22,710 --> 00:04:20,799
the space launch system

84
00:04:24,310 --> 00:04:22,720
the new booster that you'll see tomorrow

85
00:04:25,830 --> 00:04:24,320
is three and a half million pounds of

86
00:04:28,710 --> 00:04:25,840
thrust and it'll be a very exciting

87
00:04:30,390 --> 00:04:28,720
event for all of us we're delighted to

88
00:04:32,710 --> 00:04:30,400

have you here

89
00:04:34,390 --> 00:04:32,720
to share in this experience i'm really

90
00:04:35,270 --> 00:04:34,400
looking i will keep my remarks brief

91
00:04:36,790 --> 00:04:35,280
because i'm looking forward to

92
00:04:39,430 --> 00:04:36,800
interacting with you with your questions

93
00:04:41,590 --> 00:04:39,440
and answers but i'm also excited to see

94
00:04:44,310 --> 00:04:41,600
within you in the audience folks with

95
00:04:45,830 --> 00:04:44,320
google glass and 3d cameras and all

96
00:04:48,550 --> 00:04:45,840
those that really appreciate the

97
00:04:50,790 --> 00:04:48,560
high-tech stuff in in the world and and

98
00:04:53,670 --> 00:04:50,800
it's that kind of stuff that's going to

99
00:04:55,110 --> 00:04:53,680
get us to mars and we at orbital atk are

100
00:04:57,510 --> 00:04:55,120
just very very proud to be a part of

101
00:04:59,270 --> 00:04:57,520
that and that journey is extremely

102
00:05:01,909 --> 00:04:59,280
important to all of us

103
00:05:04,070 --> 00:05:01,919
orbital atk a new name for us

104
00:05:05,590 --> 00:05:04,080
we have just completed a merger a very

105
00:05:08,070 --> 00:05:05,600
successful one

106
00:05:09,990 --> 00:05:08,080
i'm privileged to lead a division known

107
00:05:11,430 --> 00:05:10,000
as propulsion systems now which

108
00:05:13,670 --> 00:05:11,440
encompasses

109
00:05:15,830 --> 00:05:13,680
three plants here in utah the one that

110
00:05:17,749 --> 00:05:15,840
you're at here today which focuses on a

111
00:05:19,909 --> 00:05:17,759
lot of nasa work but also

112
00:05:21,670 --> 00:05:19,919
work in propulsion for other

113
00:05:23,270 --> 00:05:21,680

customers

114
00:05:25,510 --> 00:05:23,280
and in the test area where we're going

115
00:05:27,350 --> 00:05:25,520
to conduct this test in the next week we

116
00:05:29,510 --> 00:05:27,360
have several other tests for other

117
00:05:30,550 --> 00:05:29,520
customers and and other programs at

118
00:05:32,629 --> 00:05:30,560
darpa

119
00:05:34,070 --> 00:05:32,639
and for the folks out at the wallops

120
00:05:36,150 --> 00:05:34,080
flight center so it's a very exciting

121
00:05:38,950 --> 00:05:36,160
time for us lots going on

122
00:05:40,870 --> 00:05:38,960
i'm also privileged to welcome our nasa

123
00:05:43,029 --> 00:05:40,880
leadership team bill gerstenmaier

124
00:05:45,029 --> 00:05:43,039
delighted to have them here they're very

125
00:05:46,550 --> 00:05:45,039
very important people to us and uh we're

126
00:05:49,110 --> 00:05:46,560
just thrilled to be a part of their team

127
00:05:50,950 --> 00:05:49,120
in making the vision uh for space

128
00:05:52,550 --> 00:05:50,960
exploration and the journey to mars

129
00:05:54,230 --> 00:05:52,560
happen so i look forward to your

130
00:05:55,430 --> 00:05:54,240
questions and again a very hearty

131
00:05:57,749 --> 00:05:55,440
welcome from

132
00:05:59,270 --> 00:05:57,759
on behalf of all of us at orbital atk to

133
00:06:01,270 --> 00:05:59,280
all of you to be for being here thank

134
00:06:03,270 --> 00:06:01,280
you

135
00:06:04,950 --> 00:06:03,280
thanks charlie i mean again it's it's

136
00:06:07,110 --> 00:06:04,960
awesome to be here it's it's great for

137
00:06:09,110 --> 00:06:07,120
you to be here to experience this event

138
00:06:10,710 --> 00:06:09,120

of what's occurring here and i think

139
00:06:12,230 --> 00:06:10,720
what's neat for you in the audience is

140
00:06:13,990 --> 00:06:12,240
you get a chance to

141
00:06:15,909 --> 00:06:14,000
experience what we kind of see all the

142
00:06:17,670 --> 00:06:15,919
time a lot of times our tests are done

143
00:06:19,830 --> 00:06:17,680
kind of behind closed doors or maybe

144
00:06:21,909 --> 00:06:19,840
done in a test chamber someplace they

145
00:06:23,830 --> 00:06:21,919
may be done in a wind tunnel someplace

146
00:06:25,270 --> 00:06:23,840
and you don't really get a chance to see

147
00:06:27,189 --> 00:06:25,280
what's happening you know you got to see

148
00:06:29,110 --> 00:06:27,199
this great video of the the rocket

149
00:06:31,110 --> 00:06:29,120
launch you're going to get to actually

150
00:06:32,629 --> 00:06:31,120
see one of those solid rocket boosters

151
00:06:34,469 --> 00:06:32,639
up close and personal except it's not

152
00:06:36,230 --> 00:06:34,479
going to be going away from you as it

153
00:06:37,749 --> 00:06:36,240
was shown in the video it's staying

154
00:06:39,270 --> 00:06:37,759
right here on the earth right next to

155
00:06:41,350 --> 00:06:39,280
you so you'll get a chance to really

156
00:06:44,550 --> 00:06:41,360
experience in all its glory and so

157
00:06:46,309 --> 00:06:44,560
really savor it i mean take it all in

158
00:06:48,790 --> 00:06:46,319
do it virtually but also do it

159
00:06:50,710 --> 00:06:48,800
physically you know feel the vibration

160
00:06:52,870 --> 00:06:50,720
come through your feet feel the pressure

161
00:06:54,950 --> 00:06:52,880
wave hit you feel the thermal shock come

162
00:06:56,550 --> 00:06:54,960
back from the rocket experience that

163
00:06:58,629 --> 00:06:56,560

feel it and then you are part of the

164
00:07:01,110 --> 00:06:58,639
space program you can do it by being

165
00:07:02,710 --> 00:07:01,120
here you will be a part of it it won't

166
00:07:05,029 --> 00:07:02,720
be just something that you've seen on

167
00:07:07,189 --> 00:07:05,039
your screen you are here and you're

168
00:07:09,189 --> 00:07:07,199
hearing a very very critical test for us

169
00:07:11,029 --> 00:07:09,199
so what this test is is we've got the

170
00:07:13,749 --> 00:07:11,039
rocket out there now in the shake and

171
00:07:15,830 --> 00:07:13,759
bake oven right up to 95 degrees

172
00:07:17,110 --> 00:07:15,840
right it's it's nice and toasty and then

173
00:07:19,110 --> 00:07:17,120
we're going to pull the cover back

174
00:07:20,710 --> 00:07:19,120
tomorrow and it's got to stay above that

175
00:07:22,790 --> 00:07:20,720
that temperature around 90 degrees is

176
00:07:24,629 --> 00:07:22,800
what we want the mean bulk propellant

177
00:07:27,670 --> 00:07:24,639
temperature to be

178
00:07:30,309 --> 00:07:27,680
pbmt for those in the know and so what

179
00:07:31,990 --> 00:07:30,319
we want to do is is then fire the rocket

180
00:07:34,390 --> 00:07:32,000
and look at performance so we'll look at

181
00:07:35,589 --> 00:07:34,400
ballistic performance other things

182
00:07:37,189 --> 00:07:35,599
there's also tremendous amount of

183
00:07:39,189 --> 00:07:37,199
instrumentation on this we'll do a full

184
00:07:41,029 --> 00:07:39,199
gimbal profile to look at how the nozzle

185
00:07:42,790 --> 00:07:41,039
operates we'll understand how the

186
00:07:44,309 --> 00:07:42,800
insulation performs we'll understand

187
00:07:45,909 --> 00:07:44,319
what the ballistics are or how much

188
00:07:48,070 --> 00:07:45,919

thrust comes out of the rocket all those

189
00:07:49,510 --> 00:07:48,080
things will be a key piece and all this

190
00:07:51,110 --> 00:07:49,520
data goes into what we call a

191
00:07:53,589 --> 00:07:51,120
qualification motor so we've done our

192
00:07:55,270 --> 00:07:53,599
development firings those are behind us

193
00:07:57,990 --> 00:07:55,280
now we're ready to capture data that

194
00:07:59,589 --> 00:07:58,000
will actually go into the calculations

195
00:08:01,589 --> 00:07:59,599
that will actually be on the launch

196
00:08:03,589 --> 00:08:01,599
vehicle when it's time to go fly

197
00:08:05,350 --> 00:08:03,599
um so then i think i just opened a

198
00:08:07,189 --> 00:08:05,360
couple more few more remarks and then

199
00:08:08,790 --> 00:08:07,199
i'll open it up for questions

200
00:08:11,110 --> 00:08:08,800
you know i think

201
00:08:13,749 --> 00:08:11,120
we talk about the journey to mars and

202
00:08:15,589 --> 00:08:13,759
in in in my thinking the stress really

203
00:08:16,550 --> 00:08:15,599
needs to be on that first word its

204
00:08:18,790 --> 00:08:16,560
journey

205
00:08:21,110 --> 00:08:18,800
um we often get hung up on the

206
00:08:23,189 --> 00:08:21,120
destination but what we're doing here is

207
00:08:24,950 --> 00:08:23,199
really a journey it's going to take a

208
00:08:27,350 --> 00:08:24,960
long time for us to get ready to go do

209
00:08:30,469 --> 00:08:27,360
this you get a chance to see how much

210
00:08:32,469 --> 00:08:30,479
work goes in to what we do so you'll see

211
00:08:33,750 --> 00:08:32,479
that this qualification motor firing

212
00:08:35,110 --> 00:08:33,760
there'll be another one at cold

213
00:08:37,990 --> 00:08:35,120

temperatures to look at the other

214
00:08:40,469 --> 00:08:38,000
extreme we've got the sls hardware down

215
00:08:42,469 --> 00:08:40,479
at michoud starting to get assembled

216
00:08:43,909 --> 00:08:42,479
we've got a you know world-class welding

217
00:08:45,990 --> 00:08:43,919
facility we're getting checked out and

218
00:08:47,910 --> 00:08:46,000
getting it up to speed we've got the

219
00:08:50,470 --> 00:08:47,920
orion capsule for the uncrewed test

220
00:08:52,230 --> 00:08:50,480
flight in 2018 starting to come together

221
00:08:54,470 --> 00:08:52,240
those pieces are going down to new

222
00:08:56,470 --> 00:08:54,480
orleans to get welded together so this

223
00:08:58,310 --> 00:08:56,480
isn't like a sprint or an easy thing

224
00:09:01,509 --> 00:08:58,320
this takes a lot of work a lot of

225
00:09:03,430 --> 00:09:01,519
expertise and and i've had a tremendous

226
00:09:04,870 --> 00:09:03,440
day this morning i got a chance to go

227
00:09:06,470 --> 00:09:04,880
around with charlie we got to talk to

228
00:09:07,190 --> 00:09:06,480
the folks that actually do all the work

229
00:09:09,590 --> 00:09:07,200
here

230
00:09:11,829 --> 00:09:09,600
at the site and to see their excitement

231
00:09:14,070 --> 00:09:11,839
and and see where their hardware fits

232
00:09:15,829 --> 00:09:14,080
and to to actually your presence here

233
00:09:18,070 --> 00:09:15,839
makes a difference to them they see all

234
00:09:19,750 --> 00:09:18,080
these folks coming out making trips from

235
00:09:21,269 --> 00:09:19,760
from the east coast and from west coast

236
00:09:22,790 --> 00:09:21,279
to come here to participate in this

237
00:09:25,350 --> 00:09:22,800
activity this is really something

238
00:09:27,750 --> 00:09:25,360

special so again

239
00:09:30,150 --> 00:09:27,760
tremendous time savor it learn what you

240
00:09:31,990 --> 00:09:30,160
can ask us questions and then we we

241
00:09:33,430 --> 00:09:32,000
stand ready to try to answer any

242
00:09:35,190 --> 00:09:33,440
questions you've got so with that i'll

243
00:09:37,030 --> 00:09:35,200
we'll we'll actually interact and and

244
00:09:38,070 --> 00:09:37,040
see what you got for questions

245
00:09:39,350 --> 00:09:38,080
great for those in the room please

246
00:09:41,670 --> 00:09:39,360
remember to wave the microphone state

247
00:09:45,829 --> 00:09:41,680
your full name and where you're from uh

248
00:09:45,839 --> 00:09:50,150
hey

249
00:09:55,030 --> 00:09:52,710
hi my name is angelica kalika and

250
00:09:57,750 --> 00:09:55,040
i'm from boulder colorado i was just

251
00:10:00,150 --> 00:09:57,760
wondering what would a failed test look

252
00:10:04,150 --> 00:10:00,160
like would it just be a poof of smoke

253
00:10:05,750 --> 00:10:04,160
and some sad music in the background or

254
00:10:08,870 --> 00:10:05,760
and and then in contrast to that what

255
00:10:10,870 --> 00:10:08,880
would a very successful test look like

256
00:10:13,110 --> 00:10:10,880
well the

257
00:10:15,110 --> 00:10:13,120
great question um

258
00:10:16,710 --> 00:10:15,120
we have been working really hard so we

259
00:10:18,230 --> 00:10:16,720
would determine that you

260
00:10:19,829 --> 00:10:18,240
hopefully won't see what a failed test

261
00:10:22,389 --> 00:10:19,839
looks like

262
00:10:24,310 --> 00:10:22,399
we we've had things failure can range on

263
00:10:25,750 --> 00:10:24,320

a large scale

264
00:10:27,670 --> 00:10:25,760
you can have

265
00:10:30,470 --> 00:10:27,680
a delay in the test we had one of those

266
00:10:31,670 --> 00:10:30,480
several years ago

267
00:10:32,470 --> 00:10:31,680
we

268
00:10:34,310 --> 00:10:32,480
every

269
00:10:36,230 --> 00:10:34,320
machine that has been built has certain

270
00:10:38,069 --> 00:10:36,240
failure modes we work really really hard

271
00:10:39,190 --> 00:10:38,079
to keep our failure modes from cropping

272
00:10:41,750 --> 00:10:39,200
up

273
00:10:44,949 --> 00:10:41,760
what you're going to see in this test

274
00:10:48,230 --> 00:10:44,959
is a full duration test

275
00:10:50,069 --> 00:10:48,240
a little over two minutes and it will

276
00:10:52,949 --> 00:10:50,079
first start up with a

277
00:10:55,190 --> 00:10:52,959
burst and then as it stabilizes at full

278
00:10:56,949 --> 00:10:55,200
power will start to gimbal the nozzles

279
00:10:59,590 --> 00:10:56,959
and you'll see the plume actually move

280
00:11:01,190 --> 00:10:59,600
around and dance up and down

281
00:11:03,509 --> 00:11:01,200
for those of you who haven't seen a test

282
00:11:05,269 --> 00:11:03,519
out here before the other thing we do

283
00:11:07,509 --> 00:11:05,279
is the plume is pointed into the

284
00:11:10,630 --> 00:11:07,519
hillside so it actually will pick up

285
00:11:13,190 --> 00:11:10,640
dirt and that's intentional we want the

286
00:11:15,350 --> 00:11:13,200
soil to mix with the exhaust plume to

287
00:11:17,350 --> 00:11:15,360
neutralize it so that it's relatively

288
00:11:19,590 --> 00:11:17,360

harmless dust when it comes back to the

289
00:11:21,509 --> 00:11:19,600
surface of the earth

290
00:11:24,069 --> 00:11:21,519
the real

291
00:11:26,550 --> 00:11:24,079
success is in collecting the information

292
00:11:28,870 --> 00:11:26,560
that we need to go further to be able to

293
00:11:29,990 --> 00:11:28,880
put crew on on the vehicle in a few

294
00:11:31,430 --> 00:11:30,000
years

295
00:11:33,509 --> 00:11:31,440
that's where

296
00:11:35,110 --> 00:11:33,519
what we're looking for for success is in

297
00:11:37,750 --> 00:11:35,120
some 700

298
00:11:41,430 --> 00:11:37,760
channels of data that we're collecting

299
00:11:43,190 --> 00:11:41,440
pressures temperatures vibrations loads

300
00:11:44,870 --> 00:11:43,200
ability of the nozzle to move where we

301
00:11:46,069 --> 00:11:44,880
command it the avionics running

302
00:11:48,150 --> 00:11:46,079
correctly

303
00:11:50,150 --> 00:11:48,160
sometimes we

304
00:11:52,150 --> 00:11:50,160
intentionally put flaws in the motor to

305
00:11:54,310 --> 00:11:52,160
see how they'll perform we know some of

306
00:11:56,389 --> 00:11:54,320
our failure modes are things where the

307
00:11:57,670 --> 00:11:56,399
insulation burns through too early we

308
00:11:59,190 --> 00:11:57,680
don't want that to happen sometimes

309
00:12:01,030 --> 00:11:59,200
we'll put it flaws intentionally into

310
00:12:03,110 --> 00:12:01,040
the insulation we're not doing that this

311
00:12:04,790 --> 00:12:03,120
time but over the life of the the system

312
00:12:07,509 --> 00:12:04,800
we will intentionally flaw the motor to

313
00:12:09,110 --> 00:12:07,519

make sure it's robust and

314
00:12:11,190 --> 00:12:09,120
we're protected from those kinds of

315
00:12:13,190 --> 00:12:11,200
failure modes that you're alluding to so

316
00:12:15,430 --> 00:12:13,200
for us a successful test tomorrow's full

317
00:12:16,310 --> 00:12:15,440
full duration getting the the nozzles to

318
00:12:17,910 --> 00:12:16,320
swing

319
00:12:19,509 --> 00:12:17,920
and then collecting all that data to

320
00:12:22,790 --> 00:12:19,519
make sure we've got the design right for

321
00:12:26,550 --> 00:12:25,030
my name is john hansel i'm an author and

322
00:12:28,470 --> 00:12:26,560
the diving safety officer for the new

323
00:12:31,350 --> 00:12:28,480
england aquarium up in boston or over in

324
00:12:32,870 --> 00:12:31,360
boston uh my question to you is

325
00:12:35,269 --> 00:12:32,880
what difference is or was there a key

326
00:12:37,190 --> 00:12:35,279
difference that happened between the dm

327
00:12:40,069 --> 00:12:37,200
development motor stuff to this

328
00:12:41,750 --> 00:12:40,079
particular static fire is there one big

329
00:12:45,670 --> 00:12:41,760
thing that you guys you know picked up

330
00:12:49,430 --> 00:12:47,750
well so the the whole sequence is

331
00:12:51,350 --> 00:12:49,440
development means you incrementally

332
00:12:53,590 --> 00:12:51,360
change things to get to a final

333
00:12:55,509 --> 00:12:53,600
configuration that you qualify

334
00:12:57,509 --> 00:12:55,519
and then that qualification proves that

335
00:12:59,910 --> 00:12:57,519
you've repeatedly set yourself up for

336
00:13:02,389 --> 00:12:59,920
what crew will fly on and yes we did

337
00:13:05,110 --> 00:13:02,399
incrementally do things uh with this

338
00:13:07,269 --> 00:13:05,120

design we've got new avionics in it from

339
00:13:09,030 --> 00:13:07,279
what used to be on shuttle they are far

340
00:13:10,069 --> 00:13:09,040
more capable than what we had at that

341
00:13:13,190 --> 00:13:10,079
program

342
00:13:14,870 --> 00:13:13,200
they will operate more reliably

343
00:13:16,629 --> 00:13:14,880
and more capably

344
00:13:18,949 --> 00:13:16,639
we also changed what's known as the

345
00:13:21,110 --> 00:13:18,959
insulator the material that sits between

346
00:13:23,030 --> 00:13:21,120
the wall of the motor

347
00:13:24,949 --> 00:13:23,040
