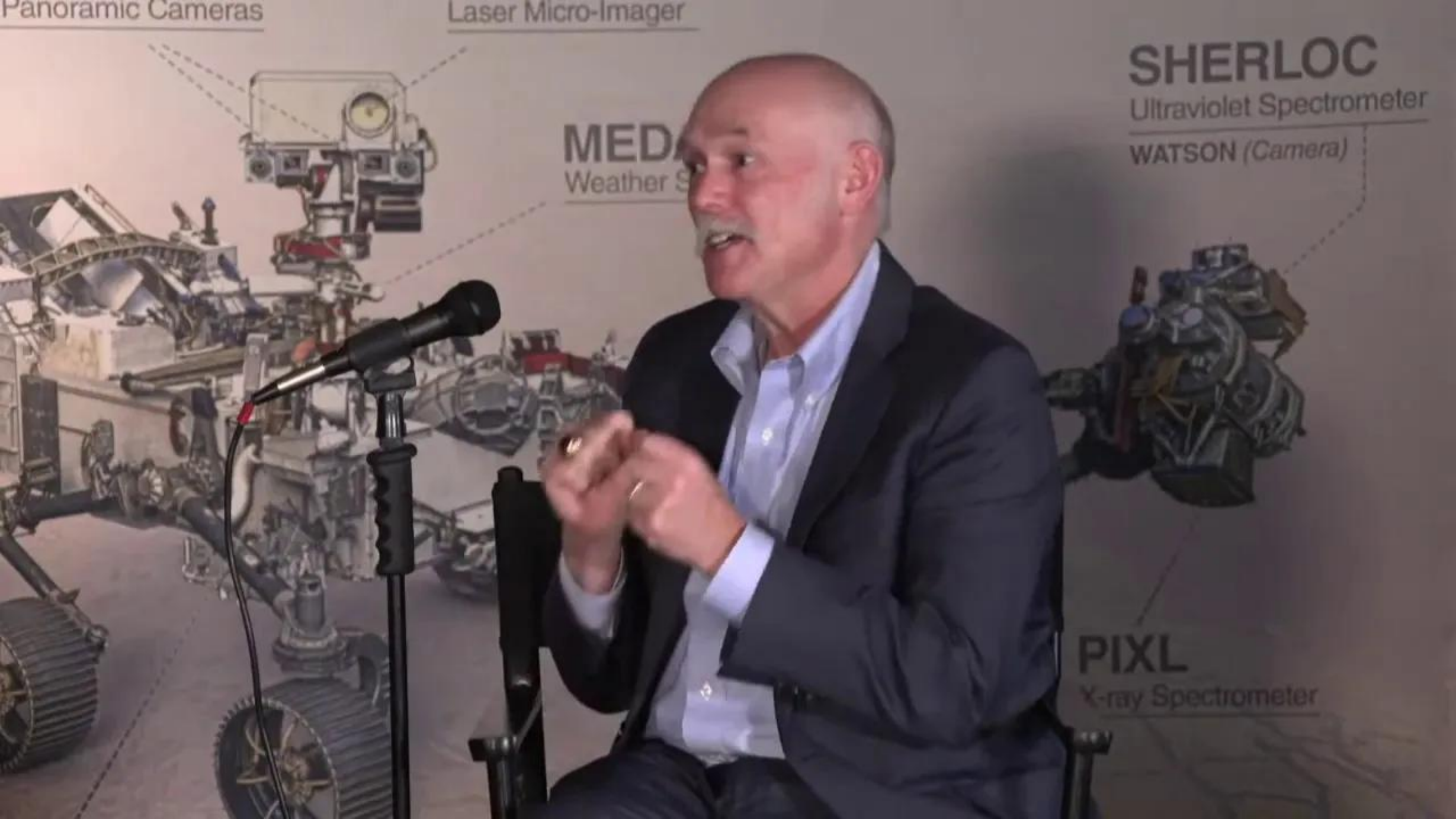
Panoramic Cameras
Laser Micro-Imager
SHERLOC
Ultraviolet Spectrometer
WATSON (Camera)
Weather
PIXL
X-ray Spectrometer

1
00:00:01,820 --> 00:00:34,150
[Music]

2
00:00:34,160 --> 00:00:46,870
t-minus one minute

3
00:01:17,590 --> 00:01:04,070
[Music]

4
00:01:23,350 --> 00:01:19,370
we are go for launch

5
00:01:27,190 --> 00:01:23,360
[Music]

6
00:01:31,030 --> 00:01:27,200
t-minus 10 9 8

7
00:01:34,630 --> 00:01:31,040
7 6 5 4

8
00:01:36,710 --> 00:01:34,640
3 2 1.

9
00:01:38,069 --> 00:01:36,720
welcome to the nasa social for the mars

10
00:01:45,450 --> 00:01:38,079
2020 mission

11
00:02:21,510 --> 00:01:57,430
[Music]

