1
00:02:06,830 --> 00:00:36,610
[Music]

2
00:02:06,840 --> 00:02:11,810
me

3
00:03:02,830 --> 00:02:21,920
[Music]

4
00:04:17,670 --> 00:03:04,910
so

5
00:04:25,909 --> 00:04:19,349
thank you for joining our telecom we

6
00:04:30,710 --> 00:04:28,790
hello welcome to our teleconference we

7
00:04:31,909 --> 00:04:30,720
are doing some sound checks right now

8
00:04:34,150 --> 00:04:31,919
and after our sound check

9
00:04:35,110 --> 00:04:34,160
we will go live and start the briefing

10
00:04:37,430 --> 00:04:35,120
thank you

11
00:04:39,990 --> 00:04:37,440
to start i'd like to get the names of

12
00:04:44,870 --> 00:04:40,000
our presenters

13
00:04:47,990 --> 00:04:44,880

robert hogg on i'm sorry kim

14
00:04:48,000 --> 00:04:54,830
thank you and stand by we will go live

15
00:04:54,840 --> 00:05:38,710
shortly

16
00:05:42,710 --> 00:05:41,270
welcome to today's teleconference

17
00:05:45,510 --> 00:05:42,720
mission team members from

18
00:05:47,029 --> 00:05:45,520
nasa's jet propulsion laboratory in

19
00:05:49,189 --> 00:05:47,039
southern california

20
00:05:50,230 --> 00:05:49,199
will discuss some of the first

21
00:05:53,430 --> 00:05:50,240
accomplishments

22
00:05:56,550 --> 00:05:53,440
of the rover to date i'm your host

23
00:05:57,590 --> 00:05:56,560
raquel villanueva joining us on this

24
00:06:01,430 --> 00:05:57,600
teleconference

25
00:06:06,550 --> 00:06:01,440
is robert hogg perseverance

26
00:06:10,070 --> 00:06:06,560
deputy mission manager anais

27
00:06:13,749 --> 00:06:10,080
perseverance mobility test bed engineer

28
00:06:17,430 --> 00:06:13,759
and katie staff morgan perseverance

29
00:06:19,189 --> 00:06:17,440
deputy project scientist for anyone

30
00:06:20,309 --> 00:06:19,199
listening who would like to submit a

31
00:06:23,430 --> 00:06:20,319
question

32
00:06:25,189 --> 00:06:23,440
you can do so by using the countdown to

33
00:06:27,029 --> 00:06:25,199
mars hashtag

34
00:06:29,590 --> 00:06:27,039
our phone lines are now open to the

35
00:06:34,070 --> 00:06:29,600
media you can ask a question

36
00:06:36,309 --> 00:06:34,080
by pressing star one to enter the queue

37
00:06:37,990 --> 00:06:36,319
to access the images that we will be

38
00:06:41,749 --> 00:06:38,000

seeing during the event

39
00:06:46,230 --> 00:06:41,759
visit nasa.gov

40
00:06:49,589 --> 00:06:46,240
perseverance first to set the stage

41
00:06:51,990 --> 00:06:49,599
nasa's mars 2020 perseverance rover

42
00:06:53,350 --> 00:06:52,000
touched down at jezreel crater on

43
00:06:57,189 --> 00:06:53,360
february 18th

44
00:06:59,029 --> 00:06:57,199
and the team has been very busy since

45
00:07:03,029 --> 00:06:59,039
i'll hand it over to robert to talk

46
00:07:05,749 --> 00:07:03,039
about what the team has been up to

47
00:07:06,230 --> 00:07:05,759
thanks a lot raquel well everything is

48
00:07:08,550 --> 00:07:06,240
going

49
00:07:10,710 --> 00:07:08,560
very well on our latest mission to mars

50
00:07:11,990 --> 00:07:10,720
here perseverance has been doing an

51
00:07:13,830 --> 00:07:12,000
exceptional job

52
00:07:15,189 --> 00:07:13,840
during her first two weeks on the red

53
00:07:16,469 --> 00:07:15,199
planet

54
00:07:18,390 --> 00:07:16,479
one of the great things about the

55
00:07:19,830 --> 00:07:18,400
beginning days of these missions is all

56
00:07:20,950 --> 00:07:19,840
the things that happen for the very

57
00:07:23,830 --> 00:07:20,960
first time

58
00:07:26,550 --> 00:07:23,840
every day for example the first image

59
00:07:28,950 --> 00:07:26,560
that came down after we landed

60
00:07:30,870 --> 00:07:28,960
the rover's first radio report back to

61
00:07:32,950 --> 00:07:30,880
earth via our orbiters

62
00:07:34,629 --> 00:07:32,960
the first caller panorama of our landing

63
00:07:37,909 --> 00:07:34,639

site all the first

64
00:07:39,909 --> 00:07:37,919
instrument checks after landing and

65
00:07:40,950 --> 00:07:39,919
the first time we get to see various

66
00:07:43,749 --> 00:07:40,960
major parts

67
00:07:44,469 --> 00:07:43,759
of the system working as they should so

68
00:07:47,270 --> 00:07:44,479
on that note

69
00:07:47,990 --> 00:07:47,280
i am happy to report that yesterday

70
00:07:51,029 --> 00:07:48,000
afternoon

71
00:07:51,990 --> 00:07:51,039
we carried out our very first drive on

72
00:07:53,510 --> 00:07:52,000
mars

73
00:07:56,629 --> 00:07:53,520
go ahead and show that first picture

74
00:08:00,230 --> 00:07:58,150
here we're looking out the front of the

75
00:08:01,909 --> 00:08:00,240
rover and you can see our first tracks

76
00:08:05,189 --> 00:08:01,919
on mars and this was just

77
00:08:07,990 --> 00:08:05,199
so amazing to see last night

78
00:08:08,550 --> 00:08:08,000
and uh we're really happy about this

79
00:08:10,150 --> 00:08:08,560
andy

80
00:08:11,909 --> 00:08:10,160
is going to talk to this first drive in

81
00:08:13,350 --> 00:08:11,919
detail shortly so we'll come back to

82
00:08:16,390 --> 00:08:13,360
this

83
00:08:18,629 --> 00:08:16,400
so i'll describe another recent first

84
00:08:20,950 --> 00:08:18,639
which was our robotic arm checkout which

85
00:08:23,189 --> 00:08:20,960
we carried out on cell 12.