casing and the propellant because the

348
00:13:26,150 --> 00:13:24,959
propellants burn at about 5000 degrees

349
00:13:28,230 --> 00:13:26,160
you have to have an insulator in there

350
00:13:30,870 --> 00:13:28,240
and it's a special

351
00:13:34,710 --> 00:13:30,880
material from a rubber base that

352
00:13:37,190 --> 00:13:34,720
ablates and protects the system of the

353
00:13:39,269 --> 00:13:37,200
case from being compromised by the heat

354
00:13:41,030 --> 00:13:39,279
we actually came up with an insulator

355
00:13:42,870 --> 00:13:41,040
that pulled a couple thousand pounds of

356
00:13:44,629 --> 00:13:42,880
weight out of the total system

357
00:13:46,470 --> 00:13:44,639
and we had to prove that capability

358
00:13:49,030 --> 00:13:46,480
through the dm motors we ran into a

359
00:13:51,430 --> 00:13:49,040
challenge with how we process that

360
00:13:53,590 --> 00:13:51,440
insulator that we finally

361
00:13:55,350 --> 00:13:53,600
knock on wood we think we have resolved

362
00:13:57,750 --> 00:13:55,360
i'll let the next panel probably you'll

363
00:14:00,069 --> 00:13:57,760

have some of the program managers more

364
00:14:01,829 --> 00:14:00,079
deeply go into that with you if you like

365
00:14:03,750 --> 00:14:01,839
but to give you an idea we've we've

366
00:14:06,710 --> 00:14:03,760
improved on a lot of the heritage

367
00:14:08,949 --> 00:14:06,720
systems to add new um capabilities that

368
00:14:10,550 --> 00:14:08,959
we know we could fold in technologically

369
00:14:12,150 --> 00:14:10,560
so we get better performance out of this

370
00:14:13,750 --> 00:14:12,160
the biggest change though is we added a

371
00:14:16,629 --> 00:14:13,760
segment which is 25 percent more

372
00:14:18,150 --> 00:14:16,639
propellant for way more performance

373
00:14:20,230 --> 00:14:18,160
the typical shuttle booster would give

374
00:14:21,590 --> 00:14:20,240
you about three million pounds this is a

375
00:14:23,189 --> 00:14:21,600
little over three and a half million

376
00:14:24,710 --> 00:14:23,199
pounds of thrust

377
00:14:26,710 --> 00:14:24,720
so it's going to be the kind of

378
00:14:28,550 --> 00:14:26,720
performance we need to get

379
00:14:31,829 --> 00:14:28,560
our exploration journey to mars off the

380
00:14:37,030 --> 00:14:34,550
my name is justin davenport and i'm from

381
00:14:40,230 --> 00:14:37,040
south jordan utah i had a question how

382
00:14:42,790 --> 00:14:40,240
many qualification

383
00:14:44,870 --> 00:14:42,800
firings are you going to need before sls

384
00:14:45,590 --> 00:14:44,880
flies and how many do you think you'll

385
00:14:48,150 --> 00:14:45,600
do

386
00:14:49,030 --> 00:14:48,160
per year afterward

387
00:14:50,710 --> 00:14:49,040
so

388
00:14:52,069 --> 00:14:50,720

we give

389
00:14:53,670 --> 00:14:52,079
we'll do two

390
00:14:57,030 --> 00:14:53,680
qualifications there'll be another one

391
00:14:59,509 --> 00:14:57,040
next year a little in the late spring

392
00:15:01,509 --> 00:14:59,519
and then we are still determining what

393
00:15:04,629 --> 00:15:01,519
the tempo will be

394
00:15:07,189 --> 00:15:04,639
for ground tests in the long run um and

395
00:15:09,670 --> 00:15:07,199
that has to do with as we ramp up and

396
00:15:12,470 --> 00:15:09,680
and bill can talk to this the the pace

397
00:15:15,110 --> 00:15:12,480
that we fly our exploration missions we

398
00:15:16,790 --> 00:15:15,120
will fold in testing as required along

399
00:15:18,550 --> 00:15:16,800
the way you might want to speak to that

400
00:15:20,710 --> 00:15:18,560
again i think we've kind of learned from

401
00:15:22,870 --> 00:15:20,720
our past experience that it's uh there's

402
00:15:24,790 --> 00:15:22,880
some advantages to actually periodically

403
00:15:26,710 --> 00:15:24,800
testing another

404
00:15:28,470 --> 00:15:26,720
doing another test firing even at a full

405
00:15:30,310 --> 00:15:28,480
scale level because certain things

406
00:15:32,550 --> 00:15:30,320
change if certain products may not be

407
00:15:34,790 --> 00:15:32,560
available anymore we you know we've

408
00:15:37,030 --> 00:15:34,800
taken asbestos out of the rocket we may

409
00:15:38,550 --> 00:15:37,040
change some material properties those

410
00:15:40,230 --> 00:15:38,560
things will occur over time and when

411
00:15:41,829 --> 00:15:40,240
enough of those changes are there i

412
00:15:43,829 --> 00:15:41,839
think you would like to go back and do

413
00:15:45,590 --> 00:15:43,839

another big full-scale test to go do

414
00:15:47,189 --> 00:15:45,600
that we haven't made a formal plan to do

415
00:15:48,629 --> 00:15:47,199
that but we'll figure out the right pace

416
00:15:50,230 --> 00:15:48,639
and what we're trying to get with the

417
00:15:52,550 --> 00:15:50,240
sls rocket is we're trying to fly

418
00:15:54,790 --> 00:15:52,560
roughly once a year after we get to the

419
00:15:56,949 --> 00:15:54,800
crude flights in the 2020s is is our

420
00:15:58,870 --> 00:15:56,959
overall kind of flight schedule so

421
00:16:00,470 --> 00:15:58,880
um and we're you know we're struggling

422
00:16:01,829 --> 00:16:00,480
to see if there's ways to do more but

423
00:16:03,350 --> 00:16:01,839
but that's kind of where we're thinking

424
00:16:04,949 --> 00:16:03,360
and we're trying to build systems along

425
00:16:08,310 --> 00:16:04,959
those lines to support roughly that kind

426
00:16:10,310 --> 00:16:08,320
of flight rate

427
00:16:11,110 --> 00:16:10,320
i'm zach cromer from st louis missouri

428
00:16:13,670 --> 00:16:11,120
and

429
00:16:16,389 --> 00:16:13,680
i was wondering um with the tests for

430
00:16:18,710 --> 00:16:16,399
the aries uh qualification motors are

431
00:16:20,470 --> 00:16:18,720
there any major changes that differ from

432
00:16:21,430 --> 00:16:20,480
the five segments from the constellation

433
00:16:26,150 --> 00:16:21,440
program

434
00:16:29,350 --> 00:16:26,160
and will you be

435
00:16:32,069 --> 00:16:29,360
using any data from the previous tests

436
00:16:34,470 --> 00:16:32,079
to advance in the sls

437
00:16:35,350 --> 00:16:34,480
there were some design changes this is

438
00:16:37,189 --> 00:16:35,360

now

439
00:16:39,509 --> 00:16:37,199
a side-mounted strap-on booster as

440
00:16:41,590 --> 00:16:39,519
opposed to an in-line first stage boost

441
00:16:43,910 --> 00:16:41,600
so a lot of it was structural the way

442
00:16:47,110 --> 00:16:43,920
the vehicle attaches

443
00:16:50,230 --> 00:16:47,120
this has attachment points to the core

444
00:16:51,430 --> 00:16:50,240
that didn't exist on the aries design

445
00:16:53,110 --> 00:16:51,440
there were some

446
00:16:54,949 --> 00:16:53,120
other changes that i'll let the next

447
00:16:56,069 --> 00:16:54,959
panel get into in more detail because

448
00:16:57,990 --> 00:16:56,079
they'll have

449
00:17:00,790 --> 00:16:58,000
ability to dive deep with you on that

450
00:17:03,829 --> 00:17:00,800
but fundamentally by moving from

451
00:17:05,350 --> 00:17:03,839
a design that had the booster as a core

452
00:17:07,829 --> 00:17:05,360
with the rest of the structure standing

453
00:17:09,189 --> 00:17:07,839
on top of it to one that attaches to the

454
00:17:11,110 --> 00:17:09,199
side

455
00:17:12,549 --> 00:17:11,120
we had to make some changes based on

456
00:17:19,510 --> 00:17:12,559
that

457
00:17:24,150 --> 00:17:22,309
and yes sorry we will we will use not

458
00:17:25,909 --> 00:17:24,160
only the data from that program but all

459
00:17:28,150 --> 00:17:25,919
the way back to the beginning of shuttle

460
00:17:30,230 --> 00:17:28,160
one of the things that's important about

461
00:17:32,070 --> 00:17:30,240
programs like this is

462
00:17:35,270 --> 00:17:32,080
the data you have is really precious

463
00:17:37,909 --> 00:17:35,280

because it it instructs you as to

464
00:17:40,549 --> 00:17:37,919
how things are expected to behave in the

465
00:17:43,029 --> 00:17:40,559
future and it also gives you uh a ground

466
00:17:45,190 --> 00:17:43,039
truth as to why you did things to begin

467
00:17:47,350 --> 00:17:45,200
with so that when you encounter a

468
00:17:51,029 --> 00:17:47,360
problem like bill was alluding to with

469
00:17:53,510 --> 00:17:51,039
future tests for obsolete materials

470
00:17:55,029 --> 00:17:53,520
process changes tooling changes design

471
00:17:56,630 --> 00:17:55,039
change needs

472
00:17:58,470 --> 00:17:56,640
we'll know where we came from we'll know

473
00:18:00,310 --> 00:17:58,480
what the starting point was why we did

474
00:18:02,230 --> 00:18:00,320
it the way we did it and what we can

475
00:18:03,990 --> 00:18:02,240
afford to change without messing up the

476
00:18:07,909 --> 00:18:04,000
recipe right that's the important piece

477
00:18:08,710 --> 00:18:07,919
of having all that data from the past

478
00:18:10,549 --> 00:18:08,720
hi

479
00:18:12,310 --> 00:18:10,559
my name is emily bondrake i'm a world

480
00:18:14,310 --> 00:18:12,320
history teacher at morris county school

481
00:18:16,789 --> 00:18:14,320
of technology in new jersey so instead

482
00:18:19,590 --> 00:18:16,799
of a his science question more of a

483
00:18:21,590 --> 00:18:19,600
history question um we also learn about

484
00:18:24,230 --> 00:18:21,600
how technology affects the global

485
00:18:26,549 --> 00:18:24,240
political status of the world how like

486
00:18:29,270 --> 00:18:26,559
um the telegraph for example led to the

487
00:18:30,870 --> 00:18:29,280
age of imperialism so do you ever look

488
00:18:33,190 --> 00:18:30,880

at sort of the big geopolitical picture

489
00:18:36,230 --> 00:18:33,200
like how this technology could

490
00:18:37,990 --> 00:18:36,240
um evolve into different global politics

491
00:18:39,430 --> 00:18:38,000
whether it's imperialism of mars or how

492
00:18:42,470 --> 00:18:39,440
different countries interact with this

493
00:18:47,110 --> 00:18:44,150
i don't know this is

494
00:18:51,669 --> 00:18:47,120
so so so charlie looks over history

495
00:18:55,590 --> 00:18:53,669
learning about imperialism of say africa

496
00:18:57,270 --> 00:18:55,600
so this is a great question right this

497
00:19:00,070 --> 00:18:57,280
is why i'm an engineer right

498
00:19:02,470 --> 00:19:00,080
i i couldn't pass either english public

499
00:19:04,950 --> 00:19:02,480
speaking or history

500
00:19:05,909 --> 00:19:04,960
so so so we'll tell you kind of what

501
00:19:08,789 --> 00:19:05,919
we're doing

502
00:19:10,789 --> 00:19:08,799
what's cool about what we do is

503
00:19:12,390 --> 00:19:10,799
is our business really requires all of

504
00:19:15,510 --> 00:19:12,400
us to work together as a team so there

505
00:19:17,350 --> 00:19:15,520
is an unbelievable sense of teamwork in

506
00:19:18,710 --> 00:19:17,360
what we do from from all the folks that

507
00:19:20,390 --> 00:19:18,720
are working here on the rocket and get

508
00:19:22,630 --> 00:19:20,400
things ready to go

509
00:19:24,549 --> 00:19:22,640
not one single individual can do these

510
00:19:26,710 --> 00:19:24,559
activities i think it's even the same

511
00:19:28,310 --> 00:19:26,720
way internationally you know we work a

512
00:19:30,310 --> 00:19:28,320
lot on the space station with our

513
00:19:32,310 --> 00:19:30,320

international partners there's 15 16

514
00:19:34,150 --> 00:19:32,320
countries participating

515
00:19:35,750 --> 00:19:34,160
on the international space station and

516
00:19:37,909 --> 00:19:35,760
what's interesting is the folks that we

517
00:19:40,950 --> 00:19:37,919
work with all really share that same

518
00:19:42,710 --> 00:19:40,960
passion for exploration and space and

519
00:19:44,789 --> 00:19:42,720
pushing human presence into the solar

520
00:19:46,870 --> 00:19:44,799
system so there's something that that

521
00:19:48,070 --> 00:19:46,880
unites us in a way

522
00:19:51,110 --> 00:19:48,080
that

523
00:19:53,830 --> 00:19:51,120
maybe transcends culture and transcends

524
00:19:55,669 --> 00:19:53,840
some of our individual pieces because

525
00:19:58,230 --> 00:19:55,679
that challenge that we're working on

526
00:20:00,390 --> 00:19:58,240
makes you kind of put aside those

527
00:20:02,870 --> 00:20:00,400
differences and find the areas where you

528
00:20:05,190 --> 00:20:02,880
can work together and build together as

529
00:20:07,590 --> 00:20:05,200
a team and how can you contribute so so

530
00:20:09,669 --> 00:20:07,600
to me there this is the history lesson

531
00:20:12,710 --> 00:20:09,679
may be that these challenges that

532
00:20:15,909 --> 00:20:12,720
require us as a globe to come together

533
00:20:18,549 --> 00:20:15,919
to go work together may drive

534
00:20:20,230 --> 00:20:18,559
cooperation to a level that's totally

535
00:20:21,830 --> 00:20:20,240
different you know today on space

536
00:20:24,149 --> 00:20:21,840
station we're dependent upon the

537
00:20:26,549 --> 00:20:24,159
russians for crew transportation

538
00:20:27,990 --> 00:20:26,559

some people see that as a bad thing i

539
00:20:30,710 --> 00:20:28,000
don't necessarily see that as a bad

540
00:20:32,470 --> 00:20:30,720
thing this is my teammate we're in the

541
00:20:34,630 --> 00:20:32,480
process of retooling rebuilding our

542
00:20:36,230 --> 00:20:34,640
rockets getting ready to go fly so we're

543
00:20:37,990 --> 00:20:36,240
going to let them take transportation

544
00:20:40,230 --> 00:20:38,000
for a while and then we'll come back and

545
00:20:41,669 --> 00:20:40,240
we'll do it later we want to end sole

546
00:20:43,750 --> 00:20:41,679
reliance so we can have a redundant

547
00:20:45,350 --> 00:20:43,760
system in case something doesn't work

548
00:20:47,510 --> 00:20:45,360
right so we want to get there quickly

549
00:20:49,430 --> 00:20:47,520
but we can hand off capability for them

550
00:20:51,750 --> 00:20:49,440
for a period of time likewise they need

551
00:20:53,830 --> 00:20:51,760
us on space station for power they get

552
00:20:55,590 --> 00:20:53,840
commands through the united states so we

553
00:20:57,510 --> 00:20:55,600
are very mutually dependent upon each

554
00:20:59,669 --> 00:20:57,520
other so that's the best of of a

555
00:21:01,110 --> 00:20:59,679
cooperation so i think what we can learn

556
00:21:03,430 --> 00:21:01,120
out of space flight and learn what we're

557
00:21:05,110 --> 00:21:03,440
doing if you think a single nation is

558
00:21:06,870 --> 00:21:05,120
going to go to mars i don't think that's

559
00:21:09,430 --> 00:21:06,880
going to happen we're going to go to

560
00:21:11,190 --> 00:21:09,440
mars as some international cooperation

561
00:21:13,029 --> 00:21:11,200
group we've already got the europeans

562
00:21:15,350 --> 00:21:13,039
participating with the service module on

563
00:21:16,870 --> 00:21:15,360

the orion capsule so we're already

564
00:21:18,230 --> 00:21:16,880
starting to reach out internationally so

565
00:21:20,310 --> 00:21:18,240
i think the thing that history will

566
00:21:22,950 --> 00:21:20,320
teach us is how these big challenges

567
00:21:24,950 --> 00:21:22,960
forced us to work together as a globe

568
00:21:27,990 --> 00:21:24,960
and move forward and then maybe that's

569
00:21:29,909 --> 00:21:28,000
the lesson i liked your story your story

570
00:21:31,830 --> 00:21:29,919
earlier today about butch coming home

571
00:21:33,830 --> 00:21:31,840
and home was really not in the u.s right

572
00:21:34,710 --> 00:21:33,840
and one day we might think about home

573
00:21:37,510 --> 00:21:34,720
being

574
00:21:39,830 --> 00:21:37,520
the you know the cis lunar space that we

575
00:21:41,750 --> 00:21:39,840
live in yeah yeah what we talked about

576
00:21:43,270 --> 00:21:41,760
today is tomorrow night right this is

577
00:21:45,190 --> 00:21:43,280
what's exciting right i have a team now

578
00:21:47,029 --> 00:21:45,200
in kazakhstan ready for our crews to

579
00:21:48,630 --> 00:21:47,039
come home and and what charlie and i

580
00:21:51,110 --> 00:21:48,640
were talking about was when the crews

581
00:21:52,789 --> 00:21:51,120
land in kazakhstan they say they're home

582
00:21:54,470 --> 00:21:52,799
and that's really not home right home is

583
00:21:56,230 --> 00:21:54,480
here in the u.s but that is their new

584
00:21:57,669 --> 00:21:56,240
home the surface of the earth is home

585
00:21:58,470 --> 00:21:57,679
because they've been on station for six

586
00:22:00,549 --> 00:21:58,480
months

587
00:22:02,870 --> 00:22:00,559
so what we like what we're excited about

588
00:22:04,230 --> 00:22:02,880

is some day right when we're going to

589
00:22:06,870 --> 00:22:04,240
mars and we have

590
00:22:09,830 --> 00:22:06,880
permanent presence on mars you come back

591
00:22:11,750 --> 00:22:09,840
to the moon earth system that's your new

592
00:22:13,510 --> 00:22:11,760
home so now you're in orbit around the

593
00:22:15,270 --> 00:22:13,520
moon and you're going to call that home

594
00:22:16,390 --> 00:22:15,280
that's when we've really pushed the

595
00:22:21,830 --> 00:22:16,400
human

596
00:22:25,990 --> 00:22:23,990
hi i am jeff bohn from the san francisco

597
00:22:27,430 --> 00:22:26,000
bay area i'm a google glass explorer and

598
00:22:29,350 --> 00:22:27,440
it's nice that you use that word because

599
00:22:30,950 --> 00:22:29,360
that's what we do we explore so

600
00:22:32,310 --> 00:22:30,960
thank you for presenting this

601
00:22:33,590 --> 00:22:32,320
information answer a lot of questions i

602
00:22:35,270 --> 00:22:33,600
had as a kid and give us a lot of

603
00:22:36,710 --> 00:22:35,280
information work with

604
00:22:38,549 --> 00:22:36,720
i want to ask you about that thrust

605
00:22:40,230 --> 00:22:38,559
measurement obviously the thrust is

606
00:22:41,830 --> 00:22:40,240
being generated so at the opposite end

607
00:22:43,190 --> 00:22:41,840
you have like some gauges that are

608
00:22:44,549 --> 00:22:43,200
picking that information up and i want