12
00:02:25,190 --> 00:02:23,750
and welcome back ladies and gentlemen to

13
00:02:27,990 --> 00:02:25,200

our countdown to mars

14
00:02:29,589 --> 00:02:28,000
virtual nasa social i again am yves

15
00:02:31,430 --> 00:02:29,599
lamothe with the exploration ground

16
00:02:32,229 --> 00:02:31,440
system comp systems as the project

17
00:02:35,670 --> 00:02:32,239
manager

18
00:02:36,470 --> 00:02:35,680
and with me once again maddie maddie

19
00:02:38,309 --> 00:02:36,480
how's it going

20
00:02:39,750 --> 00:02:38,319
i'm doing great eve how are you i am

21
00:02:42,790 --> 00:02:39,760
doing as great

22
00:02:43,509 --> 00:02:42,800
as can be all right so since as as as i

23
00:02:45,190 --> 00:02:43,519
like to say

24
00:02:46,390 --> 00:02:45,200
you're great i'm great let's make them

25
00:02:48,309 --> 00:02:46,400
great all right so what do we have in

26
00:02:50,390 --> 00:02:48,319
store for now so we have a really

27
00:02:52,150 --> 00:02:50,400
awesome show coming up not only do we

28
00:02:53,750 --> 00:02:52,160
have a great guest we're also going to

29
00:02:55,509 --> 00:02:53,760
take you behind the scenes at space

30
00:02:57,509 --> 00:02:55,519
launch complex 41

31
00:02:58,790 --> 00:02:57,519
which is where the perseverance rover

32
00:03:00,869 --> 00:02:58,800
will be launching

33
00:03:03,030 --> 00:03:00,879
tomorrow morning so while you're joining

34
00:03:04,710 --> 00:03:03,040
us make sure to drop your questions

35
00:03:06,790 --> 00:03:04,720
in the youtube chat in the virtual

36
00:03:09,350 --> 00:03:06,800
social facebook group or on twitter

37
00:03:10,949 --> 00:03:09,360
using the countdown for mars awesome

38
00:03:13,670 --> 00:03:10,959

that is fantastic so

39
00:03:15,750 --> 00:03:13,680
as maddie said right um it's behind the

40
00:03:17,509 --> 00:03:15,760
scenes at the launch pad what really

41
00:03:23,110 --> 00:03:17,519
happens in order for us to be able to

42
00:03:30,630 --> 00:03:26,949
the journey of 30 million miles to mars

43
00:03:32,550 --> 00:03:30,640
begins right here at pad 41 here at the

44
00:03:34,070 --> 00:03:32,560
cape canaveral space force station

45
00:03:36,070 --> 00:03:34,080
hi everyone i'm daryl with nasa

46
00:03:37,030 --> 00:03:36,080
communications and i'm joined by isaac

47
00:03:39,110 --> 00:03:37,040
spence

48
00:03:41,190 --> 00:03:39,120
lead structures engineer for united

49
00:03:42,229 --> 00:03:41,200
launch alliance and we are standing

50
00:03:45,030 --> 00:03:42,239
right here

51
00:03:46,070 --> 00:03:45,040
isaac just a few feet from the pad where

52
00:03:48,229 --> 00:03:46,080
this atlas 5

53
00:03:49,270 --> 00:03:48,239
is going to take mars perseverance on

54
00:03:51,430 --> 00:03:49,280
this incredibly

55
00:03:52,470 --> 00:03:51,440
long journey there's so much cool stuff

56
00:03:55,190 --> 00:03:52,480
to talk about

57
00:03:55,910 --> 00:03:55,200
first tell me this rocket this atlas 5

58
00:03:57,589 --> 00:03:55,920
is going to roll

59
00:03:59,429 --> 00:03:57,599
into this section right here tell me a

60
00:04:01,270 --> 00:03:59,439
little bit about how that works how that

61
00:04:02,149 --> 00:04:01,280
rocket comes in here and launches from

62
00:04:05,509 --> 00:04:02,159
right here

63
00:04:08,390 --> 00:04:05,519

so our rocket on top of the 1.3 million

64
00:04:10,710 --> 00:04:08,400
pound mobile launch platform will come

65
00:04:13,429 --> 00:04:10,720
out two days prior to launch

66
00:04:14,869 --> 00:04:13,439
we'll set down it'll have the mobile

67
00:04:16,789 --> 00:04:14,879
environmentally controlled system

68
00:04:18,870 --> 00:04:16,799
trailers with it it'll have our payload

69
00:04:22,230 --> 00:04:18,880
van our ground support van

70
00:04:23,430 --> 00:04:22,240
all attached and then we do we start our

71
00:04:25,430 --> 00:04:23,440
final processing

72
00:04:27,270 --> 00:04:25,440
out at the pad to get ready for launch

73
00:04:28,790 --> 00:04:27,280
and this this is the pad right here so

74
00:04:30,550 --> 00:04:28,800
what are we looking at

75
00:04:32,469 --> 00:04:30,560
so you can see right here is our flame

76
00:04:32,870 --> 00:04:32,479
bucket cover that's over the exhaust

77
00:04:34,629 --> 00:04:32,880
duct

78
00:04:36,230 --> 00:04:34,639
so for launch when you see the big plume

79
00:04:37,430 --> 00:04:36,240
coming out it'll be going right down

80
00:04:39,110 --> 00:04:37,440
through there

81
00:04:40,950 --> 00:04:39,120
so that cover is one of the last things

82
00:04:42,230 --> 00:04:40,960
we do before we clear the pad will be to

83
00:04:43,830 --> 00:04:42,240
pull that cover out

84
00:04:45,909 --> 00:04:43,840
and then to clear for launch so you'll

85
00:04:46,790 --> 00:04:45,919
see our exhaust duct right there so at

86
00:04:49,670 --> 00:04:46,800
launch

87
00:04:51,749 --> 00:04:49,680
our just over 2.4 million pounds of

88
00:04:53,670 --> 00:04:51,759

thrust that we have with the atlas v

89
00:04:56,310 --> 00:04:53,680
booster along with the four solid rocket

90
00:04:57,990 --> 00:04:56,320
boosters will propel us right into space

91
00:04:59,510 --> 00:04:58,000
and so what's that like for you uh what

92
00:04:59,990 --> 00:04:59,520
do you anticipate is going to be like

93
00:05:03,430 --> 00:05:00,000
when

94
00:05:05,029 --> 00:05:03,440
getting ready to go

95
00:05:06,629 --> 00:05:05,039
oh it's amazing i mean every every

96
00:05:08,230 --> 00:05:06,639
mission is special i mean you look at

97
00:05:09,670 --> 00:05:08,240