86
00:08:26,469 --> 00:08:23,199
go ahead and show that next graphic the

87
00:08:29,510 --> 00:08:26,479
simulation of the arm moving

88
00:08:32,230 --> 00:08:29,520

so this is with our five degree freedom

89
00:08:32,870 --> 00:08:32,240
seven foot long robotic arm with a very

90
00:08:35,350 --> 00:08:32,880
complex

91
00:08:35,909 --> 00:08:35,360
turret assembly at the end the turret

92
00:08:38,949 --> 00:08:35,919
weighs

93
00:08:42,070 --> 00:08:38,959
45 kilograms or close to 100 pounds so

94
00:08:42,550 --> 00:08:42,080
this thing is is massive what you're

95
00:08:45,030 --> 00:08:42,560
seeing

96
00:08:46,550 --> 00:08:45,040
in this simulation is it's actually a

97
00:08:48,630 --> 00:08:46,560
representation of

98
00:08:50,150 --> 00:08:48,640
the telemetry we got back of what the

99
00:08:53,110 --> 00:08:50,160
arm did on mars

100
00:08:54,150 --> 00:08:53,120
of all the different motions of the arm

101
00:08:56,949 --> 00:08:54,160
we call this the

102
00:08:57,750 --> 00:08:56,959
the no load checkout it unstows and

103
00:09:00,389 --> 00:08:57,760
places

104
00:09:01,990 --> 00:09:00,399
the whole arm in a vertical orientation

105
00:09:05,110 --> 00:09:02,000
and then it does a test wiggle

106
00:09:10,070 --> 00:09:05,120
of each joint and then it rested

107
00:09:13,750 --> 00:09:11,750
so here you're seeing the actual images

108
00:09:14,470 --> 00:09:13,760
from the rover that we got back of this

109
00:09:17,829 --> 00:09:14,480
activity

110
00:09:20,389 --> 00:09:17,839
which was super cool i should mention

111
00:09:22,230 --> 00:09:20,399
uh the turret has two of our very

112
00:09:24,949 --> 00:09:22,240
important science instruments

113
00:09:26,389 --> 00:09:24,959

sherlock and pixel and it also has an

114
00:09:29,829 --> 00:09:26,399
engineering camera

115
00:09:30,870 --> 00:09:29,839
watson so yeah sherlock and watson will

116
00:09:34,230 --> 00:09:30,880
be doing

117
00:09:36,389 --> 00:09:34,240
up close sleuthing for us on mars here

118
00:09:38,230 --> 00:09:36,399
and of course the turret has the very

119
00:09:41,110 --> 00:09:38,240
important operator and corer

120
00:09:43,190 --> 00:09:41,120
for drilling and taking the samples that

121
00:09:46,310 --> 00:09:43,200
we hope to return to earth

122
00:09:47,030 --> 00:09:46,320
and finally it has the gdrt we call it

123
00:09:49,910 --> 00:09:47,040
the gas

124
00:09:51,430 --> 00:09:49,920
dust removal tool for blowing surfaces

125
00:09:53,350 --> 00:09:51,440
clean

126
00:09:54,790 --> 00:09:53,360
this robotic arm is also used for

127
00:09:56,550 --> 00:09:54,800
engineering imaging

128
00:09:58,470 --> 00:09:56,560
for example being able to see under the

129
00:10:02,389 --> 00:09:58,480
rover where the helicopter is

130
00:10:05,350 --> 00:10:02,399
and taking our now famous rover selfies

131
00:10:06,710 --> 00:10:05,360
so great to see it unstowed here and put

132
00:10:09,350 --> 00:10:06,720
through its paces

133
00:10:10,230 --> 00:10:09,360
for the first time another important

134
00:10:13,829 --> 00:10:10,240
first

135
00:10:16,389 --> 00:10:13,839
instrument deployments

136
00:10:18,870 --> 00:10:16,399
checkouts and calibrations that we've

137
00:10:20,630 --> 00:10:18,880
been doing over the last five days

138
00:10:22,949 --> 00:10:20,640

one of these that was really fun to see

139
00:10:25,430 --> 00:10:22,959
was the uh the meta instrument

140
00:10:26,710 --> 00:10:25,440
our weather station from our partners in

141
00:10:30,790 --> 00:10:26,720
spain

142
00:10:33,269 --> 00:10:30,800
please show uh this next picture r4

143
00:10:34,470 --> 00:10:33,279
so in salt 12 we deployed the meta wind

144
00:10:37,030 --> 00:10:34,480
sensors

145
00:10:38,150 --> 00:10:37,040
which are housed on the mast and you can

146
00:10:40,949 --> 00:10:38,160
see them

147
00:10:41,910 --> 00:10:40,959
uh in testing on earth on the left and

148
00:10:45,030 --> 00:10:41,920
then on the right

149
00:10:48,310 --> 00:10:45,040
is a little animated gif of

150
00:10:50,710 --> 00:10:48,320
uh on mars showing each uh

151
00:10:52,710 --> 00:10:50,720
wind temperature successfully deploying

152
00:10:54,389 --> 00:10:52,720
uh so that was that was great to see

153
00:10:57,590 --> 00:10:54,399
there's one more important milestone i

154
00:11:00,870 --> 00:10:57,600
want to describe that doesn't involve

155
00:11:01,750 --> 00:11:00,880
any great images but it's vital and that

156
00:11:04,069 --> 00:11:01,760
is our flight

157
00:11:05,110 --> 00:11:04,079
software update the software that runs

158
00:11:08,470 --> 00:11:05,120
the rover

159
00:11:09,269 --> 00:11:08,480
after landing we spent a few saws doing

160
00:11:11,990 --> 00:11:09,279
a complete

161
00:11:12,310 --> 00:11:12,000
upgrade to our service software which

162
00:11:14,470 --> 00:11:12,320
has

163
00:11:16,150 --> 00:11:14,480

been in development and testing for many

164
00:11:18,550 --> 00:11:16,160
many years

165
00:11:20,550 --> 00:11:18,560
so this is the software that that really

166
00:11:23,430 --> 00:11:20,560
releases all the capabilities

167
00:11:25,350 --> 00:11:23,440
that first appearance has available for

168
00:11:28,550 --> 00:11:25,360
our surface mission

169
00:11:28,870 --> 00:11:28,560
it's about 16 megabytes so pretty small

170
00:11:32,069 --> 00:11:28,880
but

171
00:11:32,949 --> 00:11:32,079
when operating it has 140 tasks all

172
00:11:35,430 --> 00:11:32,959
running

173
00:11:37,269 --> 00:11:35,440
on the rover's computer at the same time

174
00:11:38,710 --> 00:11:37,279
and when we did this update we had to be

175
00:11:41,190 --> 00:11:38,720
very careful

176
00:11:42,230 --> 00:11:41,200
not to have any major problems because

177
00:11:44,790 --> 00:11:42,240
you know there's no

178
00:11:46,870 --> 00:11:44,800
helpline to call or any way that we can

179
00:11:50,710 --> 00:11:46,880
run over to the rover and press the big

180
00:11:52,470 --> 00:11:50,720
reset button so we were very careful and

181
00:11:53,350 --> 00:11:52,480
and getting it done was a big relief for

182
00:11:57,190 --> 00:11:53,360
the team

183
00:11:58,069 --> 00:11:57,200
and uh so the end result is is kind of

184
00:12:00,310 --> 00:11:58,079
like getting an

185
00:12:01,590 --> 00:12:00,320
update to your electric car stuff where

186
00:12:03,910 --> 00:12:01,600
one day your car

187
00:12:05,990 --> 00:12:03,920
knows how to do autonomous driving

188
00:12:06,629 --> 00:12:06,000

detecting obstacles and navigating by

189
00:12:09,110 --> 00:12:06,639
itself

190
00:12:11,829 --> 00:12:09,120
uh amongst many many other bells and

191
00:12:13,430 --> 00:12:11,839
whistles that we have in store

192
00:12:15,750 --> 00:12:13,440
all right so i'll now hand it over to

193
00:12:18,949 --> 00:12:15,760
anna east and she can tell you all about

194
00:12:22,550 --> 00:12:21,110
thanks robert so before i get into the

195
00:12:24,710 --> 00:12:22,560
first drive

196
00:12:26,710 --> 00:12:24,720
i wanted to give a little overview of

197
00:12:27,670 --> 00:12:26,720
our mobility system so if we go to the

198
00:12:30,710 --> 00:12:27,680
first graphic

199
00:12:33,509 --> 00:12:30,720
a1 so

200
00:12:34,949 --> 00:12:33,519
you'll see our rover during its first

201
00:12:38,150 --> 00:12:34,959
drive on earth

202
00:12:39,910 --> 00:12:38,160
we are six wheel drive so with one motor

203
00:12:41,829 --> 00:12:39,920
for each of the six wheels that move us

204
00:12:44,150 --> 00:12:41,839
forward and backward

205
00:12:45,030 --> 00:12:44,160
and our four corner wheels are able to

206
00:12:48,069 --> 00:12:45,040
steer so that's

207
00:12:49,910 --> 00:12:48,079
10 actuators total but with only eight

208
00:12:51,590 --> 00:12:49,920
motor control cards we can't drive the

209
00:12:53,350 --> 00:12:51,600
steer at the same time so if we ever

210
00:12:55,030 --> 00:12:53,360
want to turn we have to steer the four

211
00:12:57,030 --> 00:12:55,040
corner wheels in place first and then

212
00:12:59,670 --> 00:12:57,040
drive a longer path

213
00:13:01,350 --> 00:12:59,680

so we can turn in place or drive along

214
00:13:05,670 --> 00:13:01,360
six for richer arcs and

215
00:13:08,949 --> 00:13:05,680
all at a top speed of .01 miles per hour

216
00:13:10,389 --> 00:13:08,959
so not very fast and you'll kind of see

217
00:13:13,030 --> 00:13:10,399
you'll kind of see those arcs in those

218
00:13:15,509 --> 00:13:13,040
tracks when we get into a later picture

219
00:13:17,430 --> 00:13:15,519
of the first drive the wheels are all

220
00:13:18,470 --> 00:13:17,440
attached to a rocker bogey suspension

221
00:13:20,150 --> 00:13:18,480
system

222
00:13:22,550 --> 00:13:20,160
which has heritage all the way back to

223
00:13:23,430 --> 00:13:22,560
syndra and so even though perseverance

224
00:13:25,509 --> 00:13:23,440
is obviously

225
00:13:28,230 --> 00:13:25,519
a much larger rover we're still able to

226
00:13:28,629 --> 00:13:28,240
use it and with our suspension design we

227
00:13:30,310 --> 00:13:28,639
can

228
00:13:32,150 --> 00:13:30,320
technically drive over rocks that are

229
00:13:33,269 --> 00:13:32,160
about one wheel diameter in height while

230
00:13:36,389 --> 00:13:33,279
still keeping

231
00:13:38,550 --> 00:13:36,399
the rover chassis leveled um

232
00:13:40,710 --> 00:13:38,560
so you know i mentioned our suspension

233
00:13:42,550 --> 00:13:40,720
design has heritage back to the journey

234
00:13:44,629 --> 00:13:42,560
even part of parts of our software

235
00:13:45,670 --> 00:13:44,639
are built upon code that we've used in

236
00:13:47,829 --> 00:13:45,680
previous rovers

237
00:13:49,189 --> 00:13:47,839
so the mobility system that you see

238
00:13:51,269 --> 00:13:49,199

today is really built over

239
00:13:52,870 --> 00:13:51,279
decades and several missions with each

240
00:13:54,069 --> 00:13:52,880
one making improvements over its

241
00:13:55,670 --> 00:13:54,079
predecessor

242
00:13:57,590 --> 00:13:55,680
so some new things that we have on

243
00:14:00,069 --> 00:13:57,600
perseverance are are

244
00:14:01,110 --> 00:14:00,079
our redesigned wheels they're slightly

245
00:14:03,189 --> 00:14:01,120
narrower

246
00:14:05,430 --> 00:14:03,199
they're thicker with a larger diameter

247
00:14:07,350 --> 00:14:05,440
which gives us some better traction

248
00:14:08,870 --> 00:14:07,360
and we have a new browser design the

249
00:14:10,949 --> 00:14:08,880
grousers are the treads

250
00:14:12,710 --> 00:14:10,959
that tread patterns you see on the wheel

251
00:14:13,990 --> 00:14:12,720
and it makes us less prone to tears in

252
00:14:15,350 --> 00:14:14,000
the wheels when we drive over sharp

253
00:14:18,550 --> 00:14:15,360
rocks

254
00:14:19,030 --> 00:14:18,560
another notable new addition to our

255
00:14:21,030 --> 00:14:19,040
system

256
00:14:22,389 --> 00:14:21,040
is the vce which is our vision compute

257
00:14:24,389 --> 00:14:22,399
element

258
00:14:26,870 --> 00:14:24,399
if you remember from edl we have the vce

259
00:14:28,389 --> 00:14:26,880
for terrain relative navigation

260
00:14:30,310 --> 00:14:28,399
but now that we're on the surface we've

261
00:14:32,150 --> 00:14:30,320
repurposed it entirely

262
00:14:34,150 --> 00:14:32,160