609
00:22:46,230 --> 00:22:44,559
to ask you specifically once you start

610
00:22:47,909 --> 00:22:46,240
to vector that rocket you know two three

611
00:22:49,669 --> 00:22:47,919
four up to nine degrees

612
00:22:50,950 --> 00:22:49,679
can you also read exactly that thrust

613
00:22:52,789 --> 00:22:50,960

measurement and three axis to kind of

614
00:22:54,870 --> 00:22:52,799
make sure you understand that data fully

615
00:22:56,230 --> 00:22:54,880
yeah we have a thrust block on the front

616
00:22:57,430 --> 00:22:56,240
end of the engine that is highly

617
00:23:00,710 --> 00:22:57,440
instrumented

618
00:23:02,950 --> 00:23:00,720
and um the uh the booster is in it is is

619
00:23:04,149 --> 00:23:02,960
a long device and you'll notice that

620
00:23:05,990 --> 00:23:04,159
there are a couple of what we call

621
00:23:07,270 --> 00:23:06,000
mid-span supports

622
00:23:09,830 --> 00:23:07,280
that hold it

623
00:23:11,830 --> 00:23:09,840
in a position that we

624
00:23:13,990 --> 00:23:11,840
want it to be in to

625
00:23:15,510 --> 00:23:14,000
represent flight conditions to the

626
00:23:18,070 --> 00:23:15,520
degree we can it's normally going to be

627
00:23:20,070 --> 00:23:18,080
vertical can't test it that way so we

628
00:23:22,789 --> 00:23:20,080
make some compromises

629
00:23:25,110 --> 00:23:22,799
but once the motor ignites the pressure

630
00:23:27,669 --> 00:23:25,120
inside the case increases

631
00:23:29,750 --> 00:23:27,679
up to a thousand or higher pounds per

632
00:23:31,430 --> 00:23:29,760
square inch and so that pressure

633
00:23:33,909 --> 00:23:31,440
actually stiffens the case and it'll

634
00:23:36,470 --> 00:23:33,919
actually rise to more horizontal lift

635
00:23:38,549 --> 00:23:36,480
itself off of those supports and so now

636
00:23:39,909 --> 00:23:38,559
we get a as true an indication of the

637
00:23:41,590 --> 00:23:39,919
kind of forces that are being

638
00:23:42,470 --> 00:23:41,600

transmitted into the thrust block as we

639
00:23:45,029 --> 00:23:42,480
can

640
00:23:48,310 --> 00:23:45,039
uh when we vector it we do a co see

641
00:23:49,750 --> 00:23:48,320
those movements in the traces so we can

642
00:23:51,269 --> 00:23:49,760
you know through analysis we can

643
00:23:52,870 --> 00:23:51,279
determine what is actually going on

644
00:23:54,470 --> 00:23:52,880
there and again the next panel you're

645
00:23:56,470 --> 00:23:54,480
going to have a real expert or two that

646
00:23:57,830 --> 00:23:56,480
can dive into how that was all put

647
00:24:03,110 --> 00:23:57,840
together so

648
00:24:07,510 --> 00:24:05,350
hi i'm i'm john bills i'm a producer for

649
00:24:09,669 --> 00:24:07,520
sci-fi cantina on youtube and based in

650
00:24:11,350 --> 00:24:09,679
utah county my question is what do you

651
00:24:12,710 --> 00:24:11,360
do with the test booster after you've

652
00:24:14,870 --> 00:24:12,720
fired it it'll just be sitting there

653
00:24:16,549 --> 00:24:14,880
what are your plans once it's fired off

654
00:24:18,549 --> 00:24:16,559
and your test is over

655
00:24:21,510 --> 00:24:18,559
yeah that's a good question so the most

656
00:24:24,549 --> 00:24:21,520
of the hardware is reusable

657
00:24:27,909 --> 00:24:24,559
and what you'll find is

658
00:24:30,390 --> 00:24:27,919
the cases that make up this booster have

659
00:24:31,350 --> 00:24:30,400
been around and recovered and reused

660
00:24:33,669 --> 00:24:31,360
since

661
00:24:35,430 --> 00:24:33,679
the program began on shuttle

662
00:24:37,510 --> 00:24:35,440
several of them on the last test i had

663
00:24:38,950 --> 00:24:37,520

flown as an astronaut on a few of my

664
00:24:40,950 --> 00:24:38,960
shuttle flights matter of fact we still

665
00:24:43,990 --> 00:24:40,960
have the the hardware from the first

666
00:24:46,390 --> 00:24:44,000
space shuttle mission so it's it's made

667
00:24:48,470 --> 00:24:46,400
made its its worth in the program by

668
00:24:50,310 --> 00:24:48,480
being able to reuse it

669
00:24:53,190 --> 00:24:50,320
we can't reuse the majority of the

670
00:24:55,430 --> 00:24:53,200
nozzle because it is ablative and it

671
00:24:57,430 --> 00:24:55,440
it has to be rebuilt the metal hardware

672
00:24:59,590 --> 00:24:57,440
that makes up the nozzle we can recover

673
00:25:01,510 --> 00:24:59,600
and reuse hydraulic systems the

674
00:25:03,269 --> 00:25:01,520
electronics the avionics a lot of that

675
00:25:04,710 --> 00:25:03,279
stuff will be reused

676
00:25:06,390 --> 00:25:04,720
what we will do immediately after the

677
00:25:08,630 --> 00:25:06,400
test of course is we will start

678
00:25:10,789 --> 00:25:08,640
dissecting what we see in it

679
00:25:13,029 --> 00:25:10,799
to make sure we measure things like the

680
00:25:14,470 --> 00:25:13,039
depth of the the insulator material

681
00:25:16,789 --> 00:25:14,480
remaining we know how far it ablated

682
00:25:18,710 --> 00:25:16,799
back and it performed correctly and and

683
00:25:20,549 --> 00:25:18,720
a lot of things of that nature that we

684
00:25:23,510 --> 00:25:20,559
want to dissect at first and completely

685
00:25:28,070 --> 00:25:23,520
understand how it performed before we go

686
00:25:29,990 --> 00:25:28,080
completely recycling it and reusing it

687
00:25:31,750 --> 00:25:30,000
a lot of people are wondering how close

688
00:25:36,870 --> 00:25:31,760

do you think we are to finding life on

689
00:25:41,029 --> 00:25:38,630
man i don't know

690
00:25:44,470 --> 00:25:42,549
i don't know it's interesting we you

691
00:25:46,710 --> 00:25:44,480
know we have the rovers on mars and

692
00:25:48,149 --> 00:25:46,720
they've been looking for water and and

693
00:25:50,789 --> 00:25:48,159
they're you know they're

694
00:25:52,549 --> 00:25:50,799
looking for life

695
00:25:53,830 --> 00:25:52,559
it's interesting question it's

696
00:25:55,269 --> 00:25:53,840
interesting it's more of a science

697
00:25:56,789 --> 00:25:55,279
question it's interesting because on

698
00:25:58,470 --> 00:25:56,799
human spaceflight i'm kind of

699
00:26:00,950 --> 00:25:58,480
specialized so i'm looking at the other

700
00:26:03,110 --> 00:26:00,960
way how do i move life into the solar

701
00:26:05,110 --> 00:26:03,120
system and then we'll know there's life

702
00:26:06,950 --> 00:26:05,120
on mars when i put crews on the surface

703
00:26:09,510 --> 00:26:06,960
of mars so then there won't be any

704
00:26:11,430 --> 00:26:09,520
debate so so i'm trying to actually

705
00:26:13,029 --> 00:26:11,440
drive to decor the equation the other

706
00:26:14,870 --> 00:26:13,039
way so instead of searching for life

707
00:26:21,110 --> 00:26:14,880
we're trying to put life into the solar

708
00:26:24,870 --> 00:26:23,430
so so we'll we'll see how that goes and

709
00:26:28,149 --> 00:26:24,880
but

710
00:26:30,470 --> 00:26:28,159
lot of interesting things the next rover

711
00:26:32,470 --> 00:26:30,480
will have an oxygen generation system on

712
00:26:33,669 --> 00:26:32,480
it and the idea there is to actually

713
00:26:35,190 --> 00:26:33,679

pull oxygen out of the martian

714
00:26:37,830 --> 00:26:35,200
atmosphere to see if we could use it for

715
00:26:39,990 --> 00:26:37,840
human presence the curiosity rover on

716
00:26:41,669 --> 00:26:40,000
mars today it has a radiation monitor so

717
00:26:44,230 --> 00:26:41,679
we're monitoring what the radiation is

718
00:26:45,669 --> 00:26:44,240
for humans to be on the planet

719
00:26:47,750 --> 00:26:45,679
mars is a good place to go because it

720
00:26:49,669 --> 00:26:47,760
has water for us it has temperatures

721
00:26:52,390 --> 00:26:49,679
that are tolerable almost to us as

722
00:26:54,230 --> 00:26:52,400
humans so it is it is probably the place

723
00:26:56,310 --> 00:26:54,240
that we can go that's farthest away that

724
00:26:59,029 --> 00:26:56,320
can sustain human life without us having

725
00:27:01,350 --> 00:26:59,039
to take everything with us to that to

726
00:27:03,750 --> 00:27:01,360
mars so in nasa when we talk about the

727
00:27:05,590 --> 00:27:03,760
journey we think of it as three regions

728
00:27:07,830 --> 00:27:05,600
right we we call it the earth reliant

729
00:27:09,430 --> 00:27:07,840
region that's where space station is so

730
00:27:11,269 --> 00:27:09,440
we're using space station to understand

731
00:27:13,430 --> 00:27:11,279
how the human body adapts to

732
00:27:15,269 --> 00:27:13,440
microgravity can a human stay in a

733
00:27:17,510 --> 00:27:15,279
microgravity condition for like a three

734
00:27:19,430 --> 00:27:17,520
year journey to mars we also need to

735
00:27:21,190 --> 00:27:19,440
build systems that can operate for an

736
00:27:23,750 --> 00:27:21,200
extended period of time and not break

737
00:27:25,510 --> 00:27:23,760
down and require maintenance so that's

738
00:27:27,110 --> 00:27:25,520

in the earth reliant region in the

739
00:27:29,029 --> 00:27:27,120
proving ground region which is where

740
00:27:30,870 --> 00:27:29,039
this hardware is going sls and orion

741
00:27:32,710 --> 00:27:30,880
will go first around the moon and desist

742
00:27:35,110 --> 00:27:32,720
lunar space that's a place where we

743
00:27:36,870 --> 00:27:35,120
learn the skills so in the you know

744
00:27:38,310 --> 00:27:36,880
earth reliant region we're only a couple

745
00:27:40,230 --> 00:27:38,320
hours away if something goes wrong on

746
00:27:42,389 --> 00:27:40,240
station you can be back in in a couple

747
00:27:44,470 --> 00:27:42,399
hours when you go to the region around

748
00:27:46,389 --> 00:27:44,480
the moon it's now probably five six days

749
00:27:49,190 --> 00:27:46,399
to get back so that's a great proving

750
00:27:50,789 --> 00:27:49,200
ground or a great place to learn skills

751
00:27:52,389 --> 00:27:50,799
to learn how to operate without the

752
00:27:54,549 --> 00:27:52,399
earth gravity to learn how you might

753
00:27:56,310 --> 00:27:54,559
maneuver a human spacecraft throughout

754
00:27:58,149 --> 00:27:56,320
the solar system that's the proving

755
00:28:00,549 --> 00:27:58,159
ground region then eventually we go to

756
00:28:02,470 --> 00:28:00,559
mars that's the earth independent region

757
00:28:04,470 --> 00:28:02,480
and by that point we need to be able to

758
00:28:06,710 --> 00:28:04,480
break the tie with the home planet carry

759
00:28:08,549 --> 00:28:06,720
our supplies with us to be there sustain

760
00:28:10,470 --> 00:28:08,559
ourselves in an environment totally

761
00:28:12,310 --> 00:28:10,480
different from the earth so we look at

762
00:28:14,549 --> 00:28:12,320
those three regions as part of this

763
00:28:16,310 --> 00:28:14,559

journey to mars that you've that you've

764
00:28:18,630 --> 00:28:16,320
discussed so what's kind of cool here in

765
00:28:20,549 --> 00:28:18,640
the next couple days like tomorrow we'll

766
00:28:22,470 --> 00:28:20,559
get to see two pieces of that we'll get

767
00:28:24,070 --> 00:28:22,480
to see the crew return from space

768
00:28:25,830 --> 00:28:24,080
station so that's the earth reliant

769
00:28:27,029 --> 00:28:25,840
piece and we'll get a chance to see the

770
00:28:28,630 --> 00:28:27,039
sls

771
00:28:31,350 --> 00:28:28,640
test firing tomorrow for the solid

772
00:28:33,269 --> 00:28:31,360
rocket motor and that's the beyond low

773
00:28:34,710 --> 00:28:33,279
earth orbit or to the the proving ground

774
00:28:36,549 --> 00:28:34,720
region the equipment we're building

775
00:28:38,630 --> 00:28:36,559
there so so it's a pretty exciting time

776
00:28:40,630 --> 00:28:38,640
for us in human space flight to see all

777
00:28:42,710 --> 00:28:40,640
this activity occurring in a fairly

778
00:28:43,909 --> 00:28:42,720
short period of time

779
00:28:45,990 --> 00:28:43,919
i can't help but think from your

780
00:28:47,590 --> 00:28:46,000
question about when i was uh when bill

781
00:28:48,950 --> 00:28:47,600
and i were in grade school we used to

782
00:28:50,470 --> 00:28:48,960
have encyclopedias now there's just

783
00:28:52,149 --> 00:28:50,480
wikipedias but

784
00:28:54,389 --> 00:28:52,159
i have a science i still have these

785
00:28:56,230 --> 00:28:54,399
science encyclopedias and you open up

786
00:28:57,909 --> 00:28:56,240
this chapter on planets and there was

787
00:28:58,870 --> 00:28:57,919
only suspicion that there might be

788
00:29:01,190 --> 00:28:58,880

planets

789
00:29:03,269 --> 00:29:01,200
in other places besides our own solar

790
00:29:05,269 --> 00:29:03,279
system and now we've found hundreds of

791
00:29:07,350 --> 00:29:05,279
them so who knows when we'll find that

792
00:29:08,950 --> 00:29:07,360
life but it you know that's part of

793
00:29:10,549 --> 00:29:08,960
of the search for knowledge that we're

794
00:29:12,070 --> 00:29:10,559
all about here and i loved his

795
00:29:14,310 --> 00:29:12,080
perspective and we're putting life out

796
00:29:16,230 --> 00:29:14,320
there first to go find what's there

797
00:29:20,389 --> 00:29:16,240
because we we we're going to be on that

798
00:29:24,230 --> 00:29:22,630
uh jason ryan for spaceflightinsider.com

799
00:29:26,470 --> 00:29:24,240
and i guess this one's for gerst can you

800
00:29:28,310 --> 00:29:26,480
detail the flow that we can expect in

801
00:29:30,310 --> 00:29:28,320
the lead up to exploration mission 1

802
00:29:32,549 --> 00:29:30,320
2018

803
00:29:34,549 --> 00:29:32,559
yeah sure and again you'll you'll see

804
00:29:36,870 --> 00:29:34,559
this this test firing tomorrow then

805
00:29:38,549 --> 00:29:36,880
you'll see another test firing of sls

806
00:29:40,149 --> 00:29:38,559
next year again looking at the lower

807
00:29:42,149 --> 00:29:40,159
temperature region to understand the

808
00:29:43,909 --> 00:29:42,159
characteristics of the rocket

809
00:29:45,190 --> 00:29:43,919
there'll be a lot of activity occurring

810
00:29:47,029 --> 00:29:45,200
at stennis

811
00:29:48,470 --> 00:29:47,039
fairly soon i think in april when the

812
00:29:50,149 --> 00:29:48,480
high pressure industrial water system

813
00:29:51,750 --> 00:29:50,159

gets back online we can start testing

814
00:29:54,149 --> 00:29:51,760
you'll see us

815
00:29:55,350 --> 00:29:54,159
using this shuttle main engines to be

816
00:29:57,669 --> 00:29:55,360
tested

817
00:29:59,269 --> 00:29:57,679
down at down at stennis purpose there is

818
00:30:01,029 --> 00:29:59,279
to really wring out the new controller

819
00:30:03,830 --> 00:30:01,039
there's a brand new controller for the

820
00:30:05,510 --> 00:30:03,840
solid uh for the liquid

821
00:30:07,269 --> 00:30:05,520
rocket motors the old shuttle main

822
00:30:08,789 --> 00:30:07,279
engines that that are down at stennis

823
00:30:11,110 --> 00:30:08,799
that works going on

824
00:30:13,190 --> 00:30:11,120
um we're down at we're ready to start

825
00:30:15,430 --> 00:30:13,200
putting together the tank down at math

826
00:30:18,149 --> 00:30:15,440
with the core tank we have some things

827
00:30:19,350 --> 00:30:18,159
with our vertical uh weld center that

828
00:30:21,029 --> 00:30:19,360
there's some alignment problems that

829
00:30:22,789 --> 00:30:21,039
we're working through the teams are

830
00:30:24,470 --> 00:30:22,799
doing that we'll do our first confidence

831
00:30:25,909 --> 00:30:24,480
weld to make sure that those go together

832
00:30:27,750 --> 00:30:25,919
we'll then test make sure that works

833
00:30:30,549 --> 00:30:27,760
right and we'll start manufacturing

834
00:30:32,230 --> 00:30:30,559
probably this summer for that core stage

835
00:30:33,750 --> 00:30:32,240
that's pretty exciting work that's

836
00:30:35,830 --> 00:30:33,760
happening there

837
00:30:38,710 --> 00:30:35,840
we have the orion capsule that will be

838
00:30:40,230 --> 00:30:38,720

used on that flight in 2018 the large

839
00:30:42,070 --> 00:30:40,240
aluminum panels are starting to get

840
00:30:43,750 --> 00:30:42,080
manufactured at various locations

841
00:30:45,110 --> 00:30:43,760
throughout the u.s

842
00:30:46,870 --> 00:30:45,120
those will come down to michoud they'll

843
00:30:49,430 --> 00:30:46,880
get welded into a capsule then that

844
00:30:51,510 --> 00:30:49,440
capsule gets transported to florida that

845
00:30:53,909 --> 00:30:51,520
probably shows up in january february of

846
00:30:56,310 --> 00:30:53,919
next year then that gets outfitted with

847
00:30:57,830 --> 00:30:56,320
all the avionics electronics all those

848
00:31:00,549 --> 00:30:57,840
systems a heat shield gets added

849
00:31:02,549 --> 00:31:00,559
underneath and then we're ready to go do

850
00:31:05,029 --> 00:31:02,559
the expiration mission one that's that's

851
00:31:06,470 --> 00:31:05,039
coming up in 2018 so what we're going to

852
00:31:09,430 --> 00:31:06,480
try to do is we're going to try to do a

853
00:31:11,509 --> 00:31:09,440
lot better job of of letting the the

854
00:31:12,950 --> 00:31:11,519
public see what we're doing through all

855
00:31:15,269 --> 00:31:12,960
these activities so we're going to try

856
00:31:16,950 --> 00:31:15,279
to invite you to more tests to see what

857
00:31:19,190 --> 00:31:16,960
we're doing because we haven't done this

858
00:31:20,789 --> 00:31:19,200
much development within nasa for a long

859
00:31:23,269 --> 00:31:20,799
time you know we probably have not done

860
00:31:25,430 --> 00:31:23,279
this much development since probably the

861
00:31:26,710 --> 00:31:25,440
apollo era and maybe a little bit when

862
00:31:29,509 --> 00:31:26,720
we were starting to build the shuttle

863
00:31:31,190 --> 00:31:29,519

back in the in the 70s so this is a

864
00:31:32,870 --> 00:31:31,200
unique chance for you to see and

865
00:31:34,710 --> 00:31:32,880
participate what it takes to get a

866
00:31:37,110 --> 00:31:34,720
rocket ready to go fly

867
00:31:38,789 --> 00:31:37,120
so you can understand how this you know

868
00:31:40,789 --> 00:31:38,799