there's really two kinds of missions we

98
00:05:11,430 --> 00:05:09,680
have our ones for

99
00:05:12,870 --> 00:05:11,440
the united launch alliance does that

100
00:05:14,629 --> 00:05:12,880
supports the military

101
00:05:15,990 --> 00:05:14,639
all the men and women overseas just

102
00:05:16,790 --> 00:05:16,000
incredible missions that we see and

103
00:05:18,390 --> 00:05:16,800
those

104
00:05:20,390 --> 00:05:18,400
you don't really see the end result but

105
00:05:21,670 --> 00:05:20,400
you know that it's amazing things that

106
00:05:22,950 --> 00:05:21,680
we've been doing

107
00:05:25,510 --> 00:05:22,960
and then you have the science missions

108
00:05:28,070 --> 00:05:25,520
which are another variety which the mars

109
00:05:29,590 --> 00:05:28,080
2020 mission perseverance will be and

110
00:05:31,189 --> 00:05:29,600
those are

111
00:05:33,590 --> 00:05:31,199
in a different variety just as i mean

112
00:05:35,110 --> 00:05:33,600
just as special because you get to see

113
00:05:36,710 --> 00:05:35,120

all the outcome over the next few years

114
00:05:38,310 --> 00:05:36,720
the science that comes back over the

115
00:05:39,749 --> 00:05:38,320
years to come it's just incredible to be

116
00:05:41,029 --> 00:05:39,759
able to follow along with the mission

117
00:05:42,870 --> 00:05:41,039
just with the general public

118
00:05:44,469 --> 00:05:42,880
and then you can see up above we have

119
00:05:47,670 --> 00:05:44,479
our crew access tower

120
00:05:49,350 --> 00:05:47,680
oh yeah so that'll be fully stowed and

121
00:05:50,790 --> 00:05:49,360
out of the way for the launch but it is

122
00:05:52,390 --> 00:05:50,800
one of our new features that we have out

123
00:05:52,950 --> 00:05:52,400
here in the last couple years at the 41

124
00:05:54,710 --> 00:05:52,960
pad

125
00:05:56,629 --> 00:05:54,720
and just just so everybody knows there's

126
00:05:57,110 --> 00:05:56,639
some construction equipment around right

127
00:06:00,710 --> 00:05:57,120
here

128
00:06:02,230 --> 00:06:00,720
getting ready to get this pad ready for

129
00:06:04,870 --> 00:06:02,240
the next generation of rocket

130
00:06:05,350 --> 00:06:04,880
that's correct so with our delta iv and

131
00:06:08,230 --> 00:06:05,360
atlas

132
00:06:09,990 --> 00:06:08,240
v vehicles going away over the next

133
00:06:11,270 --> 00:06:10,000
several years we're making way for the

134
00:06:14,309 --> 00:06:11,280
vulcan centaur

135
00:06:15,830 --> 00:06:14,319
it's on track it'll be ready in 2021 so

136
00:06:16,790 --> 00:06:15,840
all the construction that you see behind

137
00:06:18,950 --> 00:06:16,800
are actually the pop

138
00:06:20,550 --> 00:06:18,960

pad modifications to get ready for

139
00:06:21,430 --> 00:06:20,560
vulcan centaur and we actually have the

140
00:06:23,189 --> 00:06:21,440
vulcan

141
00:06:24,950 --> 00:06:23,199
mobile launch platform just down the

142
00:06:26,950 --> 00:06:24,960
road also under construction

143
00:06:30,710 --> 00:06:26,960
very cool now let's take a look at some

144
00:06:35,270 --> 00:06:34,550
look at this incredible view we are 200

145
00:06:37,350 --> 00:06:35,280
feet

146
00:06:39,670 --> 00:06:37,360
up in the air right next to the launch

147
00:06:41,990 --> 00:06:39,680
pad overlooking the coast

148
00:06:43,830 --> 00:06:42,000
isaac this view is amazing really hard

149
00:06:45,430 --> 00:06:43,840
to be we're standing on top of the crew

150
00:06:48,390 --> 00:06:45,440
access tower which will be used to

151
00:06:50,230 --> 00:06:48,400
support the cst-100 starliner missions

152
00:06:51,830 --> 00:06:50,240
and just down off to our right is where

153
00:06:53,909 --> 00:06:51,840
the vehicle would be standing

154
00:06:55,749 --> 00:06:53,919
just prior to launch the mission of mars

155
00:06:56,150 --> 00:06:55,759
starts right here and goes right by this

156
00:06:58,070 --> 00:06:56,160
tunnel

157
00:07:00,469 --> 00:06:58,080
that's true and right behind us you can

158
00:07:02,870 --> 00:07:00,479
see our vertical integration facility

159
00:07:04,870 --> 00:07:02,880
where our vehicle is sitting right now

160
00:07:06,309 --> 00:07:04,880
we have the atlas 5 booster with the

161
00:07:08,790 --> 00:07:06,319
centaur on top

162
00:07:09,909 --> 00:07:08,800
um in a few days from now we'll have the

163
00:07:13,029 --> 00:07:09,919

spacecraft mated

164
00:07:13,350 --> 00:07:13,039
encapsulated in its 68 foot fairings and

165
00:07:15,990 --> 00:07:13,360
then

166
00:07:17,589 --> 00:07:16,000
all together it'll be 197 feet tall

167
00:07:19,749 --> 00:07:17,599
before it comes moving over to the pad

168
00:07:21,350 --> 00:07:19,759
and ready to go to mars now i'm looking

169
00:07:23,029 --> 00:07:21,360
over to your vif and is

170
00:07:24,550 --> 00:07:23,039
am i seeing the top of the booster

171
00:07:26,150 --> 00:07:24,560
through that that opening there

172
00:07:27,990 --> 00:07:26,160
correct you're seeing the top of the

173
00:07:29,029 --> 00:07:28,000
centaur through those two steel doors

174
00:07:31,110 --> 00:07:29,039
that are open

175
00:07:32,550 --> 00:07:31,120
so kind of describe the stack we can't

176
00:07:35,430 --> 00:07:32,560
see through this but

177
00:07:36,150 --> 00:07:35,440
how is it lined up right now so on top

178
00:07:38,710 --> 00:07:36,160
of our

179
00:07:40,309 --> 00:07:38,720
1.3 million pound mobile launch platform

180
00:07:41,029 --> 00:07:40,319
that we talked about earlier we have the

181