for the surface mission to process

263
00:14:35,750 --> 00:14:34,160

imagery for mobility and help us with

264
00:14:38,470 --> 00:14:35,760
our autonomous navigation

265
00:14:40,310 --> 00:14:38,480
so that same electronic box because we

266
00:14:41,750 --> 00:14:40,320
can't physically change anything on it

267
00:14:43,670 --> 00:14:41,760
now that we're on mars

268
00:14:45,590 --> 00:14:43,680
now has a brand new software installed

269
00:14:48,389 --> 00:14:45,600
on it and it's ready to go for driving

270
00:14:49,750 --> 00:14:48,399
thanks to our incredible vce team

271
00:14:51,430 --> 00:14:49,760
so that was just one of the things that

272
00:14:52,230 --> 00:14:51,440
we did in preparation for our first

273
00:14:55,990 --> 00:14:52,240
drive

274
00:14:58,550 --> 00:14:56,000
um if we go to our second graphic a2

275
00:15:00,310 --> 00:14:58,560
we also did a sphere actuator checkout

276
00:15:02,150 --> 00:15:00,320
so i mentioned each of our four corner

277
00:15:04,150 --> 00:15:02,160
wheels are able to turn

278
00:15:05,670 --> 00:15:04,160
um we commanded each of those four

279
00:15:07,110 --> 00:15:05,680
wheels through a 30 degree range of

280
00:15:09,430 --> 00:15:07,120
motion while monitoring motor

281
00:15:12,310 --> 00:15:09,440
performance and suspension angles

282
00:15:13,829 --> 00:15:12,320
and it went really well in certain cases

283
00:15:15,030 --> 00:15:13,839
better than we expected we saw some

284
00:15:17,750 --> 00:15:15,040
performance but

285
00:15:20,069 --> 00:15:17,760
in some cases was better than we've seen

286
00:15:21,590 --> 00:15:20,079
on earth driving in the mars yard and

287
00:15:24,150 --> 00:15:21,600
whether that's from the underlying

288
00:15:26,230 --> 00:15:24,160

terrain or you know the mars gravity

289
00:15:27,590 --> 00:15:26,240
we're not entirely sure but it worked

290
00:15:29,829 --> 00:15:27,600
beautifully and

291
00:15:31,030 --> 00:15:29,839
we were so excited to move on to the

292
00:15:34,870 --> 00:15:31,040
first drive

293
00:15:37,030 --> 00:15:34,880
so if we go to a3

294
00:15:37,910 --> 00:15:37,040
you'll see what our first drive actually

295
00:15:41,749 --> 00:15:37,920
did yesterday

296
00:15:45,110 --> 00:15:41,759
so our plan which executed

297
00:15:47,509 --> 00:15:45,120
perfectly was to first drive four meters

298
00:15:50,550 --> 00:15:47,519
forward that's about 13 feet

299
00:15:53,670 --> 00:15:50,560
make 150 degree turn to the left

300
00:15:55,350 --> 00:15:53,680
counterclockwise and then back up

301
00:15:57,670 --> 00:15:55,360
about two and a half meters about eight

302
00:16:00,310 --> 00:15:57,680
feet and then during that drive

303
00:16:02,310 --> 00:16:00,320
we took a pause to image the touchdown

304
00:16:03,430 --> 00:16:02,320
contact patch on the tires so where the

305
00:16:06,069 --> 00:16:03,440
tires

306
00:16:07,670 --> 00:16:06,079
made contact or the wheels i should say

307
00:16:08,069 --> 00:16:07,680
where the wheels made contact with the

308
00:16:10,790 --> 00:16:08,079
ground

309
00:16:12,310 --> 00:16:10,800
when we landed and also throughout the

310
00:16:14,629 --> 00:16:12,320
drive we took some images

311
00:16:15,829 --> 00:16:14,639
from the nav cams and processed them on

312
00:16:18,069 --> 00:16:15,839
our vce

313
00:16:19,990 --> 00:16:18,079

to kind of prove that software pipeline

314
00:16:23,350 --> 00:16:20,000
that feeds images into the vce for

315
00:16:26,629 --> 00:16:23,360
perception and image processing

316
00:16:31,350 --> 00:16:26,639
so our first drive went incredibly well

317
00:16:35,110 --> 00:16:33,189
you can see the wheel tracks that we

318
00:16:36,870 --> 00:16:35,120
left on mars i don't think i've

319
00:16:39,110 --> 00:16:36,880
ever been happier to see wheel tracks

320
00:16:41,829 --> 00:16:39,120
and i've seen a lot of them

321
00:16:42,470 --> 00:16:41,839
and this is just a huge milestone for

322
00:16:44,550 --> 00:16:42,480
the mission

323
00:16:46,710 --> 00:16:44,560
and the mobility team like we've driven

324
00:16:49,509 --> 00:16:46,720
on earth but driving on mars is

325
00:16:51,430 --> 00:16:49,519
really the ultimate goal and just so

326
00:16:53,269 --> 00:16:51,440
many people i can't even count and work

327
00:16:54,790 --> 00:16:53,279
towards this very moment for years you

328
00:16:57,910 --> 00:16:54,800
know whether they worked on

329
00:16:59,829 --> 00:16:57,920
designing and building the actuators the

330
00:17:00,949 --> 00:16:59,839
newly redesigned wheels the motor

331
00:17:02,949 --> 00:17:00,959
control system

332
00:17:04,789 --> 00:17:02,959
writing this incredibly intricate

333
00:17:06,710 --> 00:17:04,799
mobility flight software

334
00:17:08,870 --> 00:17:06,720
or spending days and nights in the test

335
00:17:11,029 --> 00:17:08,880
bed in the mars yards testing debugging

336
00:17:12,949 --> 00:17:11,039
and retesting the mobility system

337
00:17:14,949 --> 00:17:12,959
to make sure everything works together

338
00:17:16,710 --> 00:17:14,959

like this is this is really what we've

339
00:17:19,510 --> 00:17:16,720
been working towards and

340
00:17:22,390 --> 00:17:19,520
it's just amazing to see i i don't think

341
00:17:25,829 --> 00:17:22,400
the team could have been happier

342
00:17:27,510 --> 00:17:25,839
so you know looking ahead

343
00:17:28,870 --> 00:17:27,520
we're gonna do some longer drives this

344
00:17:30,549 --> 00:17:28,880
is really just the beginning

345
00:17:31,990 --> 00:17:30,559
you know now that we've showed that

346
00:17:34,870 --> 00:17:32,000
we're able to drive when we can

347
00:17:35,990 --> 00:17:34,880
do this our mobility system is capable

348
00:17:38,390 --> 00:17:36,000
of doing

349
00:17:40,230 --> 00:17:38,400
so much more we still drive at 0.01

350
00:17:43,270 --> 00:17:40,240
miles per hour

351
00:17:45,110 --> 00:17:43,280
same curiosity but you know thanks to

352
00:17:46,630 --> 00:17:45,120
our improvements on our autonomous

353
00:17:47,430 --> 00:17:46,640
software our enhanced navigation

354
00:17:49,510 --> 00:17:47,440
software

355
00:17:51,590 --> 00:17:49,520
and our new cameras we can really drive

356
00:17:53,590 --> 00:17:51,600
five times faster than curiosity and

357
00:17:54,310 --> 00:17:53,600
we're capable of averaging about 200

358
00:17:57,590 --> 00:17:54,320
meters

359
00:17:59,510 --> 00:17:57,600
per saw um and that's also partially due

360
00:18:01,270 --> 00:17:59,520
to the vce which offloads

361
00:18:03,029 --> 00:18:01,280
you know the burden of image processing

362
00:18:05,909 --> 00:18:03,039
from the rover's main computer

363
00:18:06,789 --> 00:18:05,919

or able to think while driving so in

364
00:18:08,870 --> 00:18:06,799
other words

365
00:18:10,470 --> 00:18:08,880
perseverance can walk and chew gum at

366
00:18:12,390 --> 00:18:10,480
the same time

367
00:18:14,470 --> 00:18:12,400
is a phrase we kind of like to use and

368
00:18:15,029 --> 00:18:14,480
so we're able to take a stereo pair of

369
00:18:19,510 --> 00:18:15,039
images

370
00:18:20,789 --> 00:18:19,520
houses in the terrain and choose a safe

371
00:18:22,870 --> 00:18:20,799
path forward

372
00:18:24,310 --> 00:18:22,880
all while the wheels are still turning

373
00:18:26,789 --> 00:18:24,320
and moving forward

374
00:18:29,190 --> 00:18:26,799
and so this means we can drive longer in

375
00:18:33,029 --> 00:18:29,200
the same amount of time

376
00:18:35,590 --> 00:18:33,039
and we can have less time planning

377
00:18:36,310 --> 00:18:35,600
drives and driving on the surface which

378
00:18:38,150 --> 00:18:36,320
means

379
00:18:40,230 --> 00:18:38,160
more time to do science which is why

380
00:18:42,390 --> 00:18:40,240
we're there in the first place

381
00:18:44,390 --> 00:18:42,400
and speaking of science i will hand it

382
00:18:45,669 --> 00:18:44,400
over to katie to talk about what the

383
00:18:47,909 --> 00:18:45,679
science team is

384
00:18:49,990 --> 00:18:47,919
so excited to do with all the extra time

385
00:18:51,750 --> 00:18:50,000
they're going to have

386
00:18:53,750 --> 00:18:51,760
thanks so much anais if we could please

387
00:18:55,669 --> 00:18:53,760
bring up k1

388
00:18:57,750 --> 00:18:55,679

as the perseverance team celebrates the

389
00:18:58,870 --> 00:18:57,760
rover's first successful drive on the

390
00:19:00,870 --> 00:18:58,880
surface of mars

391
00:19:02,950 --> 00:19:00,880
i am honored and excited to announce

392
00:19:06,070 --> 00:19:02,960
that perseverance's landing site is now

393
00:19:08,549 --> 00:19:06,080
called octavia e butler landing

394
00:19:10,310 --> 00:19:08,559
if you could bring up k2 please the

395
00:19:12,390 --> 00:19:10,320
perseverance science team has chosen to

396
00:19:12,950 --> 00:19:12,400
name the touchdown site for octavia e

397
00:19:14,870 --> 00:19:12,960
butler

398
00:19:16,070 --> 00:19:14,880
a visionary author and pasadena

399
00:19:18,230 --> 00:19:16,080
california native

400
00:19:20,390 --> 00:19:18,240
who is the first african american woman

401
00:19:21,909 --> 00:19:20,400
to win both the hugo award and nebula

402
00:19:23,830 --> 00:19:21,919
prize for science fiction

403
00:19:26,390 --> 00:19:23,840
and the first science fiction writer to

404
00:19:28,230 --> 00:19:26,400
be awarded a macarthur fellowship

405
00:19:29,590 --> 00:19:28,240
butler's pioneering works explored

406
00:19:32,310 --> 00:19:29,600
themes of race

407
00:19:34,310 --> 00:19:32,320
gender equality and humanity centering

408
00:19:35,990 --> 00:19:34,320
on the experiences of black women at a

409
00:19:38,230 --> 00:19:36,000
time when such voices were largely

410
00:19:40,390 --> 00:19:38,240
absent from science fiction butler's

411
00:19:41,350 --> 00:19:40,400
protagonists embodied determination and

412
00:19:43,190 --> 00:19:41,360
inventiveness

413
00:19:44,710 --> 00:19:43,200

making her a perfect fit for the

414
00:19:47,430 --> 00:19:44,720
perseverance rover mission

415
00:19:48,470 --> 00:19:47,440
and its theme of overcoming challenges

416
00:19:50,070 --> 00:19:48,480
butler inspired

417
00:19:51,669 --> 00:19:50,080
and influenced the planetary science

418
00:19:53,190 --> 00:19:51,679
community and many beyond

419
00:19:54,950 --> 00:19:53,200
including those typically under

420
00:19:56,310 --> 00:19:54,960
represented in stem fields

421
00:19:58,390 --> 00:19:56,320
and the fact that her works are as

422
00:19:59,830 --> 00:19:58,400
relevant today if not more so

423
00:20:01,430 --> 00:19:59,840
than when they were originally written

424
00:20:01,990 --> 00:20:01,440
and published is a testament to her

425
00:20:04,310 --> 00:20:02,000
vision

426
00:20:05,990 --> 00:20:04,320
genius and timelessness naming

427
00:20:08,310 --> 00:20:06,000
perseverance's landing site in honor

428
00:20:09,990 --> 00:20:08,320
of octavia e butler honors a notable

429
00:20:12,149 --> 00:20:10,000
science fiction writer a theme

430
00:20:14,230 --> 00:20:12,159
also used by the mars science laboratory

431
00:20:16,070 --> 00:20:14,240
team who named the curiosity rover's

432
00:20:18,470 --> 00:20:16,080
landing site in honor of science fiction

433
00:20:20,230 --> 00:20:18,480
writer ray bradbury in 2012.