developmental program works how the

869
00:31:42,630 --> 00:31:40,799
qualification program works and how this

870
00:31:44,549 --> 00:31:42,640
hardware all comes together to actually

871
00:31:46,230 --> 00:31:44,559
put a human on it that we're ready and

872
00:31:47,830 --> 00:31:46,240
we have enough confidence in this system

873
00:31:50,230 --> 00:31:47,840
that when the humans on there we're

874
00:31:52,230 --> 00:31:50,240
ready to go fly so it's a it's a pretty

875
00:31:53,830 --> 00:31:52,240
exciting time overall and then one other

876
00:31:56,149 --> 00:31:53,840
thing i would add too is

877
00:31:57,750 --> 00:31:56,159
sometimes we get we get we don't think

878
00:31:59,269 --> 00:31:57,760
of human space flight in the entire

879
00:32:01,430 --> 00:31:59,279
continuum you know we're doing

880
00:32:03,590 --> 00:32:01,440
commercial crew so so commercial crew

881
00:32:07,110 --> 00:32:03,600
transportation we've just awarded two

882
00:32:08,389 --> 00:32:07,120
contracts to to boeing and spacex um you

883
00:32:10,389 --> 00:32:08,399
know they're going to be flying probably

884
00:32:12,470 --> 00:32:10,399
in 2017 so probably the first crude

885
00:32:14,630 --> 00:32:12,480
flights will be to low earth orbit to

886
00:32:17,190 --> 00:32:14,640
space station by by some commercial

887
00:32:19,269 --> 00:32:17,200
companies and i see this really as all

888
00:32:21,269 --> 00:32:19,279

of human space flight so it's not an

889
00:32:23,269 --> 00:32:21,279
exploration program and a low earth

890
00:32:25,269 --> 00:32:23,279
orbit program it's what i described to

891
00:32:26,950 --> 00:32:25,279
you it's an earth reliant region it's a

892
00:32:28,470 --> 00:32:26,960
proving ground region and it's an earth

893
00:32:30,549 --> 00:32:28,480
independent region and that's a

894
00:32:32,070 --> 00:32:30,559
continuum of human space flight so i

895
00:32:33,590 --> 00:32:32,080
think it's worthwhile though to watch

896
00:32:35,110 --> 00:32:33,600
all these activities see what's

897
00:32:37,029 --> 00:32:35,120
happening we'll try to share with you as

898
00:32:38,950 --> 00:32:37,039
much as we can what's going on keep

899
00:32:41,029 --> 00:32:38,960
asking questions to us

900
00:32:42,630 --> 00:32:41,039
keep making us think you know you bring

901
00:32:44,789 --> 00:32:42,640
a unique perspective

902
00:32:46,789 --> 00:32:44,799
you know we see this all the time we've

903
00:32:49,190 --> 00:32:46,799
grown up in the industry some things we

904
00:32:51,509 --> 00:32:49,200
take for granted but a fresh set of eyes

905
00:32:54,149 --> 00:32:51,519
a new perspective is really really

906
00:32:56,310 --> 00:32:54,159
helpful to us so so keep thinking

907
00:32:58,230 --> 00:32:56,320
you know tweet questions tweet really

908
00:32:59,669 --> 00:32:58,240
hard questions to john john loves these

909
00:33:01,269 --> 00:32:59,679
really hard questions

910
00:33:03,029 --> 00:33:01,279
he can't deal with them so then he sends

911
00:33:05,669 --> 00:33:03,039
them to me i can't deal with him i send

912
00:33:07,269 --> 00:33:05,679
him to the next panel so so you get to

913
00:33:09,350 --> 00:33:07,279

see us all work here but but think of

914
00:33:11,509 --> 00:33:09,360
those hard questions and make sure that

915
00:33:13,269 --> 00:33:11,519
you keep us engaged because we want you

916
00:33:15,509 --> 00:33:13,279
to be with us on this journey tomorrow

917
00:33:24,070 --> 00:33:15,519
so thanks

918
00:33:27,430 --> 00:33:25,909
we were on a journey to mars in this

919
00:34:46,550 --> 00:33:27,440
next video give you a little feel what

920
00:34:50,069 --> 00:34:48,149
welcome back it's my pleasure to

921
00:34:51,750 --> 00:34:50,079
introduce our next panel uh starting

922
00:34:53,430 --> 00:34:51,760
from left to right we have bill hill the

923
00:34:54,950 --> 00:34:53,440
deputy associate administrator for

924
00:34:57,270 --> 00:34:54,960
exploration systems development and nasa

925
00:34:58,390 --> 00:34:57,280
headquarters

926
00:35:02,310 --> 00:34:58,400
todd may

927
00:35:04,550 --> 00:35:02,320
the space launch systems program manager

928
00:35:06,630 --> 00:35:04,560
charlie lundqvist orion crew and service

929
00:35:08,230 --> 00:35:06,640
module manager

930
00:35:10,550 --> 00:35:08,240
and mike bolger the ground systems

931
00:35:12,630 --> 00:35:10,560
development operations program manager

932
00:35:15,510 --> 00:35:12,640
start off with bill

933
00:35:16,390 --> 00:35:15,520
good afternoon and welcome to our qm1

934
00:35:18,870 --> 00:35:16,400
event

935
00:35:20,870 --> 00:35:18,880
um it's a great opportunity for you all

936
00:35:22,870 --> 00:35:20,880
to to witness this

937
00:35:24,630 --> 00:35:22,880
this event one of the things that as we

938
00:35:26,470 --> 00:35:24,640

were touring this morning

939
00:35:28,710 --> 00:35:26,480
somebody mentioned and it's kind of

940
00:35:29,990 --> 00:35:28,720
physics of the world that is

941
00:35:32,310 --> 00:35:30,000
once this thing lights off tomorrow

942
00:35:34,630 --> 00:35:32,320
you'll see it you'll feel it and then

943
00:35:36,710 --> 00:35:34,640
you'll hear it just because that's the

944
00:35:37,430 --> 00:35:36,720
way physics will progress through with

945
00:35:43,430 --> 00:35:37,440
the

946
00:35:46,150 --> 00:35:43,440
hopefully you look forward to seeing

947
00:35:48,390 --> 00:35:46,160
that tomorrow and uh and and witnessing

948
00:35:50,310 --> 00:35:48,400
that and sharing that with the uh the

949
00:35:53,829 --> 00:35:50,320
rest of the world through your tweets

950
00:35:55,270 --> 00:35:53,839
and uh facebook and and and and other

951
00:35:56,150 --> 00:35:55,280
social media

952
00:35:59,589 --> 00:35:56,160
um

953
00:36:01,910 --> 00:35:59,599
our activity is is uh looking to explore

954
00:36:04,150 --> 00:36:01,920
and pioneer the solar system

955
00:36:05,990 --> 00:36:04,160
uh that's what we're doing as gerst said

956
00:36:08,069 --> 00:36:06,000
we're progressing

957
00:36:09,190 --> 00:36:08,079
uh human presence out into the solar

958
00:36:11,510 --> 00:36:09,200
system

959
00:36:13,349 --> 00:36:11,520
um and we want to maintain once we get

960
00:36:14,630 --> 00:36:13,359
there we want to stay it's not going to

961
00:36:17,349 --> 00:36:14,640
be a

962
00:36:18,870 --> 00:36:17,359
go out and and touch space and

963
00:36:20,069 --> 00:36:18,880

and then do something else we're going

964
00:36:22,150 --> 00:36:20,079
out to stay

965
00:36:23,829 --> 00:36:22,160
and that's our intent

966
00:36:25,510 --> 00:36:23,839
today we're building the founder what we

967
00:36:27,910 --> 00:36:25,520
call the foundational

968
00:36:29,670 --> 00:36:27,920
exploration capabilities with the space

969
00:36:31,589 --> 00:36:29,680
launch system

970
00:36:33,589 --> 00:36:31,599
the orion spacecraft and then the ground

971
00:36:36,710 --> 00:36:33,599
systems to support

972
00:36:39,349 --> 00:36:36,720
the launch preparation and launch of

973
00:36:40,790 --> 00:36:39,359
sls and orion

974
00:36:43,109 --> 00:36:40,800
those aren't going to be the only things

975
00:36:45,190 --> 00:36:43,119
we're going to need we're going to need

976
00:36:46,390 --> 00:36:45,200
habitation modules to go further out

977
00:36:48,310 --> 00:36:46,400
into space

978
00:36:50,069 --> 00:36:48,320
and sustain human life for longer

979
00:36:51,750 --> 00:36:50,079
periods of time

980
00:36:53,990 --> 00:36:51,760
and as we progress out we're going to

981
00:36:56,950 --> 00:36:54,000
have to learn how to

982
00:36:59,190 --> 00:36:56,960
how to live and operate and and

983
00:37:01,349 --> 00:36:59,200
provide logistics for

984
00:37:04,069 --> 00:37:01,359
for our crews as they go deeper and

985
00:37:05,750 --> 00:37:04,079
deeper into space they also have to be

986
00:37:08,230 --> 00:37:05,760
more autonomous

987
00:37:09,990 --> 00:37:08,240
in their operational capabilities our

988
00:37:11,829 --> 00:37:10,000

cruise this is

989
00:37:12,790 --> 00:37:11,839
because as we go further out in space as

990
00:37:14,790 --> 00:37:12,800
you know

991
00:37:16,870 --> 00:37:14,800
physics gets to the point where

992
00:37:18,550 --> 00:37:16,880
we have large time delays on

993
00:37:21,030 --> 00:37:18,560
communications

994
00:37:23,670 --> 00:37:21,040
once we get to the to the martian area

995
00:37:26,150 --> 00:37:23,680
it could be up upwards of uh of 20

996
00:37:27,910 --> 00:37:26,160
minutes uh each way so

997
00:37:29,670 --> 00:37:27,920
um they're going to have to learn how to

998
00:37:31,750 --> 00:37:29,680
to be autonomous we're going to have

999
00:37:34,069 --> 00:37:31,760
data feeds back obviously

1000
00:37:37,349 --> 00:37:34,079
uh but the ground systems and and the

1001
00:37:39,510 --> 00:37:37,359
ground crews are not going to be able to

1002
00:37:42,390 --> 00:37:39,520
actively look over their shoulders and

1003
00:37:44,870 --> 00:37:42,400
continue to do things

1004
00:37:46,710 --> 00:37:44,880
tomorrow's activity is is the second

1005
00:37:48,550 --> 00:37:46,720
major

1006
00:37:50,550 --> 00:37:48,560
activity that we've done recently we did

1007
00:37:52,950 --> 00:37:50,560
a exploration systems

1008
00:37:55,109 --> 00:37:52,960
or exploration flight test in december

1009
00:37:57,349 --> 00:37:55,119
with the orion spacecraft

1010
00:38:00,790 --> 00:37:57,359
we'll do this one

1011
00:38:04,470 --> 00:38:00,800
tomorrow and then we'll do another one

1012
00:38:06,390 --> 00:38:04,480
winter spring next year another qm

1013
00:38:07,510 --> 00:38:06,400

the qm2 test

1014
00:38:09,109 --> 00:38:07,520
um

1015
00:38:11,670 --> 00:38:09,119
as gerst said we're making a lot of

1016
00:38:15,270 --> 00:38:11,680
progress we're looking to

1017
00:38:17,910 --> 00:38:15,280
to make a lot of progress uh

1018
00:38:20,230 --> 00:38:17,920
2015 is going to be a pivotal year and

1019
00:38:23,030 --> 00:38:20,240
2016 will even be better so

1020
00:38:24,310 --> 00:38:23,040
we're pressing on to uh to a launch some

1021
00:38:27,349 --> 00:38:24,320
time of

1022
00:38:29,829 --> 00:38:27,359
expiration mission one in 2018

1023
00:38:31,030 --> 00:38:29,839
and uh with that i'll hand it off to

1024
00:38:33,270 --> 00:38:31,040
todd

1025
00:38:35,430 --> 00:38:33,280
hey thanks bill hey it's good all to see

1026
00:38:37,750 --> 00:38:35,440
all y'all here today it's going to be a

1027
00:38:39,430 --> 00:38:37,760
a great time tomorrow i'm really looking

1028
00:38:41,430 --> 00:38:39,440
forward to it

1029
00:38:43,510 --> 00:38:41,440
a lot is going on in the space launch

1030
00:38:45,990 --> 00:38:43,520
system program right now

1031
00:38:47,990 --> 00:38:46,000
we're up and running it at full speed i

1032
00:38:50,310 --> 00:38:48,000
would say we've got a full head of steam

1033
00:38:52,150 --> 00:38:50,320
and we've got a lot of projects going on

1034
00:38:54,150 --> 00:38:52,160
in parallel

1035
00:38:56,069 --> 00:38:54,160
my job is to field the rocket basically

1036
00:38:58,150 --> 00:38:56,079
everything below orion

1037
00:39:00,150 --> 00:38:58,160
and get it down to the cape and hand it

1038
00:39:01,670 --> 00:39:00,160

over to mike bolger who will talk to you

1039
00:39:02,870 --> 00:39:01,680
here in a minute

1040
00:39:04,230 --> 00:39:02,880
but just working through the parts of

1041
00:39:06,950 --> 00:39:04,240
the rocket

1042
00:39:09,990 --> 00:39:06,960
bill mentioned uh the engines

1043
00:39:12,069 --> 00:39:10,000
we actually pulled off a uh

1044
00:39:13,670 --> 00:39:12,079
our first engine test down at stennis in

1045
00:39:15,910 --> 00:39:13,680
january

1046
00:39:17,270 --> 00:39:15,920
it's a brand new state of the art

1047
00:39:20,470 --> 00:39:17,280
controller

1048
00:39:23,030 --> 00:39:20,480
going to be less than half the price of

1049
00:39:24,710 --> 00:39:23,040
the old ssme controllers and yet it's

1050
00:39:26,310 --> 00:39:24,720
got state of the art control of the

1051
00:39:28,390 --> 00:39:26,320
engine itself

1052
00:39:30,230 --> 00:39:28,400
so that's a big thing uh we've actually

1053
00:39:31,750 --> 00:39:30,240
taken the facility down for a couple

1054
00:39:33,750 --> 00:39:31,760
months because we're putting in brand

1055
00:39:35,829 --> 00:39:33,760
new uh water lines and and these are

1056
00:39:38,150 --> 00:39:35,839
very high pressure water lines and and

1057
00:39:40,230 --> 00:39:38,160
they're not small they're over 90 inches

1058
00:39:41,510 --> 00:39:40,240
in diameter and so you gotta dig some

1059
00:39:42,870 --> 00:39:41,520
big holes and

1060
00:39:45,270 --> 00:39:42,880
replace the lines but in april when we

1061
00:39:47,349 --> 00:39:45,280
come back up we'll be on a pretty steady

1062
00:39:49,910 --> 00:39:47,359
cadence of engine testing and we hope to

1063
00:39:52,230 --> 00:39:49,920

get about seven done this year so uh if

1064
00:39:54,710 --> 00:39:52,240
you're you're down around that that area

1065
00:39:57,190 --> 00:39:54,720
um listen for a loud boom maybe we can

1066
00:39:58,630 --> 00:39:57,200
host one of these down there

1067
00:40:00,230 --> 00:39:58,640
moving outside to the boosters

1068
00:40:02,550 --> 00:40:00,240
themselves you got a pretty good update

1069
00:40:04,230 --> 00:40:02,560
from bill and charlie

1070
00:40:07,109 --> 00:40:04,240
a few things that they didn't mention

1071
00:40:09,030 --> 00:40:07,119
that are different about this booster

1072
00:40:10,390 --> 00:40:09,040
if you if you look closely at the aft

1073
00:40:12,309 --> 00:40:10,400
attach

1074
00:40:14,790 --> 00:40:12,319
it's actually lower with respect to the

1075
00:40:16,710 --> 00:40:14,800
nozzles we flip that that bottom segment

1076
00:40:19,430 --> 00:40:16,720
to give ourselves more space because the

1077
00:40:20,790 --> 00:40:19,440
core is longer than the external tanks

1078
00:40:22,550 --> 00:40:20,800
so if you're paying close attention

1079
00:40:25,430 --> 00:40:22,560
little things like that

1080
00:40:27,030 --> 00:40:25,440
up in the top we used to have um uh

1081
00:40:29,030 --> 00:40:27,040
parachutes and things like that because

1082
00:40:30,790 --> 00:40:29,040
we used to have a couple of ships that

1083
00:40:32,150 --> 00:40:30,800
would go out and get them and bring home

1084
00:40:33,510 --> 00:40:32,160
we've gotten

1085
00:40:35,430 --> 00:40:33,520
rid of all that we're going to let these

1086
00:40:37,349 --> 00:40:35,440
things go out into the ocean and become

1087
00:40:39,430 --> 00:40:37,359
reefs at this point that that lowers the

1088
00:40:40,630 --> 00:40:39,440

operations cost

1089
00:40:43,349 --> 00:40:40,640
another big change since the

1090
00:40:44,950 --> 00:40:43,359
constellation program is we ran a series

1091
00:40:47,990 --> 00:40:44,960
of value stream mapping

1092
00:40:49,510 --> 00:40:48,000
exercises which is a fancy way of saying

1093
00:40:51,109 --> 00:40:49,520
we've become much more efficient in how

1094
00:40:53,430 --> 00:40:51,119
we build them in some cases we've

1095
00:40:54,630 --> 00:40:53,440
reduced as much as 50 percent the amount

1096
00:40:56,230 --> 00:40:54,640
of effort

1097
00:40:58,069 --> 00:40:56,240
it takes to make one of these things and

1098
00:40:59,990 --> 00:40:58,079
so all of those changes have been

1099
00:41:01,270 --> 00:41:00,000
incorporated into it

1100
00:41:02,710 --> 00:41:01,280
you heard that this one is a five

1101
00:41:04,470 --> 00:41:02,720
segment motor

1102
00:41:06,150 --> 00:41:04,480
one of the things we found when we were

1103
00:41:07,270 --> 00:41:06,160
running the development motor firings as

1104
00:41:08,470 --> 00:41:07,280
we were getting a little bit of

1105
00:41:10,230 --> 00:41:08,480
eccentric

1106
00:41:11,910 --> 00:41:10,240
nozzle erosion

1107
00:41:14,069 --> 00:41:11,920
we think that might have been due to the

1108
00:41:16,309 --> 00:41:14,079
sag you heard charlie talk about the sag

1109
00:41:18,550 --> 00:41:16,319
before we pressurize this thing and so

1110
00:41:20,150 --> 00:41:18,560
we've added a support in the middle of

1111
00:41:23,109 --> 00:41:20,160
it to get rid of that sag and so we hope

1112
00:41:24,790 --> 00:41:23,119
to see that eccentric erosion go away so

1113
00:41:26,550 --> 00:41:24,800

just a couple of little

1114
00:41:28,630 --> 00:41:26,560
nits to be looking for

1115
00:41:30,790 --> 00:41:28,640
in when we get this test data but the

1116
00:41:32,870 --> 00:41:30,800
program's going really really well they

1117
00:41:34,870 --> 00:41:32,880
out here in clearfield about 50 miles

1118
00:41:36,790 --> 00:41:34,880
away they've been testing the new

1119
00:41:38,630 --> 00:41:36,800
avionics and software systems they're

1120
00:41:39,910 --> 00:41:38,640
done testing that now and delivered that

1121
00:41:41,510 --> 00:41:39,920
to marshall

1122
00:41:43,589 --> 00:41:41,520
where we have a systems integration lab

1123
00:41:46,710 --> 00:41:43,599
where we test the entire

1124
00:41:48,069 --> 00:41:46,720
rocket avionics suite there

1125
00:41:49,829 --> 00:41:48,079
and they've completed their critical

1126
00:41:51,190 --> 00:41:49,839
design review and so they're well into

1127
00:41:53,270 --> 00:41:51,200
the build phase

1128
00:41:55,750 --> 00:41:53,280
uh moving to the center of the rocket a

1129
00:41:57,670 --> 00:41:55,760
lot of activity going on with the core

1130
00:42:00,309 --> 00:41:57,680
we completed the critical design review

1131
00:42:01,990 --> 00:42:00,319
last year uh you heard you heard

1132
00:42:04,150 --> 00:42:02,000
bill say that uh we got a lot of

1133
00:42:06,870 --> 00:42:04,160
hardware down at michoud right now over

1134
00:42:08,550 --> 00:42:06,880
40 000 square feet i think some of you

1135
00:42:11,270 --> 00:42:08,560
nasa social folks got a chance to see

1136
00:42:12,790 --> 00:42:11,280
some of that uh this time last year

1137
00:42:15,430 --> 00:42:12,800