00:07:43,350 --> 00:07:41,039
atlas v

182
00:07:45,189 --> 00:07:43,360
booster after the booster goes up we

183
00:07:46,710 --> 00:07:45,199
have four solid rocker

184
00:07:49,110 --> 00:07:46,720
four solid rocket boosters that will be

185
00:07:51,110 --> 00:07:49,120
hung individually and then the centaur

186
00:07:53,270 --> 00:07:51,120
gets stacked on top

187
00:07:54,790 --> 00:07:53,280
that's so neat to see that oh thank

188
00:07:56,469 --> 00:07:54,800

goodness they have those doors open is

189
00:07:58,629 --> 00:07:56,479
there a reason for that

190
00:07:59,670 --> 00:07:58,639
the doors are open right now to support

191
00:08:01,510 --> 00:07:59,680
some of our

192
00:08:02,790 --> 00:08:01,520
prep operations that we're doing prior

193
00:08:04,309 --> 00:08:02,800
to spacecraft mate

194
00:08:06,309 --> 00:08:04,319
um the rest of the doors are closed

195
00:08:07,670 --> 00:08:06,319
because we like to keep the weather

196
00:08:09,350 --> 00:08:07,680
and for a lot of the summer storms that

197
00:08:11,510 --> 00:08:09,360
we get coming through here

198
00:08:13,670 --> 00:08:11,520
isaac now we're a lot closer to the

199
00:08:15,990 --> 00:08:13,680
vertical integration facility

200
00:08:17,830 --> 00:08:16,000
and this is really the track where the

201
00:08:20,150 --> 00:08:17,840
rocket rolls out to the pad

202
00:08:21,990 --> 00:08:20,160
tell me how that works so on roll day

203
00:08:23,670 --> 00:08:22,000
you'll have all of the doors you see

204
00:08:25,430 --> 00:08:23,680
behind you will be fully opened up

205
00:08:27,110 --> 00:08:25,440
all of the platforms cleared out of the

206
00:08:28,869 --> 00:08:27,120
way and then we have two

207
00:08:30,309 --> 00:08:28,879
undercarriages that come under the

208
00:08:32,149 --> 00:08:30,319
mobile launch platform

209
00:08:33,829 --> 00:08:32,159
they have electrically driven jacking

210
00:08:36,070 --> 00:08:33,839
system and rocking system

211
00:08:36,949 --> 00:08:36,080
and they'll elevate the entire structure

212
00:08:39,670 --> 00:08:36,959
three inches

213
00:08:39,990 --> 00:08:39,680

into the air and then move that mlp

214
00:08:41,829 --> 00:08:40,000
along

215
00:08:44,230 --> 00:08:41,839
with the vehicle all the way up to the

216
00:08:47,350 --> 00:08:44,240
pad such incredible care

217
00:08:49,990 --> 00:08:47,360
and such fine instruments

218
00:08:51,430 --> 00:08:50,000
balancing this very very expensive mars

219
00:08:53,750 --> 00:08:51,440
rover to the pad

220
00:08:55,990 --> 00:08:53,760
yes it's a very slow process it takes

221
00:08:58,230 --> 00:08:56,000
about 50 minutes to go from

222
00:08:59,990 --> 00:08:58,240
the vip all the way up to the pad unlike

223
00:09:00,870 --> 00:09:00,000
you said taking care to make sure that

224
00:09:02,470 --> 00:09:00,880
we don't have

225
00:09:03,910 --> 00:09:02,480
any effects on the umbilicals or the

226
00:09:04,870 --> 00:09:03,920
vehicle as we're making the way all the

227
00:09:07,030 --> 00:09:04,880
way up to the pad

228
00:09:08,070 --> 00:09:07,040
isaac what tremendous access we had

229
00:09:10,949 --> 00:09:08,080
today to see all these

230
00:09:13,110 --> 00:09:10,959
neat locations around your path yeah on

231
00:09:14,949 --> 00:09:13,120
top of the crew access tower and inside

232
00:09:16,550 --> 00:09:14,959
of our facilities it's very unique

233
00:09:17,750 --> 00:09:16,560
access but it's one that we're excited

234
00:09:19,269 --> 00:09:17,760
to share with you

235
00:09:20,949 --> 00:09:19,279
and with the world for this amazing

236
00:09:21,430 --> 00:09:20,959
mission and ula is just excited to be

237
00:09:23,670 --> 00:09:21,440
part of

238
00:09:25,350 --> 00:09:23,680

mars 2020 and perseverance rover well

239
00:09:26,949 --> 00:09:25,360
thank you very much for doing that isaac

240
00:09:35,269 --> 00:09:26,959
spence lead structures engineer for

241
00:09:40,230 --> 00:09:38,070
so all that payload the flight hardware

242
00:09:41,190 --> 00:09:40,240
the ground systems it takes one heck of

243
00:09:43,990 --> 00:09:41,200
a team to put

244
00:09:45,590 --> 00:09:44,000
all of that together and to help nasa do

245
00:09:47,829 --> 00:09:45,600
some amazing things like

246
00:09:48,710 --> 00:09:47,839
launching perseverance over to mars with

247
00:09:52,710 --> 00:09:48,720
us today

248
00:09:54,710 --> 00:09:52,720
is one one of the icons who are

249
00:09:56,230 --> 00:09:54,720
behind a lot of that work with us today

250
00:09:58,150 --> 00:09:56,240
is mr tory brown

251
00:09:59,910 --> 00:09:58,160
president of ula tori how's it going

252
00:10:01,990 --> 00:09:59,920
today he's going great

253
00:10:03,350 --> 00:10:02,000
it is such an honor to have you here

254
00:10:05,030 --> 00:10:03,360
with us and

255
00:10:06,550 --> 00:10:05,040
we would love to hear us and the

256
00:10:09,190 --> 00:10:06,560
audience would love to hear about

257
00:10:10,389 --> 00:10:09,200
what your role is with the perseverance

258
00:10:12,949 --> 00:10:10,399
mission yeah sure

259
00:10:14,230 --> 00:10:12,959
so basically i am perseverance's uber

260
00:10:16,790 --> 00:10:14,240
driver

261
00:10:18,470 --> 00:10:16,800
so i provide the atlas v rocket the

262
00:10:20,630 --> 00:10:18,480
mighty atlas that will carry

263
00:10:23,350 --> 00:10:20,640

perseverance out to mars

264
00:10:24,630 --> 00:10:23,360
how amazing is that now are you

265
00:10:26,630 --> 00:10:24,640
concerned with um

266
00:10:28,389 --> 00:10:26,640