434
00:20:22,310 --> 00:20:20,240
we chose on this mission to continue

435
00:20:24,070 --> 00:20:22,320
this scene in appreciation of the role

436
00:20:25,990 --> 00:20:24,080
that science fiction writers have played

437
00:20:28,149 --> 00:20:26,000
in inspiring so many of us

438
00:20:29,510 --> 00:20:28,159

to become the engineers scientists and

439
00:20:31,190 --> 00:20:29,520
explorers who turn

440
00:20:33,110 --> 00:20:31,200
science fiction into reality for the

441
00:20:34,710 --> 00:20:33,120
next generation

442
00:20:36,470 --> 00:20:34,720
while perseverance has been positioned

443
00:20:38,789 --> 00:20:36,480
at octavia e butler landing

444
00:20:40,630 --> 00:20:38,799
the science team has been really busy uh

445
00:20:41,110 --> 00:20:40,640
the meta instrument the rover's weather

446
00:20:42,470 --> 00:20:41,120
station

447
00:20:44,710 --> 00:20:42,480
has already begun collecting and

448
00:20:46,310 --> 00:20:44,720
returning data to earth and two weeks

449
00:20:49,190 --> 00:20:46,320
into the mission we've received about

450
00:20:50,870 --> 00:20:49,200
7 000 images from the rover's cameras

451
00:20:52,789 --> 00:20:50,880
including our first views of some of the

452
00:20:54,470 --> 00:20:52,799
geologic targets of exploration that

453
00:20:57,190 --> 00:20:54,480
brought the rover to jezreel

454
00:20:58,950 --> 00:20:57,200
if we could bring please bring up k3

455
00:21:00,950 --> 00:20:58,960
this image is from the mass can be

456
00:21:03,270 --> 00:21:00,960
camera located on the rover's mast

457
00:21:04,630 --> 00:21:03,280
it shows a flat light-toned rock on the

458
00:21:06,789 --> 00:21:04,640
right side of the image

459
00:21:07,750 --> 00:21:06,799
on which we targeted the very first

460
00:21:09,909 --> 00:21:07,760
observation from

461
00:21:11,830 --> 00:21:09,919
supercam one of the rover's instruments

462
00:21:12,870 --> 00:21:11,840
for analyzing the composition of rocks

463
00:21:14,870 --> 00:21:12,880

at the surface

464
00:21:16,950 --> 00:21:14,880
results from this first observation will

465
00:21:17,669 --> 00:21:16,960
be presented at a special super cam

466
00:21:19,909 --> 00:21:17,679
briefing

467
00:21:20,710 --> 00:21:19,919
next wednesday but on the left side of

468
00:21:23,029 --> 00:21:20,720
the image

469
00:21:24,630 --> 00:21:23,039
rocks characterized by hole partially

470
00:21:26,710 --> 00:21:24,640
filled with dark sands

471
00:21:28,710 --> 00:21:26,720
contrast with the lighter tone smoother

472
00:21:30,789 --> 00:21:28,720
texture of the rock on the right

473
00:21:32,870 --> 00:21:30,799
the image colors that you can see um

474
00:21:34,950 --> 00:21:32,880
here are portray an estimate of the

475
00:21:36,549 --> 00:21:34,960
natural color of each of these beings

476
00:21:38,310 --> 00:21:36,559
and are approximately what this scene

477
00:21:39,909 --> 00:21:38,320
would look like if if you viewed it with

478
00:21:43,110 --> 00:21:39,919
your own eyes here on earth

479
00:21:44,870 --> 00:21:43,120
if we could please bring up k4 and what

480
00:21:46,630 --> 00:21:44,880
we can see in this image

481
00:21:48,470 --> 00:21:46,640
uh from the first high resolution

482
00:21:50,950 --> 00:21:48,480
panorama from mass kmz

483
00:21:51,990 --> 00:21:50,960
are distant deposits of the jezro delta

484
00:21:53,590 --> 00:21:52,000
in the background

485
00:21:55,110 --> 00:21:53,600
the rocks in the foreground may be

486
00:21:56,390 --> 00:21:55,120
similar to those in and around the

487
00:21:57,830 --> 00:21:56,400
rover's landing site

488
00:21:59,750 --> 00:21:57,840

but i'd like to call attention to the

489
00:22:01,510 --> 00:21:59,760
rocks in the mound in the background

490
00:22:03,590 --> 00:22:01,520
this is about a mile and a half away

491
00:22:05,350 --> 00:22:03,600
from the rover and these rocks look

492
00:22:07,190 --> 00:22:05,360
notably different in that you can

493
00:22:08,950 --> 00:22:07,200
actually resolve layering within the

494
00:22:10,630 --> 00:22:08,960
rocks you see in this outcrop

495
00:22:12,870 --> 00:22:10,640
these resistant layered rocks were

496
00:22:13,750 --> 00:22:12,880
likely deposited by rivers flowing into

497
00:22:16,070 --> 00:22:13,760
the ancient lake

498
00:22:17,590 --> 00:22:16,080
jezreel and scientists on the team are

499
00:22:19,510 --> 00:22:17,600
hard at work trying to understand the

500
00:22:20,070 --> 00:22:19,520
significance and origin of rocks like

501
00:22:21,430 --> 00:22:20,080
this

502
00:22:23,750 --> 00:22:21,440
that we're seeing on the ground at the

503
00:22:25,350 --> 00:22:23,760
landing site for the very first time

504
00:22:27,110 --> 00:22:25,360
but before we can think about exploring

505
00:22:28,789 --> 00:22:27,120
the jezreel delta we have to figure out

506
00:22:30,070 --> 00:22:28,799
how to get the rover there

507
00:22:31,990 --> 00:22:30,080
the science team is working with

508
00:22:33,029 --> 00:22:32,000
engineers to determine the best path for

509
00:22:35,430 --> 00:22:33,039
the rover to drive

510
00:22:36,390 --> 00:22:35,440
to the delta so if you could bring up k5

511
00:22:38,470 --> 00:22:36,400
please

512
00:22:40,390 --> 00:22:38,480
this is a base map made of orbiter

513
00:22:41,990 --> 00:22:40,400

images from the mars reconnaissance

514
00:22:43,990 --> 00:22:42,000
orbiter high-rise camera

515
00:22:45,350 --> 00:22:44,000
showing possible traverse paths that the

516
00:22:46,710 --> 00:22:45,360
science team is considering for

517
00:22:48,310 --> 00:22:46,720
exploring jezreel

518
00:22:50,390 --> 00:22:48,320
from the landing site which is the white

519
00:22:51,510 --> 00:22:50,400
dot there we're considering two options

520
00:22:54,710 --> 00:22:51,520
to get to the delta

521
00:22:58,390 --> 00:22:54,720
a clockwise path and a traverse so you

522
00:23:00,390 --> 00:22:58,400
can see here in blue and purple

523
00:23:02,630 --> 00:23:00,400
we're working with engineers now to

524
00:23:03,350 --> 00:23:02,640
determine which path is most efficient

525
00:23:05,029 --> 00:23:03,360
and safest

526
00:23:06,950 --> 00:23:05,039
and most scientifically interesting for

527
00:23:09,190 --> 00:23:06,960
the rover to explore and then we'll

528
00:23:10,950 --> 00:23:09,200
arrive there at the front of the delta

529
00:23:12,230 --> 00:23:10,960
from there we'll go and explore the

530
00:23:14,070 --> 00:23:12,240
delta

531
00:23:16,549 --> 00:23:14,080
and eventually winding up at the mouth

532
00:23:18,390 --> 00:23:16,559
of the river that once entered jezreel

533
00:23:20,390 --> 00:23:18,400
where we will likely deposit our very

534
00:23:22,310 --> 00:23:20,400
first sample depot

535
00:23:24,310 --> 00:23:22,320
but to return to near-term milestone the

536
00:23:26,470 --> 00:23:24,320
rover team has just planned to drive

537
00:23:28,470 --> 00:23:26,480
early this morning incorporating rimfax

538
00:23:29,110 --> 00:23:28,480

the rover's ground penetrating radar

539
00:23:31,510 --> 00:23:29,120
system that

540
00:23:33,350 --> 00:23:31,520
you can use to see into the subsurface

541
00:23:35,750 --> 00:23:33,360
this first data set will add to our

542
00:23:38,310 --> 00:23:35,760
understanding of the geologic context

543
00:23:39,350 --> 00:23:38,320
of octavia e butler landing and will set

544
00:23:41,990 --> 00:23:39,360
us on our path to

545
00:23:43,430 --> 00:23:42,000
begin exploration of jezreel crater so

546
00:23:46,070 --> 00:23:43,440
with that i'll hand things back to you

547
00:23:49,110 --> 00:23:48,070
thank you kahi and thanks to all our

548
00:23:52,870 --> 00:23:49,120
speakers

549
00:23:55,830 --> 00:23:52,880
we are now ready to take media questions

550
00:23:56,710 --> 00:23:55,840
remember to press star one to get put in

551
00:23:59,430 --> 00:23:56,720
the queue

552
00:24:00,470 --> 00:23:59,440
and please direct your questions to one

553
00:24:03,029 --> 00:24:00,480
of our guests

554
00:24:05,830 --> 00:24:03,039
we're also taking questions through the

555
00:24:08,549 --> 00:24:05,840
countdown to mars hashtag

556
00:24:10,549 --> 00:24:08,559
we'll start with marcia dunn from the

557
00:24:13,669 --> 00:24:10,559
associated press

558
00:24:15,510 --> 00:24:13,679
yes hi um can you hear me

559
00:24:17,669 --> 00:24:15,520
yes we can hear you yes i have a

560
00:24:19,750 --> 00:24:17,679
question from miss

561
00:24:20,870 --> 00:24:19,760
i'd like to know how you know i know you

562
00:24:24,710 --> 00:24:20,880
said that there over

563
00:24:27,590 --> 00:24:24,720

drove 40 meters then did a little spin

564
00:24:28,630 --> 00:24:27,600
in total how much distance has it

565
00:24:31,430 --> 00:24:28,640
traveled in this

566
00:24:33,269 --> 00:24:31,440
first test drive and over what period of

567
00:24:35,110 --> 00:24:33,279
time what's the odometer say and how

568
00:24:37,110 --> 00:24:35,120
long did it take to get there

569
00:24:41,830 --> 00:24:37,120
and when will it be driving again thank

570
00:24:50,630 --> 00:24:47,590
very much i'm not sure of the total

571
00:24:51,830 --> 00:24:50,640
odometer i mean to date this is this is

572
00:25:02,780 --> 00:24:51,840
all we've driven so

573
00:25:02,790 --> 00:25:10,070
[Music]