so that's just a piece of what's going

1138
00:42:17,670 --> 00:42:15,440

on that's just the structural pieces

1139
00:42:19,349 --> 00:42:17,680
the avionics boxes are going through

1140
00:42:21,910 --> 00:42:19,359
qualification all around the country

1141
00:42:26,470 --> 00:42:24,470
we also have structural test articles

1142
00:42:28,630 --> 00:42:26,480
being built at marshall and these are

1143
00:42:30,309 --> 00:42:28,640
over a hundred feet tall one of them is

1144
00:42:32,470 --> 00:42:30,319
over 200 feet tall these are strong

1145
00:42:34,069 --> 00:42:32,480
backs where we'll take these these core

1146
00:42:36,309 --> 00:42:34,079
segments and actually put them through

1147
00:42:39,349 --> 00:42:36,319
their paces uh mechanically

1148
00:42:40,870 --> 00:42:39,359
uh the pegasus barge that used to uh to

1149
00:42:42,390 --> 00:42:40,880
move the external tank around we

1150
00:42:44,470 --> 00:42:42,400
actually had to cut it in half and add

1151
00:42:45,910 --> 00:42:44,480
about 65 feet and so now it's longer

1152
00:42:47,190 --> 00:42:45,920
than a football field because that's

1153
00:42:48,069 --> 00:42:47,200
what it takes to put the core of the

1154
00:42:49,589 --> 00:42:48,079
rocket

1155
00:42:50,950 --> 00:42:49,599
on and we'll barge that thing over to

1156
00:42:52,950 --> 00:42:50,960
stennis

1157
00:42:54,790 --> 00:42:52,960
so a lot of ancillary programs going on

1158
00:42:57,430 --> 00:42:54,800
with the core as well

1159
00:42:59,109 --> 00:42:57,440
we have a lab called the systems

1160
00:43:00,630 --> 00:42:59,119
integration lab where all those avionics

1161
00:43:01,750 --> 00:43:00,640
are coming in we've been writing flight

1162
00:43:03,750 --> 00:43:01,760
software

1163
00:43:04,630 --> 00:43:03,760

we're up to version 10 now

1164
00:43:06,150 --> 00:43:04,640
and

1165
00:43:07,910 --> 00:43:06,160
we're running that through its testing

1166
00:43:09,990 --> 00:43:07,920
now we've got version 11 going through

1167
00:43:12,069 --> 00:43:10,000
what we call scrums which are the

1168
00:43:13,430 --> 00:43:12,079
incremental development of that the next

1169
00:43:15,270 --> 00:43:13,440
one beyond that will be the one we

1170
00:43:16,470 --> 00:43:15,280
actually do when we run the the green

1171
00:43:18,069 --> 00:43:16,480
run test

1172
00:43:19,750 --> 00:43:18,079
that brings me back to stennis where we

1173
00:43:22,390 --> 00:43:19,760
have the b2 stand we'll actually take

1174
00:43:24,550 --> 00:43:22,400
the entire core with all four engines

1175
00:43:26,470 --> 00:43:24,560
put it up on top of that b2 stand and

1176
00:43:28,550 --> 00:43:26,480
run a full mission duration with uh the

1177
00:43:31,270 --> 00:43:28,560
four liquid engines at once and that'll

1178
00:43:33,190 --> 00:43:31,280
be the loudest noise we've heard uh in

1179
00:43:33,990 --> 00:43:33,200
engine world liquid engine world in 40

1180
00:43:36,630 --> 00:43:34,000
years

1181
00:43:38,230 --> 00:43:36,640
um so come back for that one as well but

1182
00:43:41,589 --> 00:43:38,240
that b2 stand is coming along really

1183
00:43:43,030 --> 00:43:41,599
well that's a a a very big project as

1184
00:43:45,109 --> 00:43:43,040
you can imagine you've got to hold that

1185
00:43:47,829 --> 00:43:45,119
thing down you've got to stick this core

1186
00:43:49,670 --> 00:43:47,839
up in the air and and and light it and

1187
00:43:51,109 --> 00:43:49,680
light these four engines and so that's

1188
00:43:52,230 --> 00:43:51,119

coming along well

1189
00:43:53,910 --> 00:43:52,240
moving up

1190
00:43:55,270 --> 00:43:53,920
you see the the conical section of the

1191
00:43:58,710 --> 00:43:55,280
rocket where it next down that's the

1192
00:44:00,470 --> 00:43:58,720
lvsa uh they have completed their design

1193
00:44:01,430 --> 00:44:00,480
and are now building the structural test

1194
00:44:04,069 --> 00:44:01,440
article

1195
00:44:07,270 --> 00:44:04,079
uh from there up to the bottom of the

1196
00:44:08,470 --> 00:44:07,280
orion you've got the lvsa launch vehicle

1197
00:44:11,270 --> 00:44:08,480
stage adapter

1198
00:44:13,109 --> 00:44:11,280
you've got the icps or the interim

1199
00:44:15,589 --> 00:44:13,119
cryogenic propulsion stage which is

1200
00:44:17,910 --> 00:44:15,599
fancy for a delta iv upper stage and

1201
00:44:20,309 --> 00:44:17,920
then the msa which is the adapter that

1202
00:44:22,309 --> 00:44:20,319
attaches it to the orion that stack

1203
00:44:24,630 --> 00:44:22,319
right now all of those structural test

1204
00:44:27,430 --> 00:44:24,640
articles are being built so the tankage

1205
00:44:28,950 --> 00:44:27,440
for the icps is being built the msa

1206
00:44:30,790 --> 00:44:28,960
structural test article is being built

1207
00:44:32,550 --> 00:44:30,800
this lvsa structural test article is

1208
00:44:34,470 --> 00:44:32,560
being built and all of those will also

1209
00:44:37,190 --> 00:44:34,480
go into a stand and go through its

1210
00:44:39,030 --> 00:44:37,200
structural testing so a lot going on in

1211
00:44:41,190 --> 00:44:39,040
the pieces of the rocket

1212
00:44:42,790 --> 00:44:41,200
we are about a month and a half away

1213
00:44:44,470 --> 00:44:42,800

from our critical design review on the

1214
00:44:45,990 --> 00:44:44,480
entire rocket

1215
00:44:47,750 --> 00:44:46,000
that's been a big effort we've been

1216
00:44:49,270 --> 00:44:47,760
through three design cycles now and

1217
00:44:52,230 --> 00:44:49,280
that's wrapping up

1218
00:44:54,710 --> 00:44:52,240
i'll have a formal readiness review on

1219
00:44:56,390 --> 00:44:54,720
april 2nd with my chief engineer and

1220
00:44:58,550 --> 00:44:56,400
chief safety officer we'll review and

1221
00:45:00,550 --> 00:44:58,560
make sure we're ready to go

1222
00:45:02,069 --> 00:45:00,560
we have a punch list of items we're

1223
00:45:03,589 --> 00:45:02,079
working through right now but we feel

1224
00:45:05,910 --> 00:45:03,599
pretty good about getting in the

1225
00:45:07,750 --> 00:45:05,920
critical design review once we get past

1226
00:45:09,829 --> 00:45:07,760
that we now consider that the entire

1227
00:45:10,870 --> 00:45:09,839
vehicle is in verification and build and

1228
00:45:12,630 --> 00:45:10,880
test

1229
00:45:13,829 --> 00:45:12,640
phase which is a big shift in the

1230
00:45:15,430 --> 00:45:13,839
program

1231
00:45:17,030 --> 00:45:15,440
and we start thinking about making the

1232
00:45:19,990 --> 00:45:17,040
commitments in terms of delivering

1233
00:45:22,550 --> 00:45:20,000
everything to our other partners here

1234
00:45:24,550 --> 00:45:22,560
we'll talk to you here in a minute

1235
00:45:26,230 --> 00:45:24,560
one interesting thing i just got back

1236
00:45:27,829 --> 00:45:26,240
from florida mike will talk a little

1237
00:45:30,470 --> 00:45:27,839
more about it but we have a set of tests

1238
00:45:32,309 --> 00:45:30,480

coming up called letf and it's where if

1239
00:45:33,510 --> 00:45:32,319
you saw in the video those swing arms

1240
00:45:35,430 --> 00:45:33,520
that come out

1241
00:45:37,349 --> 00:45:35,440
uh from the rocket and there's attached

1242
00:45:38,950 --> 00:45:37,359
to the vab

1243
00:45:40,710 --> 00:45:38,960
it looks pretty interesting on the on

1244
00:45:43,030 --> 00:45:40,720
the video but i will tell you um they're

1245
00:45:45,190 --> 00:45:43,040
building up the the articles to test

1246
00:45:46,550 --> 00:45:45,200
that down there right now and the scale

1247
00:45:49,349 --> 00:45:46,560
of just those

1248
00:45:51,109 --> 00:45:49,359
tests blew me away uh it's it's one of

1249
00:45:53,270 --> 00:45:51,119
those arms is probably one and a half

1250
00:45:54,790 --> 00:45:53,280
times the width of this building so when

1251
00:45:57,510 --> 00:45:54,800
you see that thing swing out it's not

1252
00:45:59,109 --> 00:45:57,520
just a couple of pixels it's a big old

1253
00:46:01,270 --> 00:45:59,119
piece and so we're building up

1254
00:46:03,990 --> 00:46:01,280
our piece is to deliver the plates

1255
00:46:05,589 --> 00:46:04,000
uh to uh to ground systems office and

1256
00:46:07,990 --> 00:46:05,599
then they'll perform the testing for us

1257
00:46:10,230 --> 00:46:08,000
so a lot going on so with that i'll hand

1258
00:46:11,829 --> 00:46:10,240
it over to charlie

1259
00:46:13,270 --> 00:46:11,839
okay thanks todd

1260
00:46:15,030 --> 00:46:13,280
so i'm gonna give you an update on the

1261
00:46:17,109 --> 00:46:15,040
orion spacecraft

1262
00:46:19,589 --> 00:46:17,119
orion sits on top of this immensely

1263
00:46:22,069 --> 00:46:19,599

powerful rocket uh and uh thank you todd

1264
00:46:23,670 --> 00:46:22,079
for delivering us to space where uh

1265
00:46:25,990 --> 00:46:23,680
orion will conduct

1266
00:46:28,710 --> 00:46:26,000
exploration class missions of up to four

1267
00:46:30,390 --> 00:46:28,720
astronauts uh for a duration of up to 21

1268
00:46:32,870 --> 00:46:30,400
days

1269
00:46:34,550 --> 00:46:32,880
so we had a test several months ago

1270
00:46:36,150 --> 00:46:34,560
called exploration flight test one that

1271
00:46:38,150 --> 00:46:36,160
bill mentioned and i'm going to provide

1272
00:46:40,470 --> 00:46:38,160
an update to you on on what we learned

1273
00:46:42,470 --> 00:46:40,480
from that very important test flight

1274
00:46:44,870 --> 00:46:42,480
to refresh your memory uh we launched

1275
00:46:46,950 --> 00:46:44,880
from kennedy space center uh on a delta

1276
00:46:48,309 --> 00:46:46,960
iv heavy with lifted us orbit on

1277
00:46:50,390 --> 00:46:48,319
december 5th

1278
00:46:52,790 --> 00:46:50,400
the mission lasted four and a half hours

1279
00:46:54,710 --> 00:46:52,800
we circled the earth two times

1280
00:46:57,030 --> 00:46:54,720
uh we went to an apogee which is the

1281
00:46:58,790 --> 00:46:57,040
furthest point away from the ground of 3

1282
00:47:00,870 --> 00:46:58,800
600 miles

1283
00:47:03,109 --> 00:47:00,880
and we came back

1284
00:47:05,109 --> 00:47:03,119
we went through the valeno belts twice

1285
00:47:07,430 --> 00:47:05,119
and that's an area of high ionizing

1286
00:47:09,750 --> 00:47:07,440
radiation which was a critical test of

1287
00:47:11,430 --> 00:47:09,760
our flight avionics systems

1288
00:47:13,910 --> 00:47:11,440

and then we came back re-entered the

1289
00:47:16,630 --> 00:47:13,920
atmosphere at about 20 000 miles per

1290
00:47:19,030 --> 00:47:16,640
hour which was a key

1291
00:47:20,549 --> 00:47:19,040
test of our thermal protection system

1292
00:47:23,030 --> 00:47:20,559
that protects the astronauts from the

1293
00:47:25,109 --> 00:47:23,040
extreme heat of reentry

1294
00:47:26,870 --> 00:47:25,119
we experienced about 4 000 degrees

1295
00:47:28,870 --> 00:47:26,880
fahrenheit on the heat shield which is

1296
00:47:31,829 --> 00:47:28,880
only about one and a half inches thick

1297
00:47:33,670 --> 00:47:31,839
and so uh we got to protect the crew uh

1298
00:47:35,510 --> 00:47:33,680
they're not very far away from those uh

1299
00:47:36,710 --> 00:47:35,520
temperatures

1300
00:47:40,150 --> 00:47:36,720
so um

1301
00:47:42,150 --> 00:47:40,160
we uh we landed uh fine the uh

1302
00:47:44,790 --> 00:47:42,160
decelerator system performed uh

1303
00:47:47,990 --> 00:47:44,800
flawlessly uh the uh orion spacecraft

1304
00:47:50,069 --> 00:47:48,000
touched down in the ocean about uh 600

1305
00:47:52,069 --> 00:47:50,079
miles south of san diego off the baja

1306
00:47:54,470 --> 00:47:52,079
peninsula and it was subsequently

1307
00:47:56,390 --> 00:47:54,480
recovered by mike and his team thank you

1308
00:47:58,230 --> 00:47:56,400
for that and uh brought back to kennedy

1309
00:48:00,390 --> 00:47:58,240
space center where we've been undergoing

1310
00:48:02,390 --> 00:48:00,400
a lot of post-test analysis

1311
00:48:03,589 --> 00:48:02,400
uh since then

1312
00:48:05,910 --> 00:48:03,599
so

1313
00:48:07,750 --> 00:48:05,920

during the mission um

1314
00:48:09,910 --> 00:48:07,760
the spacecraft systems almost all of

1315
00:48:12,150 --> 00:48:09,920
them performed anomaly

1316
00:48:15,030 --> 00:48:12,160
we're very pleased about that

1317
00:48:16,630 --> 00:48:15,040
there are over 17 separate

1318
00:48:18,870 --> 00:48:16,640
separation events controlled by

1319
00:48:20,549 --> 00:48:18,880
pyrotechnics those all performed within

1320
00:48:23,030 --> 00:48:20,559
microseconds of when they were supposed

1321
00:48:24,309 --> 00:48:23,040
to all flawlessly i mentioned the heat

1322
00:48:26,150 --> 00:48:24,319
shield itself

1323
00:48:28,950 --> 00:48:26,160
that heat shield is very complicated

1324
00:48:31,829 --> 00:48:28,960
structure comprised of over 300 000

1325
00:48:32,829 --> 00:48:31,839
individually gunned honeycomb cells of a

1326
00:48:35,270 --> 00:48:32,839
blade of

1327
00:48:36,630 --> 00:48:35,280
material and it seemed

1328
00:48:38,710 --> 00:48:36,640
quite well

1329
00:48:40,309 --> 00:48:38,720
we're actually still studying it as we

1330
00:48:42,549 --> 00:48:40,319
speak it was uh removed from the

1331
00:48:43,990 --> 00:48:42,559
spacecraft delivered to marshall space

1332
00:48:46,829 --> 00:48:44,000
flight center where our

1333
00:48:49,430 --> 00:48:46,839
tps engineers are looking at it as we

1334
00:48:52,069 --> 00:48:49,440
speak um the

1335
00:48:54,470 --> 00:48:52,079
avionics system did quite well we didn't

1336
00:48:57,109 --> 00:48:54,480
undergo any single part

1337
00:48:59,750 --> 00:48:57,119
interrupts from the ionizing radiation

1338
00:49:02,549 --> 00:48:59,760

and the decelerator system all 11

1339
00:49:04,470 --> 00:49:02,559
parachutes deployed normally and we

1340
00:49:05,990 --> 00:49:04,480
actually landed upright

1341
00:49:07,190 --> 00:49:06,000
and

1342
00:49:08,470 --> 00:49:07,200
so we were

1343
00:49:10,150 --> 00:49:08,480
pretty happy about everything that

1344
00:49:12,790 --> 00:49:10,160
happened

1345
00:49:15,030 --> 00:49:12,800
um since then uh our engineer has been

1346
00:49:17,270 --> 00:49:15,040
pouring through about 1100 data channels

1347
00:49:19,109 --> 00:49:17,280
that we uh collect the data during the

1348
00:49:21,510 --> 00:49:19,119
mission

1349
00:49:23,109 --> 00:49:21,520
we've also been uh you know

1350
00:49:24,870 --> 00:49:23,119
going over the vehicle

1351
00:49:26,309 --> 00:49:24,880
and checking it out to make sure uh you

1352
00:49:27,589 --> 00:49:26,319
know kicking the tires seeing how well

1353
00:49:29,829 --> 00:49:27,599
it worked

1354
00:49:33,270 --> 00:49:29,839
we just released a 90-day report is very

1355
00:49:35,910 --> 00:49:34,870
documented the results of our findings

1356
00:49:36,950 --> 00:49:35,920
to date

1357
00:49:38,870 --> 00:49:36,960
um

1358
00:49:40,150 --> 00:49:38,880
and uh we're still learning lessons

1359
00:49:41,750 --> 00:49:40,160
though from it like i mentioned the heat

1360
00:49:43,109 --> 00:49:41,760
shield at marshall where we're

1361
00:49:44,790 --> 00:49:43,119
undergoing additional coring and

1362
00:49:45,910 --> 00:49:44,800
sampling so so there's a lot to learn

1363
00:49:47,510 --> 00:49:45,920

from this mission we're going to get

1364
00:49:49,750 --> 00:49:47,520
everything we can out of it

1365
00:49:52,309 --> 00:49:49,760
but i wanted to say that we learned a

1366
00:49:53,910 --> 00:49:52,319
lot even before we flew just building

1367
00:49:56,230 --> 00:49:53,920
the spacecraft

1368
00:49:58,950 --> 00:49:56,240
we exercised a lot of what we need to

1369
00:50:01,670 --> 00:49:58,960
going forward for exploration

1370
00:50:03,910 --> 00:50:01,680
we actually had over 10 000 engineering

1371
00:50:05,910 --> 00:50:03,920
drawings that were released and most of

1372
00:50:07,750 --> 00:50:05,920
those are going to play forward

1373
00:50:09,190 --> 00:50:07,760
we had over a quarter of a million

1374
00:50:11,109 --> 00:50:09,200
individual piece parts that were

1375
00:50:13,750 --> 00:50:11,119
integrated on the spacecraft and they

1376
00:50:15,109 --> 00:50:13,760
were provided by over a thousand

1377
00:50:17,589 --> 00:50:15,119
suppliers

1378
00:50:20,549 --> 00:50:17,599
within 42 different states including atk

1379
00:50:23,670 --> 00:50:20,559
i might add here in utah

1380
00:50:25,510 --> 00:50:23,680
we also had over 17 000 wires on the

1381
00:50:27,670 --> 00:50:25,520
spacecraft

1382
00:50:29,829 --> 00:50:27,680
000 different verifications and nearly

1383
00:50:31,589 --> 00:50:29,839
half a million line software lines of

1384
00:50:33,910 --> 00:50:31,599
code so it's very complicated uh

1385
00:50:36,630 --> 00:50:33,920
spacecraft and we're very pleased at how

1386
00:50:38,870 --> 00:50:36,640
well it worked together and so uh this

1387
00:50:40,950 --> 00:50:38,880
is all going to play forward for em-1

1388
00:50:42,470 --> 00:50:40,960

and so a little bit about em-1 uh bill

1389
00:50:43,829 --> 00:50:42,480
mentioned the uh the fact that we're

1390
00:50:46,069 --> 00:50:43,839
already building parts of that

1391
00:50:47,990 --> 00:50:46,079
spacecraft now um

1392
00:50:49,829 --> 00:50:48,000
the uh crew module pressure vessel

1393
00:50:51,750 --> 00:50:49,839
components are being machined as we

1394
00:50:54,790 --> 00:50:51,760
speak at various vendors across the

1395
00:50:56,549 --> 00:50:54,800
country uh the first uh element has actu

1396
00:50:58,790 --> 00:50:56,559
of the pathfinder which is what we use

1397
00:51:00,630 --> 00:50:58,800
to validate our weld structures uh has

1398
00:51:02,470 --> 00:51:00,640
already been delivered to michoud and

1399
00:51:04,870 --> 00:51:02,480
we'll be assembling that and doing our

1400
00:51:07,190 --> 00:51:04,880
pathfinder welds over the course of the

1401
00:51:08,710 --> 00:51:07,200
summer and fall and then begin the

1402
00:51:11,829 --> 00:51:08,720
welding of the flight structure we hope

1403
00:51:14,630 --> 00:51:11,839
to deliver that uh early in 2016.