i mean you've been launching for quite

267
00:10:29,990 --> 00:10:28,399
some time so

268
00:10:32,710 --> 00:10:30,000
are there any concerns with this

269
00:10:35,110 --> 00:10:32,720
particular payload sending it up to mars

270
00:10:37,190 --> 00:10:35,120
well every payload is special and

271
00:10:37,670 --> 00:10:37,200
everything on a rocket has to go right i

272
00:10:40,310 --> 00:10:37,680
mean it

273
00:10:41,829 --> 00:10:40,320
is an incredibly complex incredibly

274
00:10:43,829 --> 00:10:41,839
powerful machine

275
00:10:45,430 --> 00:10:43,839
so we're always tense and i'll share

276
00:10:46,069 --> 00:10:45,440
with you a little secret i've done about

277
00:10:48,790 --> 00:10:46,079
400

278
00:10:50,630 --> 00:10:48,800
personal launches over my career i get

279
00:10:53,350 --> 00:10:50,640
butterflies every single time

280
00:10:55,110 --> 00:10:53,360
wow but in terms of this mission no we

281
00:10:56,630 --> 00:10:55,120
are very confident that

282
00:10:58,630 --> 00:10:56,640
the rocket is in good shape the

283
00:11:01,030 --> 00:10:58,640
spacecraft is in good shape

284
00:11:02,069 --> 00:11:01,040
we've got our second largest atlas out

285
00:11:05,670 --> 00:11:02,079
on the pad

286
00:11:06,949 --> 00:11:05,680
the 541 configuration we call this one

287
00:11:10,310 --> 00:11:06,959
the dominator

288
00:11:10,630 --> 00:11:10,320

because it has four solid rocket motors

289
00:11:13,110 --> 00:11:10,640
that

290
00:11:14,389 --> 00:11:13,120
supplement the already impressive thrust

291
00:11:16,790 --> 00:11:14,399
out of the center core

292
00:11:17,590 --> 00:11:16,800
so we start with 860 000 pounds of

293
00:11:20,790 --> 00:11:17,600
thrust

294
00:11:24,949 --> 00:11:20,800
we're going to add to that 350

295
00:11:27,030 --> 00:11:24,959
000 more pounds of thrust per srm

296
00:11:28,949 --> 00:11:27,040
when you hear ignition tomorrow morning

297
00:11:31,030 --> 00:11:28,959
do not blink because you'll miss it

298
00:11:32,230 --> 00:11:31,040
with that tiny little spacecraft it will

299
00:11:34,949 --> 00:11:32,240
leap off the pad

300
00:11:36,150 --> 00:11:34,959
wow i can't wait to see that that is

301
00:11:39,030 --> 00:11:36,160
going to be

302
00:11:39,829 --> 00:11:39,040
amazing and so far everything is looking

303
00:11:42,470 --> 00:11:39,839
good for launch

304
00:11:43,030 --> 00:11:42,480
in terms of the weather all systems are

305
00:11:46,150 --> 00:11:43,040
go

306
00:11:48,069 --> 00:11:46,160
with everything

307
00:11:50,069 --> 00:11:48,079
yeah we're in great shape so we rolled

308
00:11:51,910 --> 00:11:50,079
out to the pad this morning on our giant

309
00:11:52,710 --> 00:11:51,920
mobile launch platform that was in the

310
00:11:55,190 --> 00:11:52,720
video

311
00:11:55,990 --> 00:11:55,200
and we're hard down on the pad now all

312
00:11:58,629 --> 00:11:56,000
the systems have

313
00:11:59,269 --> 00:11:58,639

checked out so everybody's healthy we'll

314
00:12:02,310 --> 00:11:59,279
continue

315
00:12:02,790 --> 00:12:02,320
keeping perseverance cool and dry and

316
00:12:05,590 --> 00:12:02,800
clean

317
00:12:07,509 --> 00:12:05,600
through the night and the the countdown

318
00:12:09,990 --> 00:12:07,519
is going to start in just a few hours

319
00:12:11,590 --> 00:12:10,000
wow i hope you guys are excited as i am

320
00:12:12,230 --> 00:12:11,600
it's going to be such an amazing thing

321
00:12:14,150 --> 00:12:12,240
to see

322
00:12:16,710 --> 00:12:14,160
so i don't want to take anything away

323
00:12:18,629 --> 00:12:16,720
from our viewers so maddie how about we

324
00:12:20,710 --> 00:12:18,639
kick it into some of the questions we

325
00:12:22,470 --> 00:12:20,720
have perfect so first question

326
00:12:23,990 --> 00:12:22,480
is can you tell us a little bit more

327
00:12:27,030 --> 00:12:24,000
about the atlas v rocket

328
00:12:28,389 --> 00:12:27,040
and how many times has it flown yes

329
00:12:32,230 --> 00:12:28,399
atlas has flown over

330
00:12:33,990 --> 00:12:32,240
80 times in various configurations and

331
00:12:35,829 --> 00:12:34,000
like we talked about a minute ago this

332
00:12:38,550 --> 00:12:35,839
is the 541

333
00:12:39,750 --> 00:12:38,560
it also has the five meter payload

334
00:12:41,430 --> 00:12:39,760
fairing

335
00:12:42,710 --> 00:12:41,440
and one of the questions i get asked all

336
00:12:44,949 --> 00:12:42,720
the time is you have this tiny little

337
00:12:45,910 --> 00:12:44,959
spacecraft relative to the size of that

338
00:12:47,910 --> 00:12:45,920

rocket

339
00:12:49,829 --> 00:12:47,920
why are you in your big payload fairing

340
00:12:52,550 --> 00:12:49,839
instead of your smaller one

341
00:12:53,269 --> 00:12:52,560
this is a special configuration partly

342
00:12:55,750 --> 00:12:53,279
because

343
00:12:56,629 --> 00:12:55,760
perseverance is relatively modest in

344
00:12:59,670 --> 00:12:56,639
size

345
00:13:02,470 --> 00:12:59,680
metric ton class spacecraft and so with

346
00:13:03,990 --> 00:13:02,480
all of that thrust coming off the pad

347
00:13:05,269 --> 00:13:04,000
there's a tremendous amount of

348
00:13:08,870 --> 00:13:05,279
acceleration

349
00:13:11,590 --> 00:13:08,880
and our upper stage the amazing centaur

350
00:13:13,990 --> 00:13:11,600
is one of the highest really the highest

351
00:13:15,430 --> 00:13:14,000
performance upper stages in the world

352
00:13:17,509 --> 00:13:15,440
and part of what gives it that

353
00:13:20,069 --> 00:13:17,519