574
00:25:14,789 --> 00:25:13,110
marcia could you try muting

575
00:25:16,710 --> 00:25:14,799
yourself i'm trying to see if there's an

576
00:25:18,310 --> 00:25:16,720
issue with yes that might have been me

577
00:25:20,950 --> 00:25:18,320
my apologies

578
00:25:21,669 --> 00:25:20,960
no problem now let's try that again okay

579
00:25:26,830 --> 00:25:21,679
we'll have you

580
00:25:32,630 --> 00:25:29,350
seconds

581
00:25:36,789 --> 00:25:32,640
okay so um you know in total

582
00:25:40,710 --> 00:25:36,799
to do this it took us about 33 minutes

583
00:25:42,789 --> 00:25:40,720
like the drive it wasn't uh very long

584
00:25:46,070 --> 00:25:42,799
and we drove about six and a half meters

585
00:25:50,470 --> 00:25:48,230
when we plan on driving next uh that

586
00:25:54,149 --> 00:25:50,480
would be today

587
00:25:56,870 --> 00:25:54,159
we have a slightly longer drive plan

588
00:25:59,269 --> 00:25:56,880

i'm not exactly sure on the drive path

589
00:26:02,310 --> 00:25:59,279
because our rover planers have

590
00:26:05,350 --> 00:26:02,320
specked that out entirely but um

591
00:26:06,470 --> 00:26:05,360
yeah we will be we're driving today and

592
00:26:10,149 --> 00:26:06,480
hopefully tomorrow

593
00:26:13,110 --> 00:26:10,159
if all goes well

594
00:26:13,590 --> 00:26:13,120
all right thanks anais and up next is

595
00:26:17,830 --> 00:26:13,600
bill

596
00:26:19,590 --> 00:26:17,840
ask your question

597
00:26:24,870 --> 00:26:19,600
could you please mute your mic we'll try

598
00:26:26,950 --> 00:26:24,880
it out that way thank you

599
00:26:28,710 --> 00:26:26,960
uh absolutely i'll be happy to do that

600
00:26:30,630 --> 00:26:28,720
um a question for katie you know i was

601
00:26:32,789 --> 00:26:30,640
thinking back on curiosity and it seemed

602
00:26:34,470 --> 00:26:32,799
like the rover would get to mount sharp

603
00:26:36,470 --> 00:26:34,480
relatively quickly and of course it took

604
00:26:37,990 --> 00:26:36,480
months and months and months because of

605
00:26:40,230 --> 00:26:38,000
all the neat things you guys found to

606
00:26:41,990 --> 00:26:40,240
look at along the way is there even a

607
00:26:44,149 --> 00:26:42,000
nebulous timeline that says

608
00:26:45,909 --> 00:26:44,159
regardless of which path you choose how

609
00:26:46,950 --> 00:26:45,919
long it might take perseverance to get

610
00:26:48,630 --> 00:26:46,960
to the delta and

611
00:26:50,710 --> 00:26:48,640
i'm asking that especially because of

612
00:26:52,470 --> 00:26:50,720
the improvements you guys have put in it

613
00:26:54,549 --> 00:26:52,480

that let you go up to 200

614
00:26:55,830 --> 00:26:54,559
you know meters per day just just trying

615
00:26:59,190 --> 00:26:55,840
to get a sense of what

616
00:27:00,310 --> 00:26:59,200
the time is here thanks yeah that's it

617
00:27:01,909 --> 00:27:00,320
that's a great question and it's

618
00:27:02,549 --> 00:27:01,919
something we're very eager to know as

619
00:27:04,390 --> 00:27:02,559
well and

620
00:27:06,390 --> 00:27:04,400
actually we're right in the middle of

621
00:27:08,789 --> 00:27:06,400
conversations with what the

622
00:27:10,390 --> 00:27:08,799
strategic rover planners who are

623
00:27:12,149 --> 00:27:10,400
responsible for helping us figure out

624
00:27:13,190 --> 00:27:12,159
how long it takes to get places and and

625
00:27:15,750 --> 00:27:13,200
where we're going

626
00:27:17,029 --> 00:27:15,760
um and so they are just providing us the

627
00:27:19,029 --> 00:27:17,039
first estimate

628
00:27:20,310 --> 00:27:19,039
uh for for getting to the delta and so

629
00:27:21,750 --> 00:27:20,320
we are are

630
00:27:23,750 --> 00:27:21,760
learning that information real time

631
00:27:25,909 --> 00:27:23,760
ourselves as well so i don't have a

632
00:27:27,430 --> 00:27:25,919
an exact number to give you um but we

633
00:27:29,190 --> 00:27:27,440
are eagerly engaging in those

634
00:27:34,310 --> 00:27:29,200
conversations with the strategic rp's

635
00:27:38,070 --> 00:27:34,320
right now

636
00:27:42,950 --> 00:27:38,080
thank you katie and up next we have

637
00:27:47,669 --> 00:27:44,549
awesome thank you so much can you hear

638
00:27:50,950 --> 00:27:47,679

me yes we can hear you thank you

639
00:27:53,190 --> 00:27:50,960
great um so my question is for katie

640
00:27:54,549 --> 00:27:53,200
i'm curious now that perseverance has

641
00:27:57,029 --> 00:27:54,559
taken its first steps

642
00:27:58,950 --> 00:27:57,039
and you know over the last two weeks so

643
00:28:00,870 --> 00:27:58,960
many images have been sent back

644
00:28:02,389 --> 00:28:00,880
i'm curious to have mission scientists

645
00:28:04,230 --> 00:28:02,399
been able to determine

646
00:28:06,549 --> 00:28:04,240
some of the types of rocks and surface

647
00:28:07,430 --> 00:28:06,559
material that are being seen in jezreel

648
00:28:10,070 --> 00:28:07,440
crater and

649
00:28:13,510 --> 00:28:10,080
how that might compare with what you

650
00:28:18,149 --> 00:28:16,070
yes thank you for that so we we have

651
00:28:20,230 --> 00:28:18,159
acquired abundant images now of our

652
00:28:23,110 --> 00:28:20,240
landing area and so we are seeing

653
00:28:24,070 --> 00:28:23,120
uh all kinds of textures uh in the rocks

654
00:28:26,710 --> 00:28:24,080
that are around

655
00:28:27,190 --> 00:28:26,720
uh perseverance's landing site um but we

656
00:28:29,190 --> 00:28:27,200
are

657
00:28:30,470 --> 00:28:29,200
only just getting our other instruments

658
00:28:32,310 --> 00:28:30,480
checked out and so

659
00:28:33,830 --> 00:28:32,320
um those other instruments are really

660
00:28:36,070 --> 00:28:33,840
important for us uh

661
00:28:38,070 --> 00:28:36,080
to put together a model for how these

662
00:28:38,870 --> 00:28:38,080
rocks formed and what their significance

663
00:28:40,630 --> 00:28:38,880

might be

664
00:28:42,310 --> 00:28:40,640
and i think next wednesday we'll we'll

665
00:28:43,269 --> 00:28:42,320
hear results from the supercam

666
00:28:44,789 --> 00:28:43,279
instrument

667
00:28:46,310 --> 00:28:44,799
which i think is really the the next

668
00:28:48,149 --> 00:28:46,320
step in helping us determine

669
00:28:49,669 --> 00:28:48,159
uh what these rocks are and what they

670
00:28:52,630 --> 00:28:49,679
might be um

671
00:28:53,029 --> 00:28:52,640
we landed in a very interesting area uh

672
00:28:55,430 --> 00:28:53,039
where

673
00:28:57,510 --> 00:28:55,440
we are trying to to figure out uh the

674
00:28:59,269 --> 00:28:57,520
origin of these rocks are they volcanic

675
00:29:00,470 --> 00:28:59,279
or are they sedimentary

676
00:29:02,870 --> 00:29:00,480
and this is what the team has been

677
00:29:04,389 --> 00:29:02,880
thinking of um but it's hard to do that

678
00:29:06,630 --> 00:29:04,399
with images alone

679
00:29:08,070 --> 00:29:06,640
um and especially with kind of far

680
00:29:11,029 --> 00:29:08,080
distant images and so

681
00:29:12,549 --> 00:29:11,039
uh we can we do a lot of speculation on

682
00:29:14,870 --> 00:29:12,559
the line first

683
00:29:16,870 --> 00:29:14,880
with the science team but as we continue

684
00:29:18,149 --> 00:29:16,880
to acquire data sets

685
00:29:19,590 --> 00:29:18,159
and check out our instruments we're

686
00:29:21,830 --> 00:29:19,600
going to learn more about these rocks

687
00:29:23,830 --> 00:29:21,840
and get those close-up views

688
00:29:25,750 --> 00:29:23,840

of the textures and composition that are

689
00:29:27,269 --> 00:29:25,760
so important in helping us determine

690
00:29:31,750 --> 00:29:27,279
exactly what these rocks are that we're

691
00:29:35,669 --> 00:29:34,230
thank you katie up next we have a social

692
00:29:39,190 --> 00:29:35,679
media question

693
00:29:42,630 --> 00:29:39,200
bob on facebook asks what training

694
00:29:45,510 --> 00:29:42,640
do you have to drive the rover anna uses

695
00:29:51,510 --> 00:29:48,549
sure i can answer that question um so

696
00:29:53,190 --> 00:29:51,520
i my job is to look at data that's

697
00:29:55,590 --> 00:29:53,200
downlinked from the rover it's actually

698
00:29:57,350 --> 00:29:55,600
a completely different set of people

699
00:29:58,870 --> 00:29:57,360
that plan these drives you call them

700
00:30:02,710 --> 00:29:58,880
rover planners

701
00:30:05,750 --> 00:30:02,720
um and i believe the training you know

702
00:30:07,190 --> 00:30:05,760
is something like you know a few months

703
00:30:09,750 --> 00:30:07,200
of using like really specialized

704
00:30:13,190 --> 00:30:09,760
software and

705
00:30:14,789 --> 00:30:13,200
learning how to plan these drives

706
00:30:16,310 --> 00:30:14,799
and it's not actually something that

707
00:30:18,070 --> 00:30:16,320
i've done

708
00:30:19,669 --> 00:30:18,080
but as far as you know my background for

709
00:30:21,029 --> 00:30:19,679
being a mobility test engineer and

710
00:30:23,669 --> 00:30:21,039
getting into the field

711
00:30:24,549 --> 00:30:23,679
i majored in mechanical engineering at

712
00:30:26,789 --> 00:30:24,559
ucla

713
00:30:27,990 --> 00:30:26,799

and i was always interested in robotics

714