1404
00:51:16,630 --> 00:51:14,640
we have completed our delta uh

1405
00:51:18,950 --> 00:51:16,640
preliminary design review our critical

1406
00:51:22,069 --> 00:51:18,960
design review is only five months away

1407
00:51:24,710 --> 00:51:22,079
and so we're really looking forward to

1408
00:51:25,829 --> 00:51:24,720
continuing to build upon the lessons

1409
00:51:30,069 --> 00:51:25,839
learned that we got with that flight

1410
00:51:32,710 --> 00:51:31,510
thanks charlie

1411
00:51:34,790 --> 00:51:32,720
so at the kennedy space center in

1412
00:51:36,790 --> 00:51:34,800
florida we've been really busy working

1413
00:51:38,790 --> 00:51:36,800

to prepare the launch infrastructure and

1414
00:51:41,109 --> 00:51:38,800
by that i mean the facilities the ground

1415
00:51:43,349 --> 00:51:41,119
systems and the operational procedures

1416
00:51:45,109 --> 00:51:43,359
um that will that will create the 21st

1417
00:51:47,270 --> 00:51:45,119
century spaceport that will be the

1418
00:51:49,190 --> 00:51:47,280
springboard for sls and orion in our

1419
00:51:52,630 --> 00:51:49,200
journey to mars

1420
00:51:54,630 --> 00:51:52,640
at the launch pad launch complex on 39b

1421
00:51:56,230 --> 00:51:54,640
we've been developing a very flexible

1422
00:51:57,910 --> 00:51:56,240
and adaptive architecture we call it a

1423
00:52:00,150 --> 00:51:57,920
clean pad approach where we've removed

1424
00:52:01,990 --> 00:52:00,160
the old shuttle specific structure that

1425
00:52:04,309 --> 00:52:02,000
was on the launch pad

1426
00:52:06,150 --> 00:52:04,319
and we now have what we call clean pad

1427
00:52:08,150 --> 00:52:06,160
that will be able to support the sls and

1428
00:52:10,470 --> 00:52:08,160
orion and even other launch vehicles and

1429
00:52:12,150 --> 00:52:10,480
spacecraft as we move forward um we've

1430
00:52:14,790 --> 00:52:12,160
been really busy at the launch pad we've

1431
00:52:16,230 --> 00:52:14,800
create we've constructed 500 foot tall

1432
00:52:18,470 --> 00:52:16,240
lightning towers

1433
00:52:20,150 --> 00:52:18,480
we've done refurbishment on the huge 800

1434
00:52:22,309 --> 00:52:20,160
900 000 gallon

1435
00:52:24,549 --> 00:52:22,319
cryo tanks that we have out there we've

1436
00:52:26,549 --> 00:52:24,559
recently awarded a contract for the

1437
00:52:28,309 --> 00:52:26,559
construction of the flame deflector and

1438
00:52:30,390 --> 00:52:28,319

then the refurbishment of the flame

1439
00:52:31,349 --> 00:52:30,400
deflector and a host of other projects

1440
00:52:34,150 --> 00:52:31,359
were

1441
00:52:36,309 --> 00:52:34,160
complex b or 39b is really a beehive of

1442
00:52:38,150 --> 00:52:36,319
activity these days

1443
00:52:40,150 --> 00:52:38,160
also at the vehicle assembly building so

1444
00:52:41,990 --> 00:52:40,160
that's the the iconic

1445
00:52:44,309 --> 00:52:42,000
piece of our of our

1446
00:52:46,549 --> 00:52:44,319
landscape you can see it as you fly in

1447
00:52:47,670 --> 00:52:46,559
i'm 500 foot tall and and 500 feet

1448
00:52:50,150 --> 00:52:47,680
across

1449
00:52:51,829 --> 00:52:50,160
um that's that's the facility where we

1450
00:52:53,750 --> 00:52:51,839
stack and we integrate and we do the

1451
00:52:55,430 --> 00:52:53,760
initial test and checkout of the launch

1452
00:52:57,829 --> 00:52:55,440
vehicle in the spacecraft we've we've

1453
00:52:59,589 --> 00:52:57,839
got four high bays in there each again

1454
00:53:01,750 --> 00:52:59,599
500 feet tall each large enough to hold

1455
00:53:03,589 --> 00:53:01,760
a statue of liberty inside this this is

1456
00:53:04,790 --> 00:53:03,599
a massive building

1457
00:53:06,870 --> 00:53:04,800
high bay 3 is going to be the one that

1458
00:53:08,390 --> 00:53:06,880
we're going to use for sls and orion

1459
00:53:10,390 --> 00:53:08,400
we've taken out the old shuttle work

1460
00:53:12,630 --> 00:53:10,400
platforms and we're in the process of

1461
00:53:15,270 --> 00:53:12,640
constructing 10 new work platforms that

1462
00:53:17,670 --> 00:53:15,280
we'll use as we stack and test out sls

1463
00:53:19,190 --> 00:53:17,680

and orion what's neat about these is um

1464
00:53:21,589 --> 00:53:19,200
these launch platforms can move up or

1465
00:53:23,670 --> 00:53:21,599
down 10 feet and they come with an

1466
00:53:25,270 --> 00:53:23,680
insert in the in the platform so that we

1467
00:53:26,870 --> 00:53:25,280
can conform to different outer mold

1468
00:53:29,829 --> 00:53:26,880
lines of the rocket so this will really

1469
00:53:31,670 --> 00:53:29,839
help us as sls and orion evolves

1470
00:53:32,950 --> 00:53:31,680
we'll be able to evolve more easily with

1471
00:53:35,510 --> 00:53:32,960
it without going through major

1472
00:53:37,109 --> 00:53:35,520
construction of facilities type projects

1473
00:53:38,950 --> 00:53:37,119
so again trying to become flexible and

1474
00:53:40,790 --> 00:53:38,960
adaptable as we move forward we've got

1475
00:53:42,630 --> 00:53:40,800
another number of other projects going

1476
00:53:44,630 --> 00:53:42,640
on the vehicle assembly building it's a

1477
00:53:46,549 --> 00:53:44,640
50 year old facility so we're upgrading

1478
00:53:49,589 --> 00:53:46,559
our fire x systems our low voltage

1479
00:53:51,589 --> 00:53:49,599
systems um some of the big doors um and

1480
00:53:53,430 --> 00:53:51,599
then the cranes that do the lifting so

1481
00:53:55,190 --> 00:53:53,440
again another very busy area at the

1482
00:53:56,950 --> 00:53:55,200
kennedy space center

1483
00:53:58,710 --> 00:53:56,960
we're also upgrading our launch comp our

1484
00:54:00,150 --> 00:53:58,720
launch control center

1485
00:54:02,549 --> 00:54:00,160
firing room one is will be the firing

1486
00:54:05,270 --> 00:54:02,559
room that we will support testing of the

1487
00:54:06,870 --> 00:54:05,280
sls and orion from we've got a new

1488
00:54:08,069 --> 00:54:06,880

state of the art open system

1489
00:54:09,990 --> 00:54:08,079
architecture

1490
00:54:11,910 --> 00:54:10,000
command and control system in firing

1491
00:54:13,910 --> 00:54:11,920
room one we're developing the system

1492
00:54:16,069 --> 00:54:13,920
software that will run that control

1493
00:54:17,430 --> 00:54:16,079
system it's about half done

1494
00:54:19,430 --> 00:54:17,440
and we're just now getting started on

1495
00:54:21,349 --> 00:54:19,440
all of the application software the

1496
00:54:23,030 --> 00:54:21,359
displays and the automated

1497
00:54:25,030 --> 00:54:23,040
test procedures that our engineers will

1498
00:54:26,870 --> 00:54:25,040
use to ultimately do the test out of the

1499
00:54:29,030 --> 00:54:26,880
sls and orion

1500
00:54:31,190 --> 00:54:29,040
a couple other projects um todd made

1501
00:54:33,270 --> 00:54:31,200
reference to our mobile launcher mobile

1502
00:54:35,750 --> 00:54:33,280
answer is the platform and the tower

1503
00:54:39,190 --> 00:54:35,760
that provides that direct ground

1504
00:54:42,069 --> 00:54:39,200
to flight vehicle interface it's a close

1505
00:54:44,230 --> 00:54:42,079
to 400 foot tall tower

1506
00:54:45,990 --> 00:54:44,240
sits on top of on platform and then all

1507
00:54:47,589 --> 00:54:46,000
of our ground systems run through the

1508
00:54:50,789 --> 00:54:47,599
mobile launcher and run through the

1509
00:54:51,750 --> 00:54:50,799
umbilical arms to provide the power the

1510
00:54:53,750 --> 00:54:51,760
calm

1511
00:54:55,030 --> 00:54:53,760
the propellants the purge gases all the

1512
00:54:56,870 --> 00:54:55,040
things that the rocket needs from the

1513
00:54:58,470 --> 00:54:56,880

ground while it's on the ground and so

1514
00:55:00,630 --> 00:54:58,480
we're busy working on that now we've

1515
00:55:02,549 --> 00:55:00,640
been um that mobile launcher was

1516
00:55:04,150 --> 00:55:02,559
originally designed for ares 1x so we've

1517
00:55:05,750 --> 00:55:04,160
been strengthening it

1518
00:55:08,549 --> 00:55:05,760
so that it's stronger for the bigger

1519
00:55:10,150 --> 00:55:08,559
rocket we've changed the exhaust hole

1520
00:55:11,510 --> 00:55:10,160
where the flames shoot out when we do

1521
00:55:13,589 --> 00:55:11,520
the launch since it has a different

1522
00:55:14,870 --> 00:55:13,599
shape than what the aries one x had

1523
00:55:16,230 --> 00:55:14,880
um

1524
00:55:17,910 --> 00:55:16,240
we've also been making room for all of

1525
00:55:19,670 --> 00:55:17,920
those ground systems that were in the

1526
00:55:21,109 --> 00:55:19,680
process of finishing up the designs this

1527
00:55:22,549 --> 00:55:21,119
year so this year we'll finish the

1528
00:55:24,710 --> 00:55:22,559
designs on the ground systems we'll

1529
00:55:27,349 --> 00:55:24,720
finish the tower mods and the platform

1530
00:55:28,789 --> 00:55:27,359
mods um we'll start to we'll start to

1531
00:55:30,390 --> 00:55:28,799
install some of these ground systems

1532
00:55:32,069 --> 00:55:30,400
into the mobile launcher we'll take our

1533
00:55:33,510 --> 00:55:32,079
umbilical arms which are really that

1534
00:55:34,870 --> 00:55:33,520
that last point of connection and

1535
00:55:36,150 --> 00:55:34,880
there's the umbilical plate right at the

1536
00:55:37,750 --> 00:55:36,160
end the ground plate and the flight

1537
00:55:39,510 --> 00:55:37,760
plate we'll take those over to that

1538
00:55:40,549 --> 00:55:39,520

launch equipment test facility that todd

1539
00:55:42,870 --> 00:55:40,559
mentioned

1540
00:55:44,390 --> 00:55:42,880
and we'll really run those umbilicals

1541
00:55:45,589 --> 00:55:44,400
through the ringer making sure that when

1542
00:55:46,950 --> 00:55:45,599
we actually go to launch that they

1543
00:55:48,710 --> 00:55:46,960
disconnect the way that we expect them

1544
00:55:50,150 --> 00:55:48,720
to and that we don't have any issues

1545
00:55:52,069 --> 00:55:50,160
when we get there that'll go on for the

1546
00:55:53,510 --> 00:55:52,079
next couple years i'm going to be a

1547
00:55:54,789 --> 00:55:53,520
really busy and exciting area todd

1548
00:55:56,470 --> 00:55:54,799
talked a little bit about the length of

1549
00:55:57,990 --> 00:55:56,480
the arms one of the test service

1550
00:55:59,430 --> 00:55:58,000
mastermind because you don't get always

1551
00:56:01,270 --> 00:55:59,440
a sense for the scale just how big this

1552
00:56:03,030 --> 00:56:01,280
rocket is but the tail service mast

1553
00:56:04,710 --> 00:56:03,040
umbilicals are down at the base of the

1554
00:56:06,710 --> 00:56:04,720
mobile launcher they're the umbilicals

1555
00:56:09,190 --> 00:56:06,720
that we do the fueling of the

1556
00:56:11,270 --> 00:56:09,200
liquid cryogenics um those things are 38

1557
00:56:12,710 --> 00:56:11,280
feet tall right so it's almost like a

1558
00:56:14,470 --> 00:56:12,720
four-story building is just the

1559
00:56:17,030 --> 00:56:14,480
umbilical at the base at the base of

1560
00:56:19,589 --> 00:56:17,040
this rocket um let's see crawley

1561
00:56:21,430 --> 00:56:19,599
transporter is a asset we've had with us

1562
00:56:22,789 --> 00:56:21,440
since the apollo program

1563
00:56:24,710 --> 00:56:22,799

it's like a um

1564
00:56:28,230 --> 00:56:24,720
it's like a massive tank almost it's

1565
00:56:29,829 --> 00:56:28,240
like 115 foot across 130 feet the other

1566
00:56:31,589 --> 00:56:29,839
way it looks like one of those rebel

1567
00:56:34,069 --> 00:56:31,599
forces in a star wars movie if you've

1568
00:56:35,510 --> 00:56:34,079
seen some of the tanks in that um and

1569
00:56:37,670 --> 00:56:35,520
and this the crawler transporter we put

1570
00:56:39,270 --> 00:56:37,680
the mobile answer and the rocket on top

1571
00:56:40,710 --> 00:56:39,280
um in inside the vehicle assembly

1572
00:56:42,470 --> 00:56:40,720
building and we roll out to the launch

1573
00:56:45,589 --> 00:56:42,480
pad at the blazing speed of a half a

1574
00:56:48,789 --> 00:56:45,599
mile an hour um we it's it's a really

1575
00:56:51,910 --> 00:56:48,799
neat um work of art in that as you go up

1576
00:56:53,510 --> 00:56:51,920
the hill on on complex 39b um it has

1577
00:56:55,109 --> 00:56:53,520
these jacking equalization leveling

1578
00:56:56,789 --> 00:56:55,119
cylinders that keep the rocket perfectly

1579
00:56:59,430 --> 00:56:56,799
vertical so that as you go up the hill

1580
00:57:01,910 --> 00:56:59,440
we maintain perfect verticality we've

1581
00:57:03,109 --> 00:57:01,920
been doing 20-year life cycle mods on

1582
00:57:04,630 --> 00:57:03,119
the crowley transporter for the last

1583
00:57:06,230 --> 00:57:04,640
couple years we just wrapped up roller

1584
00:57:07,990 --> 00:57:06,240
bearing replacements

1585
00:57:09,910 --> 00:57:08,000
we've been working on the gearboxes

1586
00:57:11,030 --> 00:57:09,920
we've still got some work to do on the

1587
00:57:13,109 --> 00:57:11,040
jacking

1588
00:57:15,349 --> 00:57:13,119

equalization and leveling sensors or the

1589
00:57:16,789 --> 00:57:15,359
cylinders the gel cylinders but we'll be

1590
00:57:18,549 --> 00:57:16,799
finishing that up in the next couple

1591
00:57:20,150 --> 00:57:18,559
years and the crawler transporter is

1592
00:57:22,230 --> 00:57:20,160
going to be ready to go

1593
00:57:24,630 --> 00:57:22,240
so overall at kennedy we're making

1594
00:57:25,589 --> 00:57:24,640
tremendous progress the eft-1 orion

1595
00:57:27,270 --> 00:57:25,599
launch

1596
00:57:28,870 --> 00:57:27,280
was really a morale booster the whole

1597
00:57:30,549 --> 00:57:28,880
place was really electric down there it

1598
00:57:31,990 --> 00:57:30,559
was exciting and it was fun it's going

1599
00:57:34,069 --> 00:57:32,000
to be the same way here tomorrow and

1600
00:57:35,829 --> 00:57:34,079
we're excited to be a part of that

1601
00:57:37,430 --> 00:57:35,839
each of these tests are so important

1602
00:57:39,910 --> 00:57:37,440
they represent you know clear and

1603
00:57:42,470 --> 00:57:39,920
obvious progress to it us

1604
00:57:44,470 --> 00:57:42,480
they make us realize that our first sls

1605
00:57:45,910 --> 00:57:44,480
orion launch date is coming up soon we

1606
00:57:47,430 --> 00:57:45,920
know we've got a lot of work to do we

1607
00:57:49,030 --> 00:57:47,440
know it's going to be hard but it's

1608
00:57:50,390 --> 00:57:49,040
exciting and there's nothing we'd rather

1609
00:57:51,829 --> 00:57:50,400
be doing

1610
00:57:52,789 --> 00:57:51,839
and and when that flight hardware shows

1611
00:57:55,990 --> 00:57:52,799
up we're going to be ready at the

1612
00:57:57,430 --> 00:57:56,000
kennedy space center to process it

1613
00:57:59,750 --> 00:57:57,440

thanks thanks mike thanks all i

1614
00:58:00,950 --> 00:57:59,760
appreciate it we have some time for some

1615
00:58:02,950 --> 00:58:00,960
questions remember in the room if you

1616
00:58:05,349 --> 00:58:02,960
have questions to keep your hand raised

1617
00:58:07,270 --> 00:58:05,359
stand and state your name

1618
00:58:09,270 --> 00:58:07,280
and wait for the microphone for those

1619
00:58:11,109 --> 00:58:09,280
watching at home you can use the hashtag

1620
00:58:13,430 --> 00:58:11,119
asknasa and we'll try to get your

1621
00:58:14,789 --> 00:58:13,440
question either here or online so i

1622
00:58:17,349 --> 00:58:14,799
think we have a first one right at the

1623
00:58:20,710 --> 00:58:19,190
yeah i'm uh lee jensen from salt lake

1624
00:58:22,789 --> 00:58:20,720
city utah i'm a software developer and

1625
00:58:25,030 --> 00:58:22,799
so i'm curious about the

1626
00:58:26,710 --> 00:58:25,040
avionics systems a lot of talk has been

1627
00:58:28,069 --> 00:58:26,720
made about

1628
00:58:30,549 --> 00:58:28,079
you know the upgrades from the heritage

1629
00:58:32,630 --> 00:58:30,559
systems and i'm curious are are most of

1630
00:58:34,710 --> 00:58:32,640
the systems these days running on custom

1631
00:58:36,789 --> 00:58:34,720
asics or is it all like general purpose

1632
00:58:37,910 --> 00:58:36,799
computer hardware that

1633
00:58:39,510 --> 00:58:37,920
you guys are just writing custom

1634
00:58:47,270 --> 00:58:39,520
software for what's the kind of

1635
00:58:53,190 --> 00:58:48,789
that's a good question

1636
00:58:59,109 --> 00:58:56,870
uh well so i'm the hardware guy

1637
00:59:01,910 --> 00:58:59,119
we uh i know we try to minimize the

1638
00:59:04,150 --> 00:59:01,920

customization uh because of the expense

1639
00:59:06,069 --> 00:59:04,160
uh and so you won't find a lot of the

1640
00:59:07,670 --> 00:59:06,079
custom basics in the orion architecture

1641
00:59:08,950 --> 00:59:07,680
that's probably about all i can tell you

1642
00:59:10,870 --> 00:59:08,960
on that one

1643
00:59:14,549 --> 00:59:10,880
yeah on the ground we're running um ibm

1644
00:59:16,470 --> 00:59:14,559
servers with an ibm flavor of unix um we

1645
00:59:18,470 --> 00:59:16,480
we use cots where we can but we do find

1646
00:59:20,470 --> 00:59:18,480
that we do develop a lot of custom code

1647
00:59:22,069 --> 00:59:20,480
for our system software the things that

1648
00:59:24,230 --> 00:59:22,079
allow us to do the basic command and

1649
00:59:27,430 --> 00:59:24,240
control and monitoring of the data that

1650
00:59:29,190 --> 00:59:27,440
comes down um and then we do use some

1651
00:59:31,030 --> 00:59:29,200
cost tools to help us with the displays

1652
00:59:32,710 --> 00:59:31,040
that we create and also with the

1653
00:59:34,150 --> 00:59:32,720
scripting the the test procedures that

1654
00:59:35,990 --> 00:59:34,160
we're writing so it's kind of a mix of

1655
00:59:38,309 --> 00:59:36,000
both for us on the ground

1656
00:59:39,190 --> 00:59:38,319
yeah i'd say the same thing um we've got

1657
00:59:40,549 --> 00:59:39,200
some

1658
00:59:42,230 --> 00:59:40,559
a panel that can tell you specifically

1659
00:59:43,109 --> 00:59:42,240
about the boosters when they get up here

1660
00:59:45,750 --> 00:59:43,119
but

1661
00:59:48,470 --> 00:59:45,760
as far as the core of the rocket itself

1662
00:59:51,190 --> 00:59:48,480
that's based off a design that's

1663
00:59:53,510 --> 00:59:51,200

current assets that fly today

1664
00:59:55,109 --> 00:59:53,520
and then the icps is really

1665
00:59:56,870 --> 00:59:55,119
a delta iv

1666
00:59:58,950 --> 00:59:56,880
architecture and

1667
01:00:01,670 --> 00:59:58,960
and that delta iv and atlas v are going

1668
01:00:03,829 --> 01:00:01,680
to what they call common avionics and um

1669
01:00:06,470 --> 01:00:03,839
in that case we're we're just kind of

1670
01:00:07,829 --> 01:00:06,480
letting the contractor lead the way

1671
01:00:12,069 --> 01:00:07,839
that's that's the plan that they're

1672
01:00:15,589 --> 01:00:14,390
my name is john hansel i'm the diving

1673
01:00:17,030 --> 01:00:15,599
safety officer for the new england

1674
01:00:18,789 --> 01:00:17,040
aquarium and i'm saying that

1675
01:00:20,950 --> 01:00:18,799
specifically because

1676
01:00:22,870 --> 01:00:20,960
todd you had mentioned that um these new

1677
01:00:25,670 --> 01:00:22,880
solid rocket boosters won't have

1678
01:00:27,510 --> 01:00:25,680
parachutes uh and therefore i was just

1679
01:00:29,349 --> 01:00:27,520
wondering about their downrange water

1680
01:00:31,589 --> 01:00:29,359
landing

1681
01:00:33,589 --> 01:00:31,599
is that area like a highly protected

1682
01:00:37,030 --> 01:00:33,599
area and also will these things maybe

1683
01:00:38,309 --> 01:00:37,040
become artificial reefs down the road

1684
01:00:40,230 --> 01:00:38,319
yeah i think that's probably what's

1685
01:00:42,789 --> 01:00:40,240
going to happen with them they'll become

1686
01:00:44,390 --> 01:00:42,799
artificial reefs at some point and uh by

1687
01:00:45,910 --> 01:00:44,400
the time they get to the bottom of the

1688
01:00:48,069 --> 01:00:45,920

ocean they're inert

1689
01:00:49,829 --> 01:00:48,079
and uh and so we actually think we're

1690
01:00:51,910 --> 01:00:49,839
helping the environment in that

1691
01:00:53,510 --> 01:00:51,920
perspective by creating a reef

1692
01:00:59,349 --> 01:00:53,520
place for the uh the underwater

1693
01:01:02,950 --> 01:01:01,430
my name is uh

1694
01:01:05,510 --> 01:01:02,960
my name is john darrington i'm from

1695
01:01:07,349 --> 01:01:05,520
rexburg idaho my question is more on the

1696
01:01:10,630 --> 01:01:07,359
on the fiscal side of things with the

1697
01:01:12,390 --> 01:01:10,640
administration change coming in 2016

1698
01:01:13,829 --> 01:01:12,400
are you expecting any kind of budget

1699
01:01:15,750 --> 01:01:13,839
issues and what kind of budget do you

1700
01:01:17,750 --> 01:01:15,760
need yearly to make the

1701
01:01:20,710 --> 01:01:17,760
the deadlines of putting

1702
01:01:23,670 --> 01:01:20,720
a crew in space in 2018 thank you

1703
01:01:25,670 --> 01:01:23,680
well right now we're working

1704
01:01:27,829 --> 01:01:25,680
very closely with congress and with with

1705
01:01:29,109 --> 01:01:27,839
the administration to uh

1706
01:01:31,030 --> 01:01:29,119
to one

1707
01:01:33,109 --> 01:01:31,040
request money and then

1708
01:01:34,230 --> 01:01:33,119
get appropriations we've been very

1709
01:01:36,950 --> 01:01:34,240
fortunate

1710
01:01:38,309 --> 01:01:36,960
in the last three years of getting

1711
01:01:40,630 --> 01:01:38,319
appropriations above what the

1712
01:01:41,829 --> 01:01:40,640
president's request has been and that's

1713
01:01:43,990 --> 01:01:41,839

helped us

1714
01:01:45,750 --> 01:01:44,000
make more progress reduce

1715
01:01:47,270 --> 01:01:45,760
some of the risk and buy down some of

1716
01:01:51,030 --> 01:01:47,280
the margin that we

1717
01:01:55,670 --> 01:01:52,950
with any administration change whether

1718
01:01:58,309 --> 01:01:55,680
it be within the same party or not

1719
01:01:59,109 --> 01:01:58,319
you always get some sort of change

1720
01:02:01,270 --> 01:01:59,119
of

1721
01:02:04,150 --> 01:02:01,280
new administrations want to put their

1722
01:02:06,549 --> 01:02:04,160
mark on on different areas

1723
01:02:07,510 --> 01:02:06,559
we'll see as we get through 2016 how

1724
01:02:10,470 --> 01:02:07,520
much

1725
01:02:13,589 --> 01:02:10,480
in the in the election or in the

1726
01:02:15,510 --> 01:02:13,599
uh campaigns how much space plays a role

1727
01:02:17,029 --> 01:02:15,520
and how much policy

1728
01:02:18,950 --> 01:02:17,039
discussion there is relative to what

1729
01:02:21,510 --> 01:02:18,960
we're doing with exploration

1730
01:02:23,670 --> 01:02:21,520
um we will set up a

1731
01:02:26,230 --> 01:02:23,680
as as we always do set up a transition

1732
01:02:28,150 --> 01:02:26,240
team to work with whoever's coming in

1733
01:02:31,670 --> 01:02:28,160
and so we'll we'll work through it our

1734
01:02:33,829 --> 01:02:31,680
goal is to make as much progress um

1735
01:02:35,910 --> 01:02:33,839
from a hardware standpoint

1736
01:02:38,230 --> 01:02:35,920
make as much progress as we can

1737
01:02:40,789 --> 01:02:38,240
before the election

1738
01:02:42,069 --> 01:02:40,799

and so we can sustain some

1739
01:02:44,630 --> 01:02:42,079
inertia

1740
01:02:50,230 --> 01:02:44,640
coming through 16 17 and hopefully into

1741
01:02:53,829 --> 01:02:52,390
hi my name is jessica zarnovsky i'm from

1742
01:02:56,870 --> 01:02:53,839
salt lake and i'm with the salty geek

1743
01:02:58,789 --> 01:02:56,880
podcast um with mentioning that you're

1744
01:03:00,069 --> 01:02:58,799
not going to be recovering any of these

1745
01:03:01,670 --> 01:03:00,079
rockets

1746
01:03:03,589 --> 01:03:01,680
what was the decision behind that

1747
01:03:05,589 --> 01:03:03,599
besides just monetary and what sort of

1748
01:03:07,750 --> 01:03:05,599
toxicity testing has gone into on the

1749
01:03:09,029 --> 01:03:07,760
environmental effects of that

1750
01:03:11,910 --> 01:03:09,039
yeah so

1751
01:03:13,349 --> 01:03:11,920
the decisions were primarily fiscal

1752
01:03:18,390 --> 01:03:13,359
fis

1753
01:03:20,150 --> 01:03:18,400
the uh the idea being that we actually

1754
01:03:22,870 --> 01:03:20,160
have to keep what we used to call the

1755
01:03:24,150 --> 01:03:22,880
nasa navy we had we had to keep ships uh

1756
01:03:26,309 --> 01:03:24,160
operating

1757
01:03:28,950 --> 01:03:26,319
the parachute operations themselves cost

1758
01:03:30,789 --> 01:03:28,960
money um i want to say that the number

1759
01:03:33,109 --> 01:03:30,799
was on the order of

1760
01:03:34,870 --> 01:03:33,119
higher than 50 million dollars a year

1761
01:03:36,230 --> 01:03:34,880
just to have that piece of the

1762
01:03:38,390 --> 01:03:36,240
infrastructure

1763
01:03:41,589 --> 01:03:38,400

and being that we had

1764
01:03:42,950 --> 01:03:41,599
eight flight sets of boosters already at

1765
01:03:44,789 --> 01:03:42,960
hand

1766
01:03:45,990 --> 01:03:44,799
it was a pretty easy decision to make

1767
01:03:47,670 --> 01:03:46,000
and

1768
01:03:49,349 --> 01:03:47,680
particularly with the fact that as we

1769
01:03:53,029 --> 01:03:49,359
move into the future we're going to look

1770
01:03:54,309 --> 01:03:53,039
for a new booster that is designed for

1771
01:03:56,309 --> 01:03:54,319
to be

1772
01:03:57,750 --> 01:03:56,319
disposable so that we can optimize that

1773
01:03:59,510 --> 01:03:57,760
for the future so

1774
01:04:02,630 --> 01:03:59,520
keeping the operational cost of keeping

1775
01:04:05,670 --> 01:04:02,640
the parachutes going and the

1776
01:04:13,190 --> 01:04:05,680
the the nasa navy going it was a it was

1777
01:04:16,789 --> 01:04:15,029
harris i'm with the space foundation in

1778
01:04:17,910 --> 01:04:16,799
colorado springs i handle their social

1779
01:04:20,870 --> 01:04:17,920
media

1780
01:04:22,549 --> 01:04:20,880
i was able to do the orion social which

1781
01:04:25,270 --> 01:04:22,559
i actually have some friends watching so

1782
01:04:26,549 --> 01:04:25,280
hello they keep tweeting about me on tv

1783
01:04:29,349 --> 01:04:26,559
um

1784
01:04:31,190 --> 01:04:29,359
but after going to orion i saw how much

1785
01:04:33,190 --> 01:04:31,200
my posts were just inspiring young

1786
01:04:35,109 --> 01:04:33,200
adults out there and unfortunately when

1787
01:04:37,029 --> 01:04:35,119
the shuttle program went away a lot of

1788
01:04:38,309 --> 01:04:37,039

people thought that the united states

1789
01:04:40,870 --> 01:04:38,319
didn't have a space program at all

1790
01:04:43,589 --> 01:04:40,880
anymore unfortunately so i'm curious now

1791
01:04:45,589 --> 01:04:43,599
with orion and with sls and for all this

1792
01:04:47,109 --> 01:04:45,599
being such a big deal for us what all is

1793
01:04:49,029 --> 01:04:47,119
being done to inspire not only our

1794
01:04:51,990 --> 01:04:49,039
future astronauts but the future

1795
01:04:53,029 --> 01:04:52,000
developers of this technology

1796
01:04:54,069 --> 01:04:53,039
well

1797
01:04:56,870 --> 01:04:54,079
first of all

1798
01:04:58,230 --> 01:04:56,880
as uh bill gerstenmaier indicated you

1799
01:05:02,950 --> 01:04:58,240
know we're not out of the business we're

1800
01:05:04,950 --> 01:05:02,960
flying uh space station 24 7 365.