distinction is as very

354
00:13:21,190 --> 00:13:20,079
thin balloon tanks to hold the

355
00:13:23,829 --> 00:13:21,200
propellants

356
00:13:25,190 --> 00:13:23,839
thinner than a dime unable to hold even

357
00:13:26,230 --> 00:13:25,200
their own shape unless they're

358
00:13:28,949 --> 00:13:26,240
pressurized

359
00:13:31,269 --> 00:13:28,959
and when we leap off the pad with all of

360
00:13:33,350 --> 00:13:31,279
that thrust the acceleration will be so

361
00:13:34,310 --> 00:13:33,360
intense it would literally collapse the

362
00:13:37,590 --> 00:13:34,320
centaur

363
00:13:39,990 --> 00:13:37,600

and so that larger payload fairing has a

364
00:13:41,030 --> 00:13:40,000
structure with inside that will take out

365
00:13:43,509 --> 00:13:41,040
that load

366
00:13:45,509 --> 00:13:43,519
because centaur can't handle the load

367
00:13:47,189 --> 00:13:45,519
the payload fairing does

368
00:13:49,509 --> 00:13:47,199
so that's the configuration of the

369
00:13:51,910 --> 00:13:49,519
rocket one other special thing about it

370
00:13:55,829 --> 00:13:51,920
is that payload fairing was fitted with

371
00:13:58,389 --> 00:13:55,839
special very large doors so the mm-rtg

372
00:14:00,310 --> 00:13:58,399
nuclear battery for perseverance

373
00:14:02,230 --> 00:14:00,320
could be installed actually in our

374
00:14:06,389 --> 00:14:02,240
vertical integration facility

375
00:14:08,710 --> 00:14:06,399
on top of the rocket wow and so

376
00:14:10,310 --> 00:14:08,720
is is the reason where you part of the

377
00:14:12,949 --> 00:14:10,320
reason we're using the larger rocket

378
00:14:13,509 --> 00:14:12,959
is because it has to travel so far do we

379
00:14:16,150 --> 00:14:13,519
need

380
00:14:16,629 --> 00:14:16,160
the extra boost to take it out into

381
00:14:19,350 --> 00:14:16,639
further

382
00:14:21,590 --> 00:14:19,360
out into space to get it to mars or yeah

383
00:14:23,269 --> 00:14:21,600
absolutely any planetary mission takes a

384
00:14:24,710 --> 00:14:23,279
great deal of energy and in this

385
00:14:26,790 --> 00:14:24,720
particular case

386
00:14:28,310 --> 00:14:26,800
we're going to accelerate perseverance

387
00:14:30,710 --> 00:14:28,320
to over 26

388
00:14:32,470 --> 00:14:30,720

000 miles per hour so that we're at a

389
00:14:34,230 --> 00:14:32,480
very high c3 what we call a

390
00:14:36,069 --> 00:14:34,240
characteristic energy

391
00:14:37,590 --> 00:14:36,079
which tells us whether or not we're

392
00:14:39,670 --> 00:14:37,600
going to go and escape

393
00:14:40,870 --> 00:14:39,680
the gravitational influence of a given

394
00:14:43,350 --> 00:14:40,880
body in this case

395
00:14:45,030 --> 00:14:43,360
earth so we will launch this on a

396
00:14:47,509 --> 00:14:45,040
hyperbolic

397
00:14:48,470 --> 00:14:47,519
escape trajectory it will take

398
00:14:51,030 --> 00:14:48,480
perseverance

399
00:14:53,189 --> 00:14:51,040
seven months to cross that distance and

400
00:14:53,509 --> 00:14:53,199
we can only do this as i think you guys

401
00:14:56,710 --> 00:14:53,519
know

402
00:14:58,629 --> 00:14:56,720
once every 26 months just when earth is

403
00:15:01,269 --> 00:14:58,639
overtaking and about to pass

404
00:15:02,069 --> 00:15:01,279
mars in its orbit and so we shoot it out

405
00:15:05,030 --> 00:15:02,079
there on this

406
00:15:06,150 --> 00:15:05,040
long sweeping elliptical home and

407
00:15:08,949 --> 00:15:06,160
transfer

408
00:15:10,069 --> 00:15:08,959
out literally aimed millions of miles in

409
00:15:12,470 --> 00:15:10,079
front of mars

410
00:15:14,710 --> 00:15:12,480
so that by the time mars gets there it

411
00:15:17,189 --> 00:15:14,720
actually captures the spacecraft

412
00:15:19,189 --> 00:15:17,199
and brings it in and so that takes a

413
00:15:21,030 --> 00:15:19,199

tremendous amount of energy

414
00:15:23,189 --> 00:15:21,040
but also a tremendous amount of

415
00:15:25,189 --> 00:15:23,199
precision because we're going to let go

416
00:15:27,509 --> 00:15:25,199
of that spacecraft right here next to

417
00:15:29,509 --> 00:15:27,519
earth just hundreds just you know around

418
00:15:30,150 --> 00:15:29,519
a thousand miles above the surface of

419
00:15:33,030 --> 00:15:30,160
earth

420
00:15:34,870 --> 00:15:33,040
and that sweeping arc is closer to 200

421
00:15:37,269 --> 00:15:34,880
million miles of distance to be

422
00:15:39,430 --> 00:15:37,279
traveled and it has very little

423
00:15:40,069 --> 00:15:39,440
perseverance has very little ability to

424
00:15:42,389 --> 00:15:40,079
adjust its

425
00:15:43,670 --> 00:15:42,399
trajectory so we have to aim it

426
00:15:46,069 --> 00:15:43,680
precisely

427
00:15:46,710 --> 00:15:46,079
after all of that acceleration and just

428
00:15:49,430 --> 00:15:46,720
gently

429
00:15:49,990 --> 00:15:49,440
let it go in the right direction amazing

430
00:15:51,749 --> 00:15:50,000
amazing

431
00:15:53,910 --> 00:15:51,759
what else we got from our viewers so a

432
00:15:56,150 --> 00:15:53,920
lot of the viewers had signed up to send

433
00:15:57,350 --> 00:15:56,160
their name to mars aboard the mars rover

434
00:16:00,230 --> 00:15:57,360
and they want to know is

435
00:16:01,509 --> 00:16:00,240
tori bruno's name also going to mars

436
00:16:03,350 --> 00:16:01,519
absolutely

437
00:16:04,790 --> 00:16:03,360
i was one of the early people to sign up

438
00:16:06,949 --> 00:16:04,800

how exciting

439
00:16:08,629 --> 00:16:06,959
i i mean not only would i say if my name