00:30:29,669 --> 00:30:28,000
and you know systems

715
00:30:31,990 --> 00:30:29,679
that moved and interacted with

716
00:30:33,590 --> 00:30:32,000
electronics and software and so

717
00:30:39,909 --> 00:30:33,600
that's how i got into what i'm doing but

718
00:30:46,549 --> 00:30:42,070
great thank you anis up next we have

719
00:30:52,950 --> 00:30:50,549
yeah hi let me turn my

720
00:30:56,149 --> 00:30:52,960
so um i had a couple questions have you

721
00:30:57,909 --> 00:30:56,159
guys made any o2 yet from the co2

722
00:30:59,830 --> 00:30:57,919
uh in the atmosphere i understand any of

723
00:31:02,230 --> 00:30:59,840
that and also um

724
00:31:03,269 --> 00:31:02,240
has anything gone wrong have there's

725
00:31:06,710 --> 00:31:03,279
been any kind of any

726
00:31:08,389 --> 00:31:06,720
unexpected glitches or sort of problems

727
00:31:09,669 --> 00:31:08,399
you've had to overcome in terms of

728
00:31:10,630 --> 00:31:09,679
you've come across while checking out

729
00:31:13,430 --> 00:31:10,640
the equipment

730
00:31:14,630 --> 00:31:13,440
and also what are we still talking about

731
00:31:16,149 --> 00:31:14,640
the same time frame that you had

732
00:31:17,350 --> 00:31:16,159
discussed earlier about as far as when

733
00:31:25,590 --> 00:31:17,360
you might get to the

734
00:31:30,070 --> 00:31:28,149
robert do you want to take that sure i

735
00:31:32,149 --> 00:31:30,080
can i can take some of those

736
00:31:33,110 --> 00:31:32,159
so no we haven't uh run the moxie

737
00:31:36,230 --> 00:31:33,120
experiment

738
00:31:37,909 --> 00:31:36,240

uh yet um and so we've

739
00:31:40,310 --> 00:31:37,919
checked out the instrument uh but we

740
00:31:41,909 --> 00:31:40,320
haven't uh generated any o2

741
00:31:43,990 --> 00:31:41,919
my knowledge and kitty can correct me on

742
00:31:47,350 --> 00:31:44,000
that if that's off

743
00:31:50,470 --> 00:31:47,360
and um we haven't had any

744
00:31:52,070 --> 00:31:50,480
hardware uh issues no everything has

745
00:31:52,470 --> 00:31:52,080
been working that we've been checking

746
00:31:56,310 --> 00:31:52,480
out

747
00:31:59,269 --> 00:31:56,320
um and so it's it's actually

748
00:31:59,990 --> 00:31:59,279
been amazingly smooth uh in that respect

749
00:32:03,590 --> 00:32:00,000
i'm gonna knock on

750
00:32:05,509 --> 00:32:03,600
wood here and uh we've had minor little

751
00:32:08,230 --> 00:32:05,519
things on on process

752
00:32:08,630 --> 00:32:08,240
and and questions come up but but it's

753
00:32:11,990 --> 00:32:08,640
all

754
00:32:13,269 --> 00:32:12,000
just minor stuff and and uh perseverance

755
00:32:15,110 --> 00:32:13,279
is

756
00:32:17,110 --> 00:32:15,120
everything that we've looked at and

757
00:32:19,669 --> 00:32:17,120
tried has worked beautifully and

758
00:32:20,870 --> 00:32:19,679
is really happy with the hardware uh on

759
00:32:23,350 --> 00:32:20,880
the surface

760
00:32:24,149 --> 00:32:23,360
um and then on the the helicopter tech

761
00:32:27,590 --> 00:32:24,159
demo

762
00:32:30,070 --> 00:32:27,600
we're still uh figuring out uh the

763
00:32:31,830 --> 00:32:30,080

possible flight zones and we're taking

764
00:32:34,630 --> 00:32:31,840
uh nav cam images

765
00:32:35,750 --> 00:32:34,640
uh stereo images to be able to analyze

766
00:32:37,590 --> 00:32:35,760
the train

767
00:32:39,590 --> 00:32:37,600
and also the team's been looking at

768
00:32:40,549 --> 00:32:39,600
orbital images looking at possible fight

769
00:32:42,630 --> 00:32:40,559
zones and

770
00:32:44,149 --> 00:32:42,640
long story short we're still aiming for

771
00:32:45,990 --> 00:32:44,159
getting that done in

772
00:32:50,149 --> 00:32:46,000
the spring here before uh we're in the

773
00:32:50,159 --> 00:32:53,190
thank you thanks so much

774
00:32:56,549 --> 00:32:55,029
thanks robert up next on the phone lines

775
00:33:01,190 --> 00:32:56,559
we have craig

776
00:33:03,590 --> 00:33:01,200
senior from knx news radio

777
00:33:05,350 --> 00:33:03,600
thank you i just wanted to know when you

778
00:33:07,350 --> 00:33:05,360
talked about the distance that it's

779
00:33:09,190 --> 00:33:07,360
traveled

780
00:33:10,630 --> 00:33:09,200
the way i calculated it was just over

781
00:33:11,909 --> 00:33:10,640
seven yards i want to make sure that's

782
00:33:13,909 --> 00:33:11,919
correct i also wanted to know

783
00:33:15,830 --> 00:33:13,919
and apologies if you said it already but

784
00:33:16,710 --> 00:33:15,840
how long did it take to travel that

785
00:33:21,590 --> 00:33:16,720
distance

786
00:33:27,350 --> 00:33:25,029
yeah so um so six and a half meters

787
00:33:28,870 --> 00:33:27,360
total i don't know the conversion

788
00:33:31,269 --> 00:33:28,880

off the top of my head but i think

789
00:33:34,149 --> 00:33:31,279
that's about 21 feet

790
00:33:35,029 --> 00:33:34,159
um that we've driven and it took us

791
00:33:41,509 --> 00:33:35,039
about half

792
00:33:50,070 --> 00:33:45,590
thank you thanks and after that we have

793
00:33:56,549 --> 00:33:53,110
uh hi i was just wondering if there is

794
00:33:58,710 --> 00:33:56,559
a timeline so far for when we might see

795
00:34:00,389 --> 00:33:58,720
some of the first uh tests of the

796
00:34:10,230 --> 00:34:00,399
helicopter

797
00:34:17,190 --> 00:34:14,629
sure so yes uh similarly um

798
00:34:18,629 --> 00:34:17,200
by first test maybe you mean flights uh

799
00:34:20,149 --> 00:34:18,639
we we are

800
00:34:21,990 --> 00:34:20,159
the first thing that has to happen is we

801
00:34:23,030 --> 00:34:22,000
need to deploy to the surface of mars

802
00:34:25,430 --> 00:34:23,040
and so we're

803
00:34:27,109 --> 00:34:25,440
still uh analyzing various areas to

804
00:34:30,069 --> 00:34:27,119
determine the best place to do that

805
00:34:31,589 --> 00:34:30,079
and the right place to do uh its flights

806
00:34:33,990 --> 00:34:31,599
it's flight zone

807
00:34:35,589 --> 00:34:34,000
so the first test will happen after the

808
00:34:38,629 --> 00:34:35,599
deployment happens

809
00:34:40,389 --> 00:34:38,639
uh and i i won't get into all the

810
00:34:41,750 --> 00:34:40,399
details on that we'll be covering that

811
00:34:45,829 --> 00:34:41,760
in a couple weeks

812
00:34:48,389 --> 00:34:45,839
um but again it's we're we're not on a

813
00:34:49,589 --> 00:34:48,399

uh a specific path at this time because

814
00:34:50,629 --> 00:34:49,599
we still need to figure out where we're

815
00:34:52,629 --> 00:34:50,639
going to do it and

816
00:34:55,750 --> 00:34:52,639
get through some other checkouts from in

817
00:34:58,950 --> 00:34:55,760
the uh sampling caching system area

818
00:35:00,790 --> 00:34:58,960
so uh we we hope to get the whole

819
00:35:03,430 --> 00:35:00,800
helicopter thing going before

820
00:35:05,349 --> 00:35:03,440
uh spring is over and so we'll be doing

821
00:35:08,230 --> 00:35:05,359
those first

822
00:35:09,990 --> 00:35:08,240
low spin tests and checkouts and stuff

823
00:35:13,829 --> 00:35:10,000
before the actual flights

824
00:35:17,510 --> 00:35:13,839
um uh definitely before the summer

825
00:35:19,190 --> 00:35:17,520
and to go off

826
00:35:21,589 --> 00:35:19,200
to go off what robert said in the next

827
00:35:23,990 --> 00:35:21,599
couple weeks we will have

828
00:35:26,069 --> 00:35:24,000
a briefing detailing the latest test

829
00:35:28,870 --> 00:35:26,079
schedule and milestones so

830
00:35:30,150 --> 00:35:28,880
stay tuned for that as well and then we

831
00:35:33,510 --> 00:35:30,160
now have a

832
00:35:37,349 --> 00:35:33,520
social media question to take bella

833
00:35:42,950 --> 00:35:37,359
in london she's nine years old she asks

834
00:35:42,960 --> 00:35:48,950
uh katie would you like to take that

835
00:35:54,470 --> 00:35:51,990
yeah although actually i i might um

836
00:35:55,030 --> 00:35:54,480
have robert help me out with this too um

837
00:35:57,270 --> 00:35:55,040
because

838
00:35:58,950 --> 00:35:57,280

what we what we've learned from the meta

839
00:36:02,069 --> 00:35:58,960
instrument is that it is indeed

840
00:36:05,030 --> 00:36:02,079
very cold on mars and

841
00:36:06,470 --> 00:36:05,040
rovers uh you know need to be warmed up

842
00:36:08,470 --> 00:36:06,480
to operate just like

843
00:36:10,470 --> 00:36:08,480
we need to stretch and flex our own

844
00:36:12,630 --> 00:36:10,480
muscles before we go for a run

845
00:36:14,470 --> 00:36:12,640
and so what the rover does is it uses

846
00:36:16,390 --> 00:36:14,480
heaters it has heaters uh

847
00:36:18,630 --> 00:36:16,400
that that are part of the rover um that

848
00:36:21,190 --> 00:36:18,640
it uses to heat up its various

849
00:36:22,550 --> 00:36:21,200
mechanisms and so before we do

850
00:36:24,310 --> 00:36:22,560
activities like

851
00:36:26,550 --> 00:36:24,320
driving or using the instruments or

852
00:36:28,710 --> 00:36:26,560
using the rover's arm the rover warms up

853
00:36:30,550 --> 00:36:28,720
it heats itself up so that its

854
00:36:34,069 --> 00:36:30,560
mechanisms work the way that we uh

855
00:36:39,190 --> 00:36:36,710
that's great katie yeah great question

856
00:36:41,430 --> 00:36:39,200