1801
01:05:06,230 --> 01:05:04,960
um we're making great progress with

1802
01:05:08,870 --> 01:05:06,240
research there

1803
01:05:11,990 --> 01:05:08,880
um we're teaming with

1804
01:05:15,349 --> 01:05:12,000
commercial entities to to try to develop

1805
01:05:18,150 --> 01:05:15,359
a unique capability with uh

1806
01:05:20,069 --> 01:05:18,160
no gravitational influences so we can do

1807
01:05:21,270 --> 01:05:20,079
research and so the commercial

1808
01:05:24,309 --> 01:05:21,280
industries can do research

1809
01:05:25,990 --> 01:05:24,319
pharmaceutical whatever

1810
01:05:28,470 --> 01:05:26,000
i think everything we do every day

1811
01:05:30,470 --> 01:05:28,480
inspires

1812
01:05:34,950 --> 01:05:30,480
folks to get into science technology

1813
01:05:36,870 --> 01:05:34,960

engineering and math and and we see that

1814
01:05:39,190 --> 01:05:36,880
especially with events like this with

1815
01:05:42,069 --> 01:05:39,200
events like eft one

1816
01:05:44,309 --> 01:05:42,079
um we see how well we inspire

1817
01:05:47,109 --> 01:05:44,319
uh the youth of the world not just

1818
01:05:52,870 --> 01:05:47,119
america but the youth of the world in in

1819
01:05:56,870 --> 01:05:55,349
a few words to that um i spent a good

1820
01:05:57,990 --> 01:05:56,880
part of my career in the science side of

1821
01:06:01,270 --> 01:05:58,000
the house and

1822
01:06:02,630 --> 01:06:01,280
um so we we represent a human space

1823
01:06:04,549 --> 01:06:02,640
flight here but we're all part of the

1824
01:06:05,750 --> 01:06:04,559
bigger nasa and

1825
01:06:07,510 --> 01:06:05,760
i don't know how many of you are paying

1826
01:06:09,270 --> 01:06:07,520
attention but we actually went into

1827
01:06:11,270 --> 01:06:09,280
orbit around dawn

1828
01:06:13,109 --> 01:06:11,280
uh a dwarf planet last week that's

1829
01:06:14,549 --> 01:06:13,119
pretty cool and inspiring to me i i

1830
01:06:17,430 --> 01:06:14,559
don't know about y'all but i worked that

1831
01:06:20,470 --> 01:06:17,440
mission and when i saw the white spots

1832
01:06:23,109 --> 01:06:20,480
for the first time i got really excited

1833
01:06:24,710 --> 01:06:23,119
later this year pluto new horizons will

1834
01:06:26,870 --> 01:06:24,720
fly by pluto

1835
01:06:28,390 --> 01:06:26,880
that planet has not been explored or

1836
01:06:31,430 --> 01:06:28,400
that kuiper belt object depending on

1837
01:06:33,589 --> 01:06:31,440
which side of the debate you're on

1838
01:06:36,710 --> 01:06:33,599

you know curiosity is still exploring

1839
01:06:40,309 --> 01:06:36,720
mars today messenger is about to end uh

1840
01:06:42,390 --> 01:06:40,319
its mission at mercury um this agency is

1841
01:06:43,990 --> 01:06:42,400
all over the solar system uh today and

1842
01:06:45,430 --> 01:06:44,000
so i spent a lot of time making sure the

1843
01:06:47,109 --> 01:06:45,440
kids know

1844
01:06:49,829 --> 01:06:47,119
that and all you got to do is pick up a

1845
01:06:51,510 --> 01:06:49,839
kid's science book today i've got four

1846
01:06:52,710 --> 01:06:51,520
and have them from

1847
01:06:54,150 --> 01:06:52,720
middle school all the way through

1848
01:06:56,390 --> 01:06:54,160
college and you pick up those books and

1849
01:06:58,950 --> 01:06:56,400
you'll see nasa pictures everywhere the

1850
01:07:00,630 --> 01:06:58,960
science we do the human space flight the

1851
01:07:02,950 --> 01:07:00,640
hubble images

1852
01:07:04,789 --> 01:07:02,960
and that's that's not coming to an end

1853
01:07:06,789 --> 01:07:04,799
that's all that's all continuing today

1854
01:07:08,789 --> 01:07:06,799
james webb the most powerful telescope

1855
01:07:10,710 --> 01:07:08,799
is being built as we speak

1856
01:07:11,750 --> 01:07:10,720
uh and and that'll be flying in a few

1857
01:07:13,190 --> 01:07:11,760
years

1858
01:07:14,630 --> 01:07:13,200
and so we're quietly going about the

1859
01:07:16,230 --> 01:07:14,640
business of building the most powerful

1860
01:07:17,670 --> 01:07:16,240
rocket ever built and getting ready to

1861
01:07:19,029 --> 01:07:17,680
take humans further out in the solar

1862
01:07:20,710 --> 01:07:19,039
system and we just have to tell that

1863
01:07:22,950 --> 01:07:20,720

story

1864
01:07:25,270 --> 01:07:22,960
and i try to do as much as i can

1865
01:07:28,069 --> 01:07:25,280
i'd like to add to you

1866
01:07:30,950 --> 01:07:28,079
you mentioned orion and so uh i was just

1867
01:07:32,710 --> 01:07:30,960
amazed incredulous at the outpouring of

1868
01:07:36,549 --> 01:07:32,720
support we got from the exploration

1869
01:07:38,549 --> 01:07:36,559
flight test one we got 3.8 billion

1870
01:07:39,910 --> 01:07:38,559
social media hits

1871
01:07:42,549 --> 01:07:39,920
out of that event

1872
01:07:44,470 --> 01:07:42,559
and and that's just incredible to me um

1873
01:07:46,950 --> 01:07:44,480
the outpouring of support we got after

1874
01:07:50,630 --> 01:07:46,960
the mission has been uh amazing uh i

1875
01:07:52,470 --> 01:07:50,640
think i think the country is hungry for

1876
01:07:54,230 --> 01:07:52,480
for the you know technical leadership

1877
01:07:57,670 --> 01:07:54,240
for the united states to show some some

1878
01:07:59,910 --> 01:07:57,680
leadership in space and so um thanks to

1879
01:08:01,990 --> 01:07:59,920
all of you for getting the word out to

1880
01:08:05,190 --> 01:08:02,000
people there's so many things competing

1881
01:08:06,710 --> 01:08:05,200
for for news these days and uh so this

1882
01:08:09,750 --> 01:08:06,720
through your efforts i'm no good i don't

1883
01:08:11,670 --> 01:08:09,760
even know how to tweet but uh uh think

1884
01:08:16,070 --> 01:08:11,680
thankfully y'all do and you can uh help

1885
01:08:20,709 --> 01:08:18,630
tim roberts from las vegas nevada

1886
01:08:22,470 --> 01:08:20,719
to a child with a hammer the world looks

1887
01:08:24,070 --> 01:08:22,480
like a nail so it's no surprise

1888
01:08:26,149 --> 01:08:24,080

everybody in the room here is fired up

1889
01:08:27,669 --> 01:08:26,159
from about rockets and

1890
01:08:28,550 --> 01:08:27,679
and the engineering that's going into

1891
01:08:29,990 --> 01:08:28,560
the

1892
01:08:32,630 --> 01:08:30,000
test tomorrow and

1893
01:08:34,870 --> 01:08:32,640
the orion test that just happened

1894
01:08:36,630 --> 01:08:34,880
but with respect to budget do we have

1895
01:08:37,510 --> 01:08:36,640
the moral equity

1896
01:08:39,829 --> 01:08:37,520
to

1897
01:08:41,749 --> 01:08:39,839
address the galactic cosmic radiation

1898
01:08:43,030 --> 01:08:41,759
issue associated with sending people to

1899
01:08:43,990 --> 01:08:43,040
mars

1900
01:08:51,349 --> 01:08:44,000
and

1901
01:08:52,950 --> 01:08:51,359
not the rocketry but the medicine side

1902
01:08:56,550 --> 01:08:52,960
of this equation i wish you guys could

1903
01:09:05,990 --> 01:09:00,630
i can take a crack at it

1904
01:09:10,070 --> 01:09:06,000
radiation uh is a big concern for us for

1905
01:09:12,229 --> 01:09:10,080
deep space exploration um we uh

1906
01:09:14,789 --> 01:09:12,239
we can shield astronauts but shielding

1907
01:09:17,110 --> 01:09:14,799
is very mass expensive and so you know

1908
01:09:19,030 --> 01:09:17,120
we try to shave every ounce off our

1909
01:09:20,550 --> 01:09:19,040
spaceship and so there is a lot of

1910
01:09:23,669 --> 01:09:20,560
research going on in the human research

1911
01:09:26,709 --> 01:09:23,679
program i'm not an expert at it uh

1912
01:09:28,870 --> 01:09:26,719
looking at ways to shield the crew

1913
01:09:30,550 --> 01:09:28,880

safely and more mass efficiently as well

1914
01:09:32,229 --> 01:09:30,560
as certain therapeutics that they can

1915
01:09:34,229 --> 01:09:32,239
take to

1916
01:09:36,470 --> 01:09:34,239
minimize their exposure prevent the the

1917
01:09:38,149 --> 01:09:36,480
damage that would incur it is an air all

1918
01:09:39,749 --> 01:09:38,159
i can say is a big area it is an area of

1919
01:09:41,669 --> 01:09:39,759
concern and it is

1920
01:09:44,550 --> 01:09:41,679
being taken into consideration in the

1921
01:09:49,510 --> 01:09:44,560
research program that nasa's doing uh

1922
01:09:49,520 --> 01:09:53,110
do you have the shielding you need

1923
01:09:57,590 --> 01:09:55,110
well orion is going to be part of a

1924
01:09:59,669 --> 01:09:57,600
larger architecture to go to mars i

1925
01:10:01,430 --> 01:09:59,679
mentioned that orion spacecraft itself

1926
01:10:04,149 --> 01:10:01,440
we only have enough expendables to keep

1927
01:10:06,070 --> 01:10:04,159
four crew alive for about 21 days so

1928
01:10:08,229 --> 01:10:06,080
mission tomorrow is going to take years

1929
01:10:10,149 --> 01:10:08,239
so we would dock on orbit with a larger

1930
01:10:12,149 --> 01:10:10,159
infrastructure and the anticipation

1931
01:10:15,189 --> 01:10:12,159
would be they would go in this

1932
01:10:18,070 --> 01:10:16,870
have the proper shielding for the long

1933
01:10:20,229 --> 01:10:18,080
mission

1934
01:10:24,709 --> 01:10:20,239
yeah it'd be a habitation module

1935
01:10:26,630 --> 01:10:24,719
you know our uh you know our uh um

1936
01:10:29,030 --> 01:10:26,640
our medical community is keenly aware of

1937
01:10:31,910 --> 01:10:29,040
this we're working with uh

1938
01:10:34,310 --> 01:10:31,920

um medical ethicists i think that's the

1939
01:10:35,910 --> 01:10:34,320
right way to say it on how

1940
01:10:36,870 --> 01:10:35,920
best to do this

1941
01:10:39,990 --> 01:10:36,880
uh

1942
01:10:41,830 --> 01:10:40,000
we may find that it's not ethical to put

1943
01:10:44,470 --> 01:10:41,840
astronauts out there

1944
01:10:45,910 --> 01:10:44,480
without the proper shielding

1945
01:10:48,630 --> 01:10:45,920
you know there's a lot of there's a lot

1946
01:10:50,870 --> 01:10:48,640
of talk about some commercial entities

1947
01:10:53,189 --> 01:10:50,880
uh sending folks out there and just kind

1948
01:10:54,790 --> 01:10:53,199
of putting them out there

1949
01:10:57,270 --> 01:10:54,800
we're going to make sure we protect our

1950
01:10:58,870 --> 01:10:57,280
astronauts when they go we're looking at

1951
01:11:00,550 --> 01:10:58,880
active uh

1952
01:11:02,870 --> 01:11:00,560
active radiation protection we're

1953
01:11:05,430 --> 01:11:02,880
looking at you know using water

1954
01:11:08,149 --> 01:11:05,440
encased uh

1955
01:11:10,070 --> 01:11:08,159
spacecraft like a habitat

1956
01:11:13,110 --> 01:11:10,080
but we're keenly aware of it and and

1957
01:11:14,790 --> 01:11:13,120
we're it is part of the design space

1958
01:11:18,709 --> 01:11:14,800
thank you you're welcome

1959
01:11:22,870 --> 01:11:20,870
and thanks again todd i was pleased and

1960
01:11:25,030 --> 01:11:22,880
pleasured to see uh michoud when the

1961
01:11:27,270 --> 01:11:25,040
final assembly tower for welding got

1962
01:11:28,550 --> 01:11:27,280
opened up thanks for that um i heard

1963
01:11:29,590 --> 01:11:28,560

mention of maybe like a little bit of a

1964
01:11:30,630 --> 01:11:29,600
welding

1965
01:11:32,470 --> 01:11:30,640
issue that you're working on and

1966
01:11:33,750 --> 01:11:32,480
possibly kind of looking at is alignment

1967
01:11:35,110 --> 01:11:33,760
or what are you doing there and can you

1968
01:11:37,990 --> 01:11:35,120
just explain that a little bit please

1969
01:11:40,390 --> 01:11:38,000
yeah that's a good question jeff so um

1970
01:11:41,750 --> 01:11:40,400
this is uh the vertical assembly center

1971
01:11:43,430 --> 01:11:41,760
this is where we take all the pieces of

1972
01:11:44,950 --> 01:11:43,440
the rocket and we put them together to

1973
01:11:46,790 --> 01:11:44,960
form the core of the rocket itself

1974
01:11:49,030 --> 01:11:46,800
structurally uh so we've actually

1975
01:11:50,630 --> 01:11:49,040
performed confidence welding on the on

1976
01:11:52,070 --> 01:11:50,640
the machine we know it can perform a

1977
01:11:55,669 --> 01:11:52,080
good weld

1978
01:11:58,070 --> 01:11:55,679
but we have the tower is 217 feet tall

1979
01:12:01,189 --> 01:11:58,080
and uh the kind of accuracy we're we're

1980
01:12:04,070 --> 01:12:01,199
looking for um is a nat's eyelash kind

1981
01:12:06,070 --> 01:12:04,080
of uh accuracy and so when we went to

1982
01:12:07,830 --> 01:12:06,080
start moving up for the larger

1983
01:12:09,830 --> 01:12:07,840
pieces we found some alignment in some

1984
01:12:11,590 --> 01:12:09,840
of the vertical plates um that need

1985
01:12:13,430 --> 01:12:11,600
adjusting and so

1986
01:12:15,270 --> 01:12:13,440
we put a team together

1987
01:12:18,390 --> 01:12:15,280
we're going to have to actually do some

1988
01:12:20,149 --> 01:12:18,400

dis disassembly of the of the top ring

1989
01:12:22,470 --> 01:12:20,159
uh loosen up the other two rings and

1990
01:12:24,149 --> 01:12:22,480
take those vertical plates and actually

1991
01:12:25,189 --> 01:12:24,159
adjust them back to the left a little

1992
01:12:26,950 --> 01:12:25,199
bit

1993
01:12:29,510 --> 01:12:26,960
we think we now have a pretty robust

1994
01:12:31,990 --> 01:12:29,520
plan to get that back into shape

1995
01:12:33,990 --> 01:12:32,000
but we want to get it right because this

1996
01:12:35,669 --> 01:12:34,000
is a thing that's going to be welding up

1997
01:12:36,790 --> 01:12:35,679
these tanks for a generation and so

1998
01:12:38,310 --> 01:12:36,800
we're going to take our time and make

1999
01:12:40,630 --> 01:12:38,320
sure we get it right

2000
01:12:42,149 --> 01:12:40,640
good question

2001
01:12:45,990 --> 01:12:42,159
next we're going to

2002
01:12:53,910 --> 01:12:46,000
test tomorrow

2003
01:12:58,390 --> 01:12:55,910
so we are getting ready to stag fire the

2004
01:12:59,830 --> 01:12:58,400
qm1 static test motor it's full rocket

2005
01:13:01,669 --> 01:12:59,840
booster it's made of five segments

2006
01:13:03,750 --> 01:13:01,679
pieced together and that's important as

2007
01:13:05,189 --> 01:13:03,760
we've added another length of a segment

2008
01:13:06,950 --> 01:13:05,199
into this booster to make it bigger and

2009
01:13:08,630 --> 01:13:06,960
better a lot of planning and work is

2010
01:13:10,550 --> 01:13:08,640
done ahead of time as we design these

2011
01:13:13,270 --> 01:13:10,560
rocket boosters to get the propellant

2012
01:13:15,189 --> 01:13:13,280
geometry just right we know at any given

2013
01:13:17,750 --> 01:13:15,199

time during the burn of that motor what

2014
01:13:19,430 --> 01:13:17,760
the what the thrust is and what the

2015
01:13:22,070 --> 01:13:19,440
profile of the pressure is inside that

2016
01:13:25,110 --> 01:13:22,080
motor so with the new thrust profile for

2017
01:13:27,270 --> 01:13:25,120
the sls boosters we've added an extra

2018
01:13:29,030 --> 01:13:27,280
fin and change some of the geometry of

2019
01:13:31,270 --> 01:13:29,040
our propellant surfaces so we can burn

2020
01:13:33,270 --> 01:13:31,280
more propellant at the beginning of the

2021
01:13:35,750 --> 01:13:33,280
test or beginning the rocket firing to

2022
01:13:37,990 --> 01:13:35,760
get a solid rocket booster burn we have

2023
01:13:39,669 --> 01:13:38,000
an igniter at the front end that that

2024
01:13:42,229 --> 01:13:39,679
it's like a small rocket itself and it

2025
01:13:43,910 --> 01:13:42,239
shoots a flame 150 feet down this entire

2026
01:13:45,910 --> 01:13:43,920
rocket booster and ignites all the

2027
01:13:48,070 --> 01:13:45,920
surface of the propellant all at once

2028
01:13:49,990 --> 01:13:48,080
once you ignite a solid rocket booster

2029
01:13:52,070 --> 01:13:50,000
it can't stop it you don't flip a switch

2030
01:13:53,990 --> 01:13:52,080
to turn it on off at the same time you

2031
01:13:55,750 --> 01:13:54,000
can't turn a knob to increase your

2032
01:13:57,110 --> 01:13:55,760
thrust or decrease your thrust that's

2033
01:13:59,590 --> 01:13:57,120
why it's important to design this

2034
01:14:01,669 --> 01:13:59,600
beforehand so we can get the amount of

2035
01:14:03,910 --> 01:14:01,679
thrust we need at each point during this

2036
01:14:05,750 --> 01:14:03,920
two-minute burn to reach the maximum

2037
01:14:08,070 --> 01:14:05,760
thrust at the given time points that we

2038
01:14:09,990 --> 01:14:08,080

need at the beginning of the burn is

2039
01:14:11,350 --> 01:14:10,000
when we have the most thrust about three

2040
01:14:13,430 --> 01:14:11,360
and a half million pounds of thrust that

2041
01:14:15,669 --> 01:14:13,440
we maintain for about 25 seconds it

2042
01:14:17,430 --> 01:14:15,679
takes just over two minutes of rocket

2043
01:14:19,189 --> 01:14:17,440
firing for the propellant to completely

2044
01:14:21,350 --> 01:14:19,199
burn out and the propellant is burning

2045
01:14:22,709 --> 01:14:21,360
really fast it's got a certain rate that

2046
01:14:25,189 --> 01:14:22,719
it's burning but it's burning from

2047
01:14:26,950 --> 01:14:25,199
inside out so as every second goes by

2048
01:14:28,709 --> 01:14:26,960
it's like one layer of that propellant

2049
01:14:30,790 --> 01:14:28,719
is essentially being peeled away and

2050
01:14:33,270 --> 01:14:30,800
shot out the end of that rocket motor

2051
01:14:35,990 --> 01:14:33,280
and as this propellant burns and and

2052
01:14:37,510 --> 01:14:36,000
begins to to create this mass that we

2053
01:14:39,510 --> 01:14:37,520
are projecting out of this rocket we are

2054
01:14:41,110 --> 01:14:39,520
creating the thrust that we need to

2055
01:14:46,149 --> 01:14:41,120
carry humans and astronaut and more

2056
01:14:50,709 --> 01:14:48,630
welcome back for those joining at home

2057
01:14:52,229 --> 01:14:50,719
remember you can use the hashtag ask

2058
01:14:54,149 --> 01:14:52,239
nasa to participate in the conversation

2059
01:14:55,590 --> 01:14:54,159
here it's our pleasure to introduce our

2060
01:14:58,070 --> 01:14:55,600
final two panelists to talk a little bit

2061
01:14:59,990 --> 01:14:58,080
about tomorrow's test and the boosters

2062
01:15:03,750 --> 01:15:00,000
from left to right we have

2063
01:15:06,149 --> 01:15:03,760

alex priscos the nasa booster manager

2064
01:15:09,750 --> 01:15:06,159
and fred brassfield orbital atk's vice

2065
01:15:13,990 --> 01:15:12,310
welcome thanks for joining us i i'll

2066
01:15:16,870 --> 01:15:14,000
tell you several of us have been looking

2067
01:15:19,189 --> 01:15:16,880
forward to years for for this day it's

2068
01:15:22,390 --> 01:15:19,199
been busy leading up to here i'd like to

2069
01:15:24,950 --> 01:15:22,400
take a few seconds just to back up

2070
01:15:28,390 --> 01:15:24,960
and talk about where we've been in in

2071
01:15:29,350 --> 01:15:28,400
what tomorrow means in in that context

2072
01:15:31,030 --> 01:15:29,360
uh

2073
01:15:32,870 --> 01:15:31,040
so we started with the development and

2074
01:15:35,030 --> 01:15:32,880
we uh

2075
01:15:37,350 --> 01:15:35,040
came and decided for for this new

2076
01:15:39,430 --> 01:15:37,360
vehicle we wanted a much more powerful

2077
01:15:41,910 --> 01:15:39,440
rocket motor it started actually on on

2078
01:15:43,510 --> 01:15:41,920
constellation but it had fiscal

2079
01:15:46,310 --> 01:15:43,520
constraints too

2080
01:15:47,430 --> 01:15:46,320
and so i use the analogy of a a a race

2081
01:15:50,390 --> 01:15:47,440
car

2082
01:15:52,709 --> 01:15:50,400
what we basically did was we we took the

2083
01:15:55,030 --> 01:15:52,719
chassis and in the body

2084
01:15:57,350 --> 01:15:55,040
and and kind of used what we had from a

2085
01:16:00,470 --> 01:15:57,360
heritage perspective and we have have

2086
01:16:03,350 --> 01:16:00,480
really um uh opened the hood

2087
01:16:05,910 --> 01:16:03,360
and we've made changes major changes and

2088
01:16:10,149 --> 01:16:05,920

and also tweaks to the to the engine for

2089
01:16:14,550 --> 01:16:11,189
factors

2090
01:16:16,550 --> 01:16:14,560
uh so so we've we've changed a bunch

2091
01:16:17,830 --> 01:16:16,560
under under the hood of this and as you

2092
01:16:20,550 --> 01:16:17,840
heard earlier

2093
01:16:22,870 --> 01:16:20,560
uh uh from a thrust perspective this

2094
01:16:23,990 --> 01:16:22,880
thing produces about 3.6 million pounds

2095
01:16:26,790 --> 01:16:24,000
of thrust

2096
01:16:28,070 --> 01:16:26,800
uh it produces about 22 million

2097
01:16:30,630 --> 01:16:28,080
horsepower

2098
01:16:34,070 --> 01:16:30,640
so just just to put that in perspective

2099
01:16:36,470 --> 01:16:34,080
that's about 14 747s all going at the

2100
01:16:38,550 --> 01:16:36,480
same time and that's one booster

2101
01:16:40,870 --> 01:16:38,560
okay so so

2102
01:16:43,110 --> 01:16:40,880
so we made these changes as we were

2103
01:16:45,750 --> 01:16:43,120
going through this to to the inside of

2104
01:16:47,189 --> 01:16:45,760
this motor and in the development uh

2105
01:16:49,270 --> 01:16:47,199
series what we were doing it was

2106
01:16:51,510 --> 01:16:49,280
essentially analogous to making tweaks

2107
01:16:53,990 --> 01:16:51,520
to the engine so we came up with our our

2108
01:16:56,149 --> 01:16:54,000
first design we had a development test

2109
01:16:58,149 --> 01:16:56,159
we then went and refined it we

2110
01:16:59,990 --> 01:16:58,159
essentially ran it like like you would

2111
01:17:01,830 --> 01:17:00,000
around the test lab

2112
01:17:03,990 --> 01:17:01,840
made some tweaks did it again and we've

2113
01:17:05,830 --> 01:17:04,000

done that three times to where we're

2114
01:17:07,510 --> 01:17:05,840
pretty satisfied now we got exactly what

2115
01:17:09,510 --> 01:17:07,520
we want and what we're about to do

2116
01:17:11,189 --> 01:17:09,520
tomorrow is go do the the first

2117
01:17:13,189 --> 01:17:11,199
qualifying lap

2118
01:17:14,630 --> 01:17:13,199
okay now now the one difference is we

2119
01:17:16,950 --> 01:17:14,640
got two qualifying tests that we're

2120
01:17:18,470 --> 01:17:16,960
going to do but instead taking the the

2121
01:17:20,229 --> 01:17:18,480
best of uh

2122
01:17:22,950 --> 01:17:20,239
best of those two both of them have got

2123
01:17:25,430 --> 01:17:22,960
to work within the specifications uh

2124
01:17:27,990 --> 01:17:25,440
we do these tests uh so that one is is