440
00:16:10,629 --> 00:16:08,639
was tory bruno i would send my name

441
00:16:11,990 --> 00:16:10,639
and a picture of my stash i'm just

442
00:16:13,910 --> 00:16:12,000
saying if it were me

443
00:16:15,670 --> 00:16:13,920
okay what else we got from our viewers

444
00:16:18,629 --> 00:16:15,680
um so we have a question

445
00:16:20,870 --> 00:16:18,639
um are there any uh major upgrades um

446
00:16:22,790 --> 00:16:20,880
going on at the launch pad right now

447
00:16:25,189 --> 00:16:22,800
yeah there's actually a ton of upgrades

448
00:16:26,949 --> 00:16:25,199
going on because we are developing new

449
00:16:29,350 --> 00:16:26,959
rocket called the vulcan

450
00:16:30,470 --> 00:16:29,360
which is much much larger than our atlas

451
00:16:32,870 --> 00:16:30,480
rocket oh wow

452
00:16:33,990 --> 00:16:32,880
and in fact more powerful than our three

453
00:16:36,870 --> 00:16:34,000
core delta four

454
00:16:39,670 --> 00:16:36,880
heavy and that rocket will share the pad

455
00:16:41,350 --> 00:16:39,680
with atlas until atlas flies out

456
00:16:43,670 --> 00:16:41,360
so if you went to the pad today you

457
00:16:44,150 --> 00:16:43,680
would see brand new liquid oxygen tanks

458
00:16:47,189 --> 00:16:44,160
because

459
00:16:49,269 --> 00:16:47,199
vulcan centaur 5 upper stage

460
00:16:50,790 --> 00:16:49,279
is so much larger we didn't have enough

461
00:16:53,030 --> 00:16:50,800
lox capacity

462
00:16:53,990 --> 00:16:53,040
and instead of burning kerosene like

463
00:16:56,550 --> 00:16:54,000

atlas

464
00:16:58,389 --> 00:16:56,560
vulcan burns methane so we added an

465
00:16:59,990 --> 00:16:58,399
entire methane farm

466
00:17:01,829 --> 00:17:00,000
and then maybe the last big thing you

467
00:17:05,029 --> 00:17:01,839
would see right at the pad

468
00:17:07,669 --> 00:17:05,039
is a upgraded almost twice as large

469
00:17:08,710 --> 00:17:07,679
acoustic water suppression system and

470
00:17:10,470 --> 00:17:08,720
when your viewers

471
00:17:12,390 --> 00:17:10,480
watch the launch tomorrow morning on the

472
00:17:14,230 --> 00:17:12,400
live stream and we say ignition

473
00:17:15,590 --> 00:17:14,240
they will see all this water spraying on

474
00:17:18,710 --> 00:17:15,600
the pad it's

475
00:17:20,710 --> 00:17:18,720
not for fire suppression at all it is

476
00:17:21,750 --> 00:17:20,720
literally there to absorb acoustic

477
00:17:25,110 --> 00:17:21,760
energy

478
00:17:27,590 --> 00:17:25,120
with the core in those large srm's if we

479
00:17:28,789 --> 00:17:27,600
let that sound reflect off the pad back

480
00:17:31,029 --> 00:17:28,799
onto the vehicle

481
00:17:32,630 --> 00:17:31,039
it would actually destroy perseverance

482
00:17:35,430 --> 00:17:32,640
even underneath the fairing

483
00:17:35,990 --> 00:17:35,440
and the water dampens that out vulcan

484
00:17:38,310 --> 00:17:36,000
needed

485
00:17:40,870 --> 00:17:38,320
so much more because it's a much larger

486
00:17:42,470 --> 00:17:40,880
rocket so we've just finished upgrading

487
00:17:44,310 --> 00:17:42,480
all of that as well

488
00:17:46,789 --> 00:17:44,320

so are there is there testing that goes

489
00:17:48,549 --> 00:17:46,799
along with ensuring the safety of the

490
00:17:49,669 --> 00:17:48,559
payload and et cetera as you're talking

491
00:17:53,510 --> 00:17:49,679
about oh yes

492
00:17:55,830 --> 00:17:53,520
yeah yeah you know so much testing

493
00:17:57,750 --> 00:17:55,840
so most of what we have been doing for

494
00:17:59,350 --> 00:17:57,760
the last couple of weeks down here is

495
00:18:01,510 --> 00:17:59,360
actually testing

496
00:18:03,430 --> 00:18:01,520
so we bring the rocket down in pieces

497
00:18:05,029 --> 00:18:03,440
from our decatur factory

498
00:18:06,470 --> 00:18:05,039
it doesn't look at when you're out there

499
00:18:08,310 --> 00:18:06,480
on the pad because there's nothing

500
00:18:10,150 --> 00:18:08,320
around it but that atlas with

501
00:18:13,350 --> 00:18:10,160
perseverance on top

502
00:18:14,150 --> 00:18:13,360
stands 20 stories high and so you can't

503
00:18:16,549 --> 00:18:14,160
move that

504
00:18:18,549 --> 00:18:16,559
in one piece instead we break it down

505
00:18:20,549 --> 00:18:18,559
into the stages we bring it here on the

506
00:18:22,390 --> 00:18:20,559
rocket ship which is our special ship

507
00:18:24,630 --> 00:18:22,400
that sails through the rivers

508
00:18:25,750 --> 00:18:24,640
down from decatur alabama through the

509
00:18:27,990 --> 00:18:25,760
caribbean around

510
00:18:29,990 --> 00:18:28,000
beneath florida and up here to the cape

511
00:18:30,789 --> 00:18:30,000
and then we have to assemble it here on

512
00:18:32,549 --> 00:18:30,799
site

513
00:18:33,990 --> 00:18:32,559

and then finally integrate it with the

514
00:18:36,549 --> 00:18:34,000
spacecraft so

515
00:18:38,150 --> 00:18:36,559
all of those interfaces all of those

516
00:18:39,510 --> 00:18:38,160
electronic systems

517
00:18:42,230 --> 00:18:39,520
everything on the rocket and the

518
00:18:45,270 --> 00:18:42,240
spacecraft have to be tested again

519
00:18:46,710 --> 00:18:45,280
after it's been assembled and tested and

520
00:18:48,470 --> 00:18:46,720
tested some more

521
00:18:50,549 --> 00:18:48,480
and then maybe even a little bit more

522
00:18:52,390 --> 00:18:50,559
because you really get one shot at this

523
00:18:55,350 --> 00:18:52,400
you know only every two years can we go

524
00:18:57,190 --> 00:18:55,360