and and uh we we build perseverance out

857
00:36:44,390 --> 00:36:41,440
of materials that can handle

858
00:36:45,109 --> 00:36:44,400
the cold temperatures on mars and uh

859
00:36:47,349 --> 00:36:45,119
after we put

860
00:36:49,990 --> 00:36:47,359
all these different things together we

861
00:36:53,109 --> 00:36:50,000
put we put the whole rover in a big

862
00:36:54,790 --> 00:36:53,119
spacecraft test chamber and we take it

863
00:36:55,910 --> 00:36:54,800

down to the different temperatures that

864
00:36:59,510 --> 00:36:55,920
it's going to experience

865
00:36:59,910 --> 00:36:59,520
overnight and and during the day and so

866
00:37:08,390 --> 00:36:59,920
we

867
00:37:11,270 --> 00:37:08,400
rover and that's down at about 180

868
00:37:13,270 --> 00:37:11,280
fahrenheit just to make sure that you

869
00:37:13,910 --> 00:37:13,280
know all the aluminum pieces and all the

870
00:37:16,150 --> 00:37:13,920
electronic

871
00:37:17,030 --> 00:37:16,160
boards and everything are gonna do just

872
00:37:19,109 --> 00:37:17,040
fine

873
00:37:20,950 --> 00:37:19,119
and as katie mentioned a big part of

874
00:37:21,670 --> 00:37:20,960
that is making sure our whole heating

875
00:37:23,589 --> 00:37:21,680
system

876
00:37:25,430 --> 00:37:23,599
is working correctly to keep the

877
00:37:28,150 --> 00:37:25,440
sensitive parts

878
00:37:30,230 --> 00:37:28,160
warm enough so that we can have a

879
00:37:35,109 --> 00:37:30,240
mission for several years on mars

880
00:37:38,230 --> 00:37:37,670
yes thanks for writing and bella up next

881
00:37:42,630 --> 00:37:38,240
we do

882
00:37:45,190 --> 00:37:42,640
have irene clocks from aviation week

883
00:37:46,870 --> 00:37:45,200
thanks very much i have two questions uh

884
00:37:49,109 --> 00:37:46,880
first for katie

885
00:37:51,589 --> 00:37:49,119
is uh the decision about whether to go

886
00:37:52,790 --> 00:37:51,599
to the left or the right to the delta at

887
00:37:55,910 --> 00:37:52,800
all related to

888
00:37:59,190 --> 00:37:55,920

where the helipad is selected

889
00:38:02,150 --> 00:37:59,200
for those completely separate operations

890
00:38:03,990 --> 00:38:02,160
and for robert you mentioned the

891
00:38:06,870 --> 00:38:04,000
sampling caching system

892
00:38:07,589 --> 00:38:06,880
still has a checkout ahead what other

893
00:38:12,470 --> 00:38:07,599
instruments

894
00:38:15,750 --> 00:38:14,150
yeah i can take that that first part of

895
00:38:17,030 --> 00:38:15,760
the question thanks for the question

896
00:38:18,950 --> 00:38:17,040
um so there are a couple different

897
00:38:19,829 --> 00:38:18,960
factors uh that i think are are likely

898
00:38:21,990 --> 00:38:19,839
to play into

899
00:38:24,710 --> 00:38:22,000
our decision of whether to take the

900
00:38:27,109 --> 00:38:24,720
clockwise or counterclockwise route

901
00:38:28,470 --> 00:38:27,119
one is the the type of terrain and how

902
00:38:30,069 --> 00:38:28,480
quickly and efficiently

903
00:38:31,910 --> 00:38:30,079
uh the rover planners think we can

904
00:38:33,750 --> 00:38:31,920
traverse that terrain

905
00:38:36,230 --> 00:38:33,760
we're very excited to get to the delta

906
00:38:37,829 --> 00:38:36,240
and we want to begin that exploration so

907
00:38:40,310 --> 00:38:37,839
we are looking to to get there

908
00:38:41,750 --> 00:38:40,320
efficiently but also along the way uh

909
00:38:44,870 --> 00:38:41,760
we're interested in

910
00:38:45,589 --> 00:38:44,880
doing science as we go and so we're also

911
00:38:47,109 --> 00:38:45,599
thinking about

912
00:38:49,030 --> 00:38:47,119
interesting science targets along the

913
00:38:51,750 --> 00:38:49,040

way the the

914
00:38:52,790 --> 00:38:51,760
counterclockwise route to the north is

915
00:38:55,589 --> 00:38:52,800
very smooth

916
00:38:55,990 --> 00:38:55,599
uh relatively speaking um but perhaps

917
00:38:58,069 --> 00:38:56,000
less

918
00:39:00,230 --> 00:38:58,079
interesting science targets along that

919
00:39:02,870 --> 00:39:00,240
way whereas the southern route

920
00:39:04,310 --> 00:39:02,880
takes us past some of these remnant

921
00:39:05,829 --> 00:39:04,320
deposits of the delta

922
00:39:07,510 --> 00:39:05,839
which might give us an opportunity to

923
00:39:09,510 --> 00:39:07,520
preview the delta before actually

924
00:39:09,990 --> 00:39:09,520
arriving there so we're very interested

925
00:39:13,349 --> 00:39:10,000
in that

926
00:39:14,790 --> 00:39:13,359
that clockwise route and the decision to

927
00:39:17,030 --> 00:39:14,800
go north or south is

928
00:39:18,150 --> 00:39:17,040
is largely decoupled from the the

929
00:39:20,870 --> 00:39:18,160
helicopter

930
00:39:22,790 --> 00:39:20,880
um and and there are a number of flight

931
00:39:24,870 --> 00:39:22,800
zones that the team is considering

932
00:39:26,310 --> 00:39:24,880
uh but once the helicopter is has

933
00:39:26,870 --> 00:39:26,320
finished its mission that's when we'll

934
00:39:28,390 --> 00:39:26,880
decide

935
00:39:32,710 --> 00:39:28,400
really whether to take the clockwise or

936
00:39:36,950 --> 00:39:34,710
on the sampling caching system and

937
00:39:38,630 --> 00:39:36,960
instrument checkouts we're actually a a

938
00:39:40,829 --> 00:39:38,640

good

939
00:39:42,710 --> 00:39:40,839
deal along on all the instrument

940
00:39:44,470 --> 00:39:42,720
checkouts um

941
00:39:45,750 --> 00:39:44,480
we're just finishing up the basic

942
00:39:48,230 --> 00:39:45,760
checkouts and then there'll be

943
00:39:49,109 --> 00:39:48,240
more use case specific things that we'll

944
00:39:51,349 --> 00:39:49,119
be doing

945
00:39:52,710 --> 00:39:51,359
and one of those for example is the

946
00:39:54,790 --> 00:39:52,720
pixel and sherlock

947
00:39:57,030 --> 00:39:54,800
instruments at the end of the arm being

948
00:39:57,990 --> 00:39:57,040
placed up close to the martian terrain

949
00:40:00,710 --> 00:39:58,000
or rocks

950
00:40:02,069 --> 00:40:00,720
and doing their final checkouts in

951
00:40:04,870 --> 00:40:02,079
manners that they're going to be

952
00:40:06,470 --> 00:40:04,880
in actual use back to the sampling

953
00:40:07,990 --> 00:40:06,480
caching system

954
00:40:09,589 --> 00:40:08,000
after we get through the instrument

955
00:40:11,270 --> 00:40:09,599
checkouts that we're doing in this first

956
00:40:13,030 --> 00:40:11,280
drive with rimfact

957
00:40:14,870 --> 00:40:13,040
we're going to get into the the

958
00:40:18,230 --> 00:40:14,880
beginnings of

959
00:40:20,309 --> 00:40:18,240
deploying uh various parts of

960
00:40:22,150 --> 00:40:20,319
sampling caching like the belly pan off

961
00:40:23,270 --> 00:40:22,160
the rover

962
00:40:25,750 --> 00:40:23,280
things like that then we're going to do

963
00:40:29,190 --> 00:40:25,760

the helicopter tech demo then come back

964
00:40:32,390 --> 00:40:29,200
and finish commissioning the whole

965
00:40:33,510 --> 00:40:32,400
uh sampling caching uh uh assembly line

966
00:40:36,069 --> 00:40:33,520
if you will

967
00:40:36,630 --> 00:40:36,079
with with the internal uh arm to handle

968
00:40:41,670 --> 00:40:36,640
the

969
00:40:43,589 --> 00:40:41,680
and all that so that we're totally

970
00:40:45,829 --> 00:40:43,599
prepared to be able to

971
00:40:53,829 --> 00:40:45,839
capture samples and get them ready for

972
00:40:56,710 --> 00:40:53,839
return to earth

973
00:40:57,109 --> 00:40:56,720
thank you and up next on the phone lines

974
00:41:01,589 --> 00:40:57,119
is

975
00:41:04,150 --> 00:41:01,599
john amos from bbc london

976
00:41:05,670 --> 00:41:04,160
uh hi people thanks very much and um

977
00:41:09,109 --> 00:41:05,680
it's good to talk to you

978
00:41:10,470 --> 00:41:09,119
um first question really is are we able

979
00:41:12,950 --> 00:41:10,480
to say that we've

980
00:41:14,870 --> 00:41:12,960
kind of moved from uh commissioning

981
00:41:16,950 --> 00:41:14,880
phase now into

982
00:41:18,390 --> 00:41:16,960
to exploration um i mean you're going to

983
00:41:21,510 --> 00:41:18,400
be moving now and

984
00:41:21,829 --> 00:41:21,520
and doing stuff and really for katie

985
00:41:24,950 --> 00:41:21,839
that

986
00:41:27,750 --> 00:41:24,960
past

987
00:41:29,190 --> 00:41:27,760
that particular mound uh that you showed

988
00:41:31,829 --> 00:41:29,200

us and what's quite

989
00:41:33,670 --> 00:41:31,839
interesting about it is that there is um

990
00:41:36,230 --> 00:41:33,680
there's a defined

991
00:41:37,030 --> 00:41:36,240
rock wall on that and when you look at

992
00:41:43,750 --> 00:41:37,040
the

993
00:41:47,030 --> 00:41:43,760
awful lot of how can i put it

994
00:41:47,990 --> 00:41:47,040
dusty slope as opposed to defined rock

995
00:41:50,069 --> 00:41:48,000
wall which you could

996
00:41:53,510 --> 00:41:50,079
get up close to uh and examine those

997
00:41:57,589 --> 00:41:55,750
yes i can take that question so uh while

998
00:41:58,870 --> 00:41:57,599
the to address the first part so while

999
00:42:01,750 --> 00:41:58,880
the rover is still

1000
00:42:04,150 --> 00:42:01,760
um doing a lot of engineering checkouts

1001
00:42:06,550 --> 00:42:04,160