2125
01:17:30,070 --> 01:17:28,000
done hot and one's done cold because the

2126
01:17:32,790 --> 01:17:30,080
performance characteristics of solid

2127
01:17:35,669 --> 01:17:32,800
rocket motors actually change depending

2128
01:17:37,189 --> 01:17:35,679
on the conditions at which they are when

2129
01:17:39,350 --> 01:17:37,199
when they ignite

2130
01:17:43,590 --> 01:17:39,360
so so tomorrow's test for us is a big

2131
01:17:46,709 --> 01:17:45,510
really will set the bar for what our

2132
01:17:49,189 --> 01:17:46,719
standard is

2133
01:17:50,870 --> 01:17:49,199
uh some of the things that have changed

2134
01:17:53,270 --> 01:17:50,880
in this motor start with some of the

2135
01:17:57,110 --> 01:17:53,280
ingredients in the propellant we've made

2136
01:18:03,270 --> 01:17:59,910
uh the whole avionics system as you guys

2137
01:18:05,510 --> 01:18:03,280
have heard has been modern modernized uh

2138
01:18:07,590 --> 01:18:05,520

uh one of the things that we ran into in

2139
01:18:09,350 --> 01:18:07,600
this program there have been a a few

2140
01:18:11,510 --> 01:18:09,360
minor things that we weren't suspecting

2141
01:18:13,430 --> 01:18:11,520
and one was as you get into a vehicle

2142
01:18:15,510 --> 01:18:13,440
like this you you

2143
01:18:17,189 --> 01:18:15,520
analyze and assess loads and what we

2144
01:18:19,189 --> 01:18:17,199
found out is the loads on this vehicle

2145
01:18:20,790 --> 01:18:19,199
were a little higher than they were on

2146
01:18:23,270 --> 01:18:20,800
shuttle and so one of the things on the

2147
01:18:24,870 --> 01:18:23,280
forward skirt where we attach to the

2148
01:18:27,189 --> 01:18:24,880
vehicle and that's where all that thrust

2149
01:18:29,510 --> 01:18:27,199
is taken out it's all taken out in that

2150
01:18:31,430 --> 01:18:29,520
forward structure we had to go in and

2151
01:18:33,669 --> 01:18:31,440
stiffen that up and we ran a couple of

2152
01:18:35,510 --> 01:18:33,679
tests full scale tests of old forward

2153
01:18:37,430 --> 01:18:35,520
skirts here to see if they were adequate

2154
01:18:38,870 --> 01:18:37,440
for this vehicle and we got wonderful

2155
01:18:41,030 --> 01:18:38,880
results on

2156
01:18:43,189 --> 01:18:41,040
on both and so

2157
01:18:44,709 --> 01:18:43,199
so so for us tomorrow's a big day it's

2158
01:18:46,630 --> 01:18:44,719
it's the culmination of this it's what

2159
01:18:47,590 --> 01:18:46,640
we call four score

2160
01:18:50,390 --> 01:18:47,600
uh

2161
01:18:52,950 --> 01:18:50,400
and and the team has done an excellent

2162
01:18:55,510 --> 01:18:52,960
job in getting ready for it

2163
01:18:57,270 --> 01:18:55,520

with that i'll turn it over fred

2164
01:18:58,229 --> 01:18:57,280
thank you alex um

2165
01:19:00,310 --> 01:18:58,239
well for

2166
01:19:02,550 --> 01:19:00,320
the one fellow up here that's a resident

2167
01:19:04,310 --> 01:19:02,560
of this particular uh plant i really

2168
01:19:05,830 --> 01:19:04,320
appreciate all of you coming

2169
01:19:09,669 --> 01:19:05,840
you may find this hard to believe but we

2170
01:19:11,030 --> 01:19:09,679
don't get a lot of visitors out here

2171
01:19:12,950 --> 01:19:11,040
so

2172
01:19:16,310 --> 01:19:12,960
how many of you thought you'd missed it

2173
01:19:18,310 --> 01:19:16,320
on the way out there we go

2174
01:19:19,910 --> 01:19:18,320
but we really do appreciate it we

2175
01:19:22,149 --> 01:19:19,920
appreciate you helping us get the word

2176
01:19:23,830 --> 01:19:22,159
out we like what we do i'm tired of

2177
01:19:25,030 --> 01:19:23,840
going to see my dentist every few months

2178
01:19:26,470 --> 01:19:25,040
and him going you guys still making

2179
01:19:28,870 --> 01:19:26,480
rockets i don't know that you know and

2180
01:19:31,270 --> 01:19:28,880
he's my dentist for crying out loud so

2181
01:19:32,470 --> 01:19:31,280
this really helps us get the word out i

2182
01:19:34,149 --> 01:19:32,480
think you've heard a lot about the

2183
01:19:35,669 --> 01:19:34,159
rocket i think you've heard a lot about

2184
01:19:38,070 --> 01:19:35,679
the program

2185
01:19:38,790 --> 01:19:38,080
tomorrow's a really big day for us we've

2186
01:19:40,630 --> 01:19:38,800
uh

2187
01:19:42,790 --> 01:19:40,640
we've been incrementally

2188
01:19:43,750 --> 01:19:42,800

optimizing this particular rocket

2189
01:19:45,590 --> 01:19:43,760
through this

2190
01:19:47,990 --> 01:19:45,600
static test phase it started on the

2191
01:19:50,470 --> 01:19:48,000
aries program everything that we learned

2192
01:19:52,630 --> 01:19:50,480
on aries has been absolutely transferred

2193
01:19:55,270 --> 01:19:52,640
over to this program we didn't repeat

2194
01:19:57,430 --> 01:19:55,280
any of those tests and we moved forward

2195
01:20:00,550 --> 01:19:57,440
this is our first qualification test as

2196
01:20:03,030 --> 01:20:00,560
opposed to demonstration but we have we

2197
01:20:04,630 --> 01:20:03,040
have incrementally got rid of mass

2198
01:20:06,550 --> 01:20:04,640
increased performance

2199
01:20:08,070 --> 01:20:06,560
alex as alex says we've changed our

2200
01:20:10,149 --> 01:20:08,080
nozzle we've seen some things on that

2201
01:20:11,669 --> 01:20:10,159
that have led to some changes we've made

2202
01:20:14,229 --> 01:20:11,679
some tweaks along the way that's what a

2203
01:20:15,990 --> 01:20:14,239
development program is all about

2204
01:20:19,669 --> 01:20:16,000
we're really excited about moving into

2205
01:20:21,350 --> 01:20:19,679
qualification from here on out so

2206
01:20:23,189 --> 01:20:21,360
we'll try to answer some questions for

2207
01:20:25,270 --> 01:20:23,199
you and i and i've noticed our chief

2208
01:20:29,110 --> 01:20:25,280
engineers in the background so we are we

2209
01:20:33,189 --> 01:20:29,120
are sad if anything hard comes up

2210
01:20:36,470 --> 01:20:34,950
bill dunford from salt lake city i've

2211
01:20:38,390 --> 01:20:36,480
got a lot of people asking me a very

2212
01:20:43,189 --> 01:20:38,400
simple question three and a half million

2213
01:20:47,270 --> 01:20:45,030

it's got a that's a really good question

2214
01:20:49,669 --> 01:20:47,280
and everybody normally asks that it it's

2215
01:20:51,510 --> 01:20:49,679
got a very large thrust block

2216
01:20:53,669 --> 01:20:51,520
at the front of the test stand that

2217
01:20:55,830 --> 01:20:53,679
charlie precourt referred to what you

2218
01:20:57,669 --> 01:20:55,840
can't see is there's a large concrete

2219
01:20:59,990 --> 01:20:57,679
infrastructure underneath the test stand

2220
01:21:01,590 --> 01:21:00,000
itself and then there's a spider like

2221
01:21:03,110 --> 01:21:01,600
takeout structure on the front that

2222
01:21:05,270 --> 01:21:03,120
helps us

2223
01:21:07,270 --> 01:21:05,280
measure the aforementioned thrust but it

2224
01:21:08,310 --> 01:21:07,280
is a large solid

2225
01:21:11,189 --> 01:21:08,320
structure

2226
01:21:13,189 --> 01:21:11,199
and it was in fact reinforced

2227
01:21:15,030 --> 01:21:13,199
and and modified for this particular

2228
01:21:17,270 --> 01:21:15,040
vehicle it was used for shuttle testing

2229
01:21:22,950 --> 01:21:17,280
for years but with the additional go

2230
01:21:27,590 --> 01:21:25,189
hi my name is spencer and i'm tweeting

2231
01:21:29,590 --> 01:21:27,600
from envision exp and i have some

2232
01:21:31,669 --> 01:21:29,600
followers that are just asking what what

2233
01:21:33,030 --> 01:21:31,679
type of engineers worked on the

2234
01:21:35,110 --> 01:21:33,040
this type of rocket because they're

2235
01:21:36,629 --> 01:21:35,120
young adolescents and students

2236
01:21:38,550 --> 01:21:36,639
so they're trying to figure out what

2237
01:21:39,910 --> 01:21:38,560
sort of career path they should go into

2238
01:21:42,149 --> 01:21:39,920

if they want to work on these types of

2239
01:21:44,149 --> 01:21:42,159
projects

2240
01:21:45,830 --> 01:21:44,159
yeah let me let me start this is fun and

2241
01:21:47,750 --> 01:21:45,840
it's it's one i love to talk about

2242
01:21:50,629 --> 01:21:47,760
because uh i've been in this business

2243
01:21:53,430 --> 01:21:50,639
for a long long time over 30 years and

2244
01:21:54,830 --> 01:21:53,440
the number of skills that it takes to

2245
01:21:57,510 --> 01:21:54,840
pull something like this off is

2246
01:22:01,189 --> 01:21:57,520
incredible uh

2247
01:22:03,590 --> 01:22:01,199
we got engineers that that

2248
01:22:05,990 --> 01:22:03,600
specialize in all different facets of

2249
01:22:08,470 --> 01:22:06,000
engineering from chemical engineers to

2250
01:22:09,669 --> 01:22:08,480
thermal experts to mechanical engineers

2251
01:22:12,070 --> 01:22:09,679
to

2252
01:22:13,510 --> 01:22:12,080
uh electrical engineers that do avionics

2253
01:22:16,229 --> 01:22:13,520
systems

2254
01:22:17,510 --> 01:22:16,239
and so we touch almost every facet of

2255
01:22:21,189 --> 01:22:17,520
engineering

2256
01:22:23,590 --> 01:22:21,199
is as well as is some that are closer to

2257
01:22:25,669 --> 01:22:23,600
the basic sciences so the breadth of

2258
01:22:28,070 --> 01:22:25,679
skills that we have to pull in to to

2259
01:22:30,950 --> 01:22:28,080
pull a project like this off is is is

2260
01:22:33,110 --> 01:22:30,960
really amazing and it's not this type or

2261
01:22:36,790 --> 01:22:33,120
that type it's it's a compilation of

2262
01:22:36,800 --> 01:22:39,030
all

2263
01:22:42,950 --> 01:22:41,270

and you had talked about the blocks up

2264
01:22:44,470 --> 01:22:42,960
at the front that we're going to be

2265
01:22:46,149 --> 01:22:44,480
basically grabbing all that are those

2266
01:22:47,430 --> 01:22:46,159
the failed blocks we saw over at that

2267
01:22:49,590 --> 01:22:47,440
building earlier that were starting the

2268
01:22:51,510 --> 01:22:49,600
metal was starting to fatigue are those

2269
01:22:53,030 --> 01:22:51,520
ones that are catching was 4 million

2270
01:22:54,550 --> 01:22:53,040
pounds of thrust that you were looking

2271
01:22:55,669 --> 01:22:54,560
at yeah is it almost four million pounds

2272
01:22:57,110 --> 01:22:55,679
of thrust

2273
01:22:59,830 --> 01:22:57,120
yes

2274
01:23:02,149 --> 01:22:59,840
all the thrust that that comes out of

2275
01:23:04,870 --> 01:23:02,159
this vehicle comes out it it at that

2276
01:23:07,510 --> 01:23:04,880
take out the the it's also attached at

2277
01:23:09,510 --> 01:23:07,520
the f but the aft swivels and allows for

2278
01:23:11,030 --> 01:23:09,520
compliance of the rest of the vehicle so

2279
01:23:12,870 --> 01:23:11,040
all the thrust is taken out at that

2280
01:23:15,189 --> 01:23:12,880
forward thrust post and that's probably

2281
01:23:17,350 --> 01:23:15,199
the the mechanism that you saw that we

2282
01:23:19,510 --> 01:23:17,360
failed two of those earlier this year on

2283
01:23:22,149 --> 01:23:19,520
intentionally very impressive

2284
01:23:27,189 --> 01:23:25,750
uh john hansel an author from boston um

2285
01:23:29,669 --> 01:23:27,199
i actually am going to ask a question

2286
01:23:30,950 --> 01:23:29,679
that was asked during our tour today but

2287
01:23:32,390 --> 01:23:30,960
but now i think we'll be able to get the

2288
01:23:35,350 --> 01:23:32,400

answer

2289
01:23:37,189 --> 01:23:35,360
for this one in specific

2290
01:23:39,750 --> 01:23:37,199
the the system that articulates the

2291
01:23:41,830 --> 01:23:39,760
nozzle is that a closed or open system

2292
01:23:43,910 --> 01:23:41,840
is that a hydraulic system or what what

2293
01:23:46,149 --> 01:23:43,920
actually mechanism uh moves the nozzle

2294
01:23:47,030 --> 01:23:46,159
around

2295
01:23:48,790 --> 01:23:47,040
well

2296
01:23:50,390 --> 01:23:48,800
david's smiling because he he

2297
01:23:53,030 --> 01:23:50,400
understands us better than all of us in

2298
01:23:54,950 --> 01:23:53,040
the room but it's a hydraulic system

2299
01:23:57,350 --> 01:23:54,960
but but it's it's it's more fascinating

2300
01:24:00,149 --> 01:23:57,360
than that right it it it's all it's

2301
01:24:02,550 --> 01:24:00,159
really a small liquid rocket system

2302
01:24:04,550 --> 01:24:02,560
that's powered by hydrazine okay that

2303
01:24:06,950 --> 01:24:04,560
powers some turbo pumps and in a

2304
01:24:09,830 --> 01:24:06,960
hydraulic system it's probably one of

2305
01:24:12,310 --> 01:24:09,840
the more complicated pieces

2306
01:24:14,470 --> 01:24:12,320
on this booster and it is a heritage

2307
01:24:16,310 --> 01:24:14,480
system or our controllers and the

2308
01:24:18,390 --> 01:24:16,320
avionics that we use to control it a lot

2309
01:24:20,709 --> 01:24:18,400
of that's been upgraded but this tvc

2310
01:24:24,950 --> 01:24:20,719
system pretty much is the is the system

2311
01:24:30,629 --> 01:24:26,950
and and david can correct me but i

2312
01:24:33,189 --> 01:24:30,639
believe in in terms of of rotational

2313
01:24:35,590 --> 01:24:33,199

speeds turbine speeds uh

2314
01:24:38,070 --> 01:24:35,600
the the speeds that the turbines rotate

2315
01:24:40,390 --> 01:24:38,080
here the fastest speeds that will happen

2316
01:24:44,550 --> 01:24:40,400
on any of the liquid engines on this

2317
01:24:48,470 --> 01:24:47,110
yeah 72 000 rpms for those that didn't

2318
01:24:50,709 --> 01:24:48,480
hear

2319
01:24:52,870 --> 01:24:50,719
hi kurt godwin with the nasa social

2320
01:24:54,390 --> 01:24:52,880
tweet from uh crow underscore t

2321
01:24:56,390 --> 01:24:54,400
underscore robot

2322
01:24:57,830 --> 01:24:56,400
now obviously environmental conditions

2323
01:25:00,550 --> 01:24:57,840
have a lot to do with the testing hence

2324
01:25:02,229 --> 01:25:00,560
the heat soak and then a cold soak

2325
01:25:04,310 --> 01:25:02,239
what about our altitude here because

2326
01:25:07,350 --> 01:25:04,320
we're well above sea level so how does

2327
01:25:11,510 --> 01:25:08,390
the the

2328
01:25:14,950 --> 01:25:12,950
obviously doesn't know any difference

2329
01:25:18,070 --> 01:25:14,960
but luckily the engineers do so when

2330
01:25:20,149 --> 01:25:18,080
they when they download the the the data

2331
01:25:21,910 --> 01:25:20,159
they'll they'll take into consideration

2332
01:25:24,310 --> 01:25:21,920
that when they perform the calculations

2333
01:25:27,510 --> 01:25:24,320
for performance

2334
01:25:29,430 --> 01:25:27,520
what what happens here at 5 000 ish feet

2335
01:25:32,070 --> 01:25:29,440
and translate that back into a c-level

2336
01:25:37,910 --> 01:25:35,350
we have time for one more question

2337
01:25:40,470 --> 01:25:37,920
hi john bill's with sci-fi cantina on

2338
01:25:42,229 --> 01:25:40,480

youtube my question is how do you begin

2339
01:25:44,390 --> 01:25:42,239
testing these boosters with the core

2340
01:25:45,830 --> 01:25:44,400
vehicle will em1 be that first test or

2341
01:25:47,590 --> 01:25:45,840
do you have other ways to start testing

2342
01:25:50,629 --> 01:25:47,600
them together

2343
01:25:52,149 --> 01:25:50,639
other than the ability to do simulations

2344
01:25:55,750 --> 01:25:52,159
and and

2345
01:25:57,990 --> 01:25:55,760
and analyses the first test is a test

2346
01:26:01,110 --> 01:25:58,000
it's the first full up flight test is

2347
01:26:03,510 --> 01:26:01,120
that the only way to do it so we do have

2348
01:26:06,390 --> 01:26:03,520
one uh structural test plan that's

2349
01:26:08,950 --> 01:26:06,400
called a modal test and so we will put

2350
01:26:11,270 --> 01:26:08,960
the vehicle together and and we will go

2351
01:26:12,790 --> 01:26:11,280
do some some modal testing of it just to

2352
01:26:14,870 --> 01:26:12,800
understand how the

2353
01:26:16,229 --> 01:26:14,880
how the various structures interplay

2354
01:26:18,310 --> 01:26:16,239
with each other

2355
01:26:19,910 --> 01:26:18,320
but but as far as a live firing fred's

2356
01:26:25,590 --> 01:26:19,920
absolutely right the first time that

2357
01:26:32,470 --> 01:26:26,550
from

2358
01:26:36,950 --> 01:26:34,629
a grip on scale of the rockets and

2359
01:26:38,390 --> 01:26:36,960
launch can you describe the experience

2360
01:26:43,669 --> 01:26:38,400
sight sound

2361
01:26:47,030 --> 01:26:45,270
um let me make sure i understand the

2362
01:26:48,070 --> 01:26:47,040
question i think they're asking us to

2363
01:26:50,229 --> 01:26:48,080

compare

2364
01:26:51,350 --> 01:26:50,239
how it is to watch a static test versus

2365
01:26:53,430 --> 01:26:51,360
a launch

2366
01:26:55,110 --> 01:26:53,440
um if they're asking how it was during

2367
01:26:57,830 --> 01:26:55,120
the launch i wish charlie was still here

2368
01:26:58,870 --> 01:26:57,840
since he he wrote a few but

2369
01:27:00,550 --> 01:26:58,880
um

2370
01:27:02,149 --> 01:27:00,560
there's no there's there's no denying

2371
01:27:04,390 --> 01:27:02,159
that a launch is

2372
01:27:05,669 --> 01:27:04,400
is for me personally

2373
01:27:06,870 --> 01:27:05,679
pretty hard to beat

2374
01:27:08,790 --> 01:27:06,880
um

2375
01:27:11,030 --> 01:27:08,800
but what you'll see tomorrow for those

2376
01:27:13,350 --> 01:27:11,040
of you who haven't seen it is you'll get

2377
01:27:14,790 --> 01:27:13,360
the full force for two minutes it's not

2378
01:27:16,790 --> 01:27:14,800
going anywhere

2379
01:27:19,110 --> 01:27:16,800
and so it was talked a little bit about

2380
01:27:21,510 --> 01:27:19,120
earlier but just from a simplistic

2381
01:27:23,350 --> 01:27:21,520
standpoint

2382
01:27:27,910 --> 01:27:23,360
you'll see

2383
01:27:29,350 --> 01:27:27,920
and and then the shock wave will hit you

2384
01:27:30,310 --> 01:27:29,360
and the sound will hit you and you'll

2385
01:27:32,149 --> 01:27:30,320
feel it

2386
01:27:33,430 --> 01:27:32,159
and it's not unpleasant but it is

2387
01:27:35,590 --> 01:27:33,440
stirring

2388
01:27:38,709 --> 01:27:35,600

and uh you're dumping five and a half

2389
01:27:39,830 --> 01:27:38,719
million pounds of of of propellant every

2390
01:27:42,550 --> 01:27:39,840
second

2391
01:27:44,470 --> 01:27:42,560
and it it it is uh it's quite an

2392
01:27:46,470 --> 01:27:44,480
experience uh

2393
01:27:48,229 --> 01:27:46,480
i know alex if you have well what what

2394
01:27:50,149 --> 01:27:48,239
are they personally well yeah it really

2395
01:27:51,669 --> 01:27:50,159
is so a couple of side notes to think

2396
01:27:54,149 --> 01:27:51,679
about tomorrow when you're watching this

2397
01:27:56,310 --> 01:27:54,159
is is is we talked about on the video

2398
01:27:57,669 --> 01:27:56,320
how the throttling mechanism for a solid

2399
01:28:00,149 --> 01:27:57,679
rocket motor is essentially

2400
01:28:01,830 --> 01:28:00,159
pre-programmed you do it by the geometry

2401
01:28:03,350 --> 01:28:01,840
of the grain the propellant that that's

2402
01:28:04,870 --> 01:28:03,360
how you do it so one of the real

2403
01:28:06,070 --> 01:28:04,880
interesting things as you're watching

2404
01:28:08,629 --> 01:28:06,080
this

2405
01:28:11,030 --> 01:28:08,639
look look at the exhaust coming out of

2406
01:28:12,229 --> 01:28:11,040
the nozzle and also pay attention to the

2407
01:28:14,629 --> 01:28:12,239
sound and

2408
01:28:16,310 --> 01:28:14,639
and see what you think may be going on

2409
01:28:17,990 --> 01:28:16,320
in terms of that throttling because we

2410
01:28:20,149 --> 01:28:18,000
hit it real hard

2411
01:28:22,709 --> 01:28:20,159
and then when we hit max dynamic

2412
01:28:25,030 --> 01:28:22,719
pressure on the vehicle we cut way way

2413
01:28:27,189 --> 01:28:25,040

back uh to reduce that force on the

2414
01:28:30,390 --> 01:28:27,199
vehicle and then we hit it hard again so

2415
01:28:32,229 --> 01:28:30,400
so so use your ears use your eyes see

2416
01:28:33,910 --> 01:28:32,239
what you can figure out what's going on

2417
01:28:36,709 --> 01:28:33,920
but like fred said the neat part about

2418
01:28:37,990 --> 01:28:36,719
this versus a launch is you get to hear

2419
01:28:39,750 --> 01:28:38,000
those things because by the time this is

2420
01:28:41,669 --> 01:28:39,760
happening in a launch it's it's a long

2421
01:28:44,790 --> 01:28:41,679
ways away and you can't you can't

2422
01:28:46,950 --> 01:28:44,800
discern the those subtleties uh the

2423
01:28:49,189 --> 01:28:46,960
other thing i'd like to say is is there

2424
01:28:51,350 --> 01:28:49,199
are differences between hot and cold

2425
01:28:53,990 --> 01:28:51,360
tests in a hot test will burn a little

2426
01:28:58,070 --> 01:28:54,000
faster so normally we'd be looking for a

2427
01:29:00,470 --> 01:28:58,080
nominal burn time of about 126 seconds

2428
01:29:01,910 --> 01:29:00,480
this one will probably be about 120

2429
01:29:04,070 --> 01:29:01,920
seconds so you can all use your

2430
01:29:06,870 --> 01:29:04,080
stopwatches along with me and if we're

2431
01:29:08,310 --> 01:29:06,880
within a couple seconds of that

2432
01:29:09,669 --> 01:29:08,320
that's as good as we'll do until we

2433
01:29:12,310 --> 01:29:09,679
start to start to see a bunch of the

2434
01:29:14,629 --> 01:29:12,320
real data that we we will take and and

2435
01:29:17,350 --> 01:29:14,639
reduce one more second there's

2436
01:29:19,590 --> 01:29:17,360
tomorrow is predicted to be a bit of a

2437
01:29:21,510 --> 01:29:19,600
overcast layer up high

2438
01:29:24,550 --> 01:29:21,520

and and if it is

2439
01:29:26,629 --> 01:29:24,560
you'll have even more fun because it it

2440
01:29:28,310 --> 01:29:26,639
it makes it even louder so i think it's

2441
01:29:29,990 --> 01:29:28,320
going to be a good day and i really

2442
01:29:31,270 --> 01:29:30,000
appreciate you all coming

2443
01:29:39,750 --> 01:29:31,280
well that's great to hear from those

2444
01:29:43,110 --> 01:29:40,950
and for those at home don't forget to

2445
01:29:45,270 --> 01:29:43,120
tune in tomorrow you can watch the

2446
01:29:48,629 --> 01:29:45,280
firing test firing live on nasa

2447
01:29:50,950 --> 01:29:48,639
television www.nasa.gov

2448
01:29:52,470 --> 01:29:50,960
nasha tv the broadcast starts at 9 00

2449
01:29:56,950 --> 01:29:52,480
a.m

2450
01:29:59,110 --> 01:29:56,960
you can also follow the conversation on

2451
01:29:59,990 --> 01:29:59,120
social media with the hashtag sls fired