to mars and if anything goes wrong

525
00:18:58,470 --> 00:18:57,200
you know this multi-billion dollar

526
00:19:01,110 --> 00:18:58,480
spacecraft

527
00:19:03,190 --> 00:19:01,120
this one-of-a-kind unique opportunity

528
00:19:04,870 --> 00:19:03,200
for which a lot of researchers have put

529
00:19:07,830 --> 00:19:04,880
their entire life's work

530
00:19:09,110 --> 00:19:07,840
into would be lost and so we don't like

531
00:19:10,950 --> 00:19:09,120
to take any chances

532
00:19:12,710 --> 00:19:10,960
even after we rolled to the pad we

533
00:19:14,870 --> 00:19:12,720
tested again

534
00:19:16,549 --> 00:19:14,880
so technically you're a one-way uber

535
00:19:17,990 --> 00:19:16,559
then we are one way

536
00:19:19,990 --> 00:19:18,000
okay i just wanted to make sure i

537
00:19:23,350 --> 00:19:20,000
clarify that's like going to the airport

538
00:19:24,549 --> 00:19:23,360

ah i see okay it's a drop off and then

539
00:19:25,669 --> 00:19:24,559
you're done right yeah

540
00:19:27,430 --> 00:19:25,679
all right what else we have from our

541
00:19:28,310 --> 00:19:27,440
viewers matt so this will be our last

542
00:19:31,190 --> 00:19:28,320
question from

543
00:19:32,870 --> 00:19:31,200
social um is it even possible for you to

544
00:19:33,909 --> 00:19:32,880
sleep the night before launch or are you

545
00:19:37,350 --> 00:19:33,919
too excited

546
00:19:40,789 --> 00:19:37,360
i get pretty excited you know it uh

547
00:19:43,029 --> 00:19:40,799
you know no launch ever gets old there's

548
00:19:44,789 --> 00:19:43,039
there's so much that has to go right

549
00:19:46,390 --> 00:19:44,799
nothing can go wrong

550
00:19:48,549 --> 00:19:46,400
you know what you're doing is an

551
00:19:50,789 --> 00:19:48,559
absolutely amazing feat you know this

552
00:19:52,549 --> 00:19:50,799
rocket will weigh almost 2 million

553
00:19:54,630 --> 00:19:52,559
pounds sitting on the launch pad

554
00:19:56,310 --> 00:19:54,640
it's a 20-story building that we're

555
00:19:58,390 --> 00:19:56,320
throwing into space

556
00:20:00,310 --> 00:19:58,400
to carry this precious cargo all of

557
00:20:02,789 --> 00:20:00,320
these millions of miles

558
00:20:03,669 --> 00:20:02,799
it's astonishing that we can do this as

559
00:20:06,070 --> 00:20:03,679
human beings

560
00:20:07,830 --> 00:20:06,080
at all and all these years later i still

561
00:20:10,149 --> 00:20:07,840
get that same feeling so

562
00:20:11,190 --> 00:20:10,159
no i won't get a lot of rest tonight

563
00:20:13,590 --> 00:20:11,200

yeah you know and you

564
00:20:14,789 --> 00:20:13,600
you talk about um things being

565
00:20:16,950 --> 00:20:14,799
astonishing and

566
00:20:19,029 --> 00:20:16,960
the work that goes into all of this you

567
00:20:20,470 --> 00:20:19,039
know honestly tori um

568
00:20:22,070 --> 00:20:20,480
you know on behalf of us you know we

569
00:20:24,710 --> 00:20:22,080
really want to thank your team for all

570
00:20:28,149 --> 00:20:24,720
the work that you guys do because if you

571
00:20:30,149 --> 00:20:28,159
didn't put in the work um the expertise

572
00:20:31,750 --> 00:20:30,159
even the the long hours and the

573
00:20:33,590 --> 00:20:31,760
sleepless nights you know to make this

574
00:20:35,510 --> 00:20:33,600
happen we would not be doing

575
00:20:37,270 --> 00:20:35,520
what we're doing now and and that's

576
00:20:38,950 --> 00:20:37,280
partly a definition of perseverance

577
00:20:40,230 --> 00:20:38,960
right is if we want it to happen if we

578
00:20:41,990 --> 00:20:40,240
want to make it happen

579
00:20:43,510 --> 00:20:42,000
then you know we're we're going to

580
00:20:45,029 --> 00:20:43,520
persevere we're going to figure it out

581
00:20:46,870 --> 00:20:45,039
and we're going to find a way to

582
00:20:48,390 --> 00:20:46,880
bring all of this together so thank you

583
00:20:51,110 --> 00:20:48,400
for being part of this

584
00:20:52,310 --> 00:20:51,120
mission and uh and helping us so you you

585
00:20:53,909 --> 00:20:52,320
know we're gonna we're gonna have a

586
00:20:56,950 --> 00:20:53,919
great show tomorrow

587
00:20:58,149 --> 00:20:56,960
and i i know as myself you know as many

588
00:20:59,750 --> 00:20:58,159

of the viewers we're gonna be very

589
00:21:00,950 --> 00:20:59,760
excited to see this thing um you know

590
00:21:02,950 --> 00:21:00,960
actually take off

591
00:21:04,310 --> 00:21:02,960
and and your team has has a lot to do

592
00:21:05,669 --> 00:21:04,320
with that so again thank you for

593
00:21:08,149 --> 00:21:05,679
everything that you've done

594
00:21:09,909 --> 00:21:08,159
thank you so um with that folks um that

595
00:21:12,390 --> 00:21:09,919
is that is our show for today

596
00:21:14,310 --> 00:21:12,400
you know um tori thank you again uh

597
00:21:16,710 --> 00:21:14,320
maddie of course always a pleasure

598
00:21:17,750 --> 00:21:16,720
i hope you guys um enjoyed the show and

599
00:21:20,390 --> 00:21:17,760
learned a lot about

600
00:21:22,710 --> 00:21:20,400
what goes on behind the scenes really to

601
00:21:25,029 --> 00:21:22,720
um launch something as special

602
00:21:26,470 --> 00:21:25,039
and unique as uh is what we're doing

603
00:21:28,390 --> 00:21:26,480
here and hope you guys

604
00:21:29,909 --> 00:21:28,400
guys get to enjoy the launch tomorrow

605
00:21:32,149 --> 00:21:29,919
thanks for tuning in once again i'm eve

606
00:21:33,110 --> 00:21:32,159
lamothe with egs com systems project

607
00:21:35,110 --> 00:21:33,120
manager