and we do of course have the helicopter

1002
00:42:08,470 --> 00:42:06,560
mission to to get started i do think the

1003
00:42:10,230 --> 00:42:08,480
minute the the rover begins to move we

1004
00:42:11,829 --> 00:42:10,240
can consider ourselves explorers on the

1005
00:42:14,710 --> 00:42:11,839
surface of mars and so i think

1006
00:42:15,349 --> 00:42:14,720
very much we can say that um though we

1007
00:42:17,430 --> 00:42:15,359
won't really

1008
00:42:19,030 --> 00:42:17,440
really begin our our science exploration

1009
00:42:21,750 --> 00:42:19,040
mission in earnest until the

1010
00:42:23,990 --> 00:42:21,760
the helicopter has finished its mission

1011
00:42:27,030 --> 00:42:24,000
um and yes i can confirm that the

1012
00:42:27,670 --> 00:42:27,040
uh delta remnant that i showed in the

1013
00:42:31,190 --> 00:42:27,680

image

1014
00:42:33,750 --> 00:42:31,200
is along that southern path and

1015
00:42:35,430 --> 00:42:33,760
we we are intrigued by these resistant

1016
00:42:37,510 --> 00:42:35,440
uh outcrops because we

1017
00:42:39,109 --> 00:42:37,520
we know there is indeed rock to explore

1018
00:42:41,829 --> 00:42:39,119
there but you know we're also

1019
00:42:43,670 --> 00:42:41,839
uh intrigued by these these slopes that

1020
00:42:45,670 --> 00:42:43,680
are

1021
00:42:47,030 --> 00:42:45,680
kind of weathering back into the into

1022
00:42:49,349 --> 00:42:47,040
the delta outcrop

1023
00:42:50,710 --> 00:42:49,359
um because while there are parts of the

1024
00:42:53,829 --> 00:42:50,720
the delta front

1025
00:42:55,910 --> 00:42:53,839
uh that that look like rocky slopes what

1026
00:42:58,309 --> 00:42:55,920
that tends to mean is that those rocks

1027
00:43:00,069 --> 00:42:58,319
are are more or less resistant to

1028
00:43:01,349 --> 00:43:00,079
weathering and often because they are

1029
00:43:02,550 --> 00:43:01,359
finer grained and that's very

1030
00:43:04,950 --> 00:43:02,560
characteristic

1031
00:43:06,550 --> 00:43:04,960
of things like shales uh here on earth

1032
00:43:07,270 --> 00:43:06,560
that you might expect to find in a delta

1033
00:43:09,349 --> 00:43:07,280
deposit

1034
00:43:10,950 --> 00:43:09,359
and those very fine grain rocks that you

1035
00:43:13,190 --> 00:43:10,960
see in a delta deposit

1036
00:43:14,550 --> 00:43:13,200
are those rocks that we are looking to

1037
00:43:17,030 --> 00:43:14,560
to study for potential

1038
00:43:17,990 --> 00:43:17,040

biosignatures and signs of organic

1039
00:43:19,990 --> 00:43:18,000
carbon

1040
00:43:22,150 --> 00:43:20,000
and there are places along the delta not

1041
00:43:22,710 --> 00:43:22,160
necessarily viewable in our images just

1042
00:43:24,630 --> 00:43:22,720
yet

1043
00:43:25,910 --> 00:43:24,640
um that are equivalent to those slopes

1044
00:43:27,430 --> 00:43:25,920
but actually we can tell from the

1045
00:43:29,190 --> 00:43:27,440
orbiter images our actual

1046
00:43:30,710 --> 00:43:29,200
rock outcrops and that's really what

1047
00:43:32,069 --> 00:43:30,720
we're interested in exploring once we

1048
00:43:33,349 --> 00:43:32,079
get to the delta

1049
00:43:34,950 --> 00:43:33,359
and so we're interested in checking out

1050
00:43:35,750 --> 00:43:34,960
these different types of rocks within

1051
00:43:37,670 --> 00:43:35,760
the delta

1052
00:43:39,030 --> 00:43:37,680
including these very fine grain rocks as

1053
00:43:40,790 --> 00:43:39,040
well as the more resistant

1054
00:43:43,030 --> 00:43:40,800
likely sandstones that we're seeing in

1055
00:43:49,589 --> 00:43:43,040
those first images of the delta remnants

1056
00:43:52,950 --> 00:43:52,230
thank you up next we have stephen clark

1057
00:44:00,950 --> 00:43:52,960
from

1058
00:44:02,950 --> 00:44:00,960
flight now i'm just curious

1059
00:44:05,589 --> 00:44:02,960
when you expect to take out the drill

1060
00:44:07,750 --> 00:44:05,599
and collect your first sample

1061
00:44:09,589 --> 00:44:07,760
will that be on the drive towards the

1062
00:44:10,470 --> 00:44:09,599
delta or will you wait until you get to

1063
00:44:12,710 --> 00:44:10,480

the delta

1064
00:44:14,150 --> 00:44:12,720
and also um going forward will you be

1065
00:44:16,630 --> 00:44:14,160
releasing daily

1066
00:44:17,910 --> 00:44:16,640
uh status reports or summaries of what's

1067
00:44:21,270 --> 00:44:17,920
been going on with the rover

1068
00:44:24,950 --> 00:44:21,280
like jbl has for previous rover missions

1069
00:44:25,910 --> 00:44:24,960
thank you i'll talk about the first part

1070
00:44:28,069 --> 00:44:25,920
of that and

1071
00:44:30,150 --> 00:44:28,079
yes in that um from a science

1072
00:44:32,150 --> 00:44:30,160
perspective we are very interested in

1073
00:44:33,829 --> 00:44:32,160
the rocks in and around where the rover

1074
00:44:35,829 --> 00:44:33,839
is as well as the rocks

1075
00:44:37,190 --> 00:44:35,839
along the way to the delta and at the

1076
00:44:39,109 --> 00:44:37,200
delta itself

1077
00:44:41,670 --> 00:44:39,119
so when sampling capabilities do come

1078
00:44:43,510 --> 00:44:41,680
online and i i'll pass that to robert

1079
00:44:45,589 --> 00:44:43,520
to address in a moment but we are

1080
00:44:46,870 --> 00:44:45,599
interested in drilling the the types of

1081
00:44:48,710 --> 00:44:46,880
rocks that we have in and around the

1082
00:44:51,589 --> 00:44:48,720
landing site but those also

1083
00:44:53,349 --> 00:44:51,599
extend further along the path that the

1084
00:44:54,870 --> 00:44:53,359
rover will likely drive to the delta

1085
00:44:56,390 --> 00:44:54,880
so from a sampling perspective and a

1086
00:44:57,589 --> 00:44:56,400
science perspective we're interested in

1087
00:44:59,349 --> 00:44:57,599
sampling the rocks

1088
00:45:00,710 --> 00:44:59,359

in and around where the rover is now as

1089
00:45:04,550 --> 00:45:00,720
well as the ones that we'll see along

1090
00:45:07,349 --> 00:45:04,560
the way to the delta

1091
00:45:07,829 --> 00:45:07,359
sure thanks katie and and as far as uh

1092
00:45:10,710 --> 00:45:07,839
getting

1093
00:45:12,309 --> 00:45:10,720
ready engineering wise for for drilling

1094
00:45:13,990 --> 00:45:12,319
uh that's gonna happen after the the

1095
00:45:16,230 --> 00:45:14,000
helicopter tech demo

1096
00:45:17,349 --> 00:45:16,240
when we finish all the commissioning and

1097
00:45:19,430 --> 00:45:17,359
calibration

1098
00:45:20,790 --> 00:45:19,440
and checkouts for for the whole sampling

1099
00:45:23,589 --> 00:45:20,800
and caching system and

1100
00:45:24,230 --> 00:45:23,599
using the robotic arm and the brighter

1101
00:45:26,950 --> 00:45:24,240
and core

1102
00:45:28,470 --> 00:45:26,960
is going to be part of that and then uh

1103
00:45:29,750 --> 00:45:28,480
to your question about the the daily

1104
00:45:31,990 --> 00:45:29,760
reports i

1105
00:45:33,910 --> 00:45:32,000
i don't have the answer off the top of

1106
00:45:34,630 --> 00:45:33,920
my head i can look into that but i will

1107
00:45:37,829 --> 00:45:34,640
say that

1108
00:45:39,430 --> 00:45:37,839
our raw images uh website is up and

1109
00:45:42,069 --> 00:45:39,440
running and so

1110
00:45:44,950 --> 00:45:42,079
all the images that we take get dumped

1111
00:45:47,670 --> 00:45:44,960
on there uh within 24 hours i believe

1112
00:45:48,630 --> 00:45:47,680
um and so anyway anyone can jump on

1113
00:45:51,030 --> 00:45:48,640

there and

1114
00:45:52,790 --> 00:45:51,040
see the rover tracks showing up shortly

1115
00:45:55,990 --> 00:45:52,800
and all the uh mass cam

1116
00:45:57,270 --> 00:45:56,000
panorama images and everything uh

1117
00:46:01,030 --> 00:45:57,280
dumping on there daily

1118
00:46:04,069 --> 00:46:01,040
uh from an image basis

1119
00:46:05,990 --> 00:46:04,079
and stephen also so you know that

1120
00:46:08,309 --> 00:46:06,000
we do have updates that we're trying to

1121
00:46:11,589 --> 00:46:08,319
get as quickly as possible online

1122
00:46:14,069 --> 00:46:11,599
you can go to at nasa persevere

1123
00:46:16,829 --> 00:46:14,079
on social media for updates and you can

1124
00:46:18,630 --> 00:46:16,839
also go to

1125
00:46:27,510 --> 00:46:18,640
mars.nasa.gov

1126
00:46:28,309 --> 00:46:27,520
perseverance and then the next person on

1127
00:46:31,349 --> 00:46:28,319
the phone line

1128
00:46:35,430 --> 00:46:31,359
is leonard david from inside

1129
00:46:37,910 --> 00:46:35,440
outer space hi thanks very much

1130
00:46:39,589 --> 00:46:37,920
i just had a kind of a broader question

1131
00:46:43,190 --> 00:46:39,599
about

1132
00:46:44,150 --> 00:46:43,200
nasa has you know now three robots on

1133
00:46:46,870 --> 00:46:44,160
mars

1134
00:46:48,950 --> 00:46:46,880
i was curious about brain drains between

1135
00:46:51,910 --> 00:46:48,960
projects i mean do you have

1136
00:46:52,870 --> 00:46:51,920
people with expertise running between

1137
00:46:56,069 --> 00:46:52,880
the projects

1138
00:47:00,550 --> 00:46:56,079

are they sequestered in their own

1139
00:47:03,990 --> 00:47:02,309
i can start with this one and then i'd

1140
00:47:06,870 --> 00:47:04,000
like to hear katie's thoughts as well

1141
00:47:08,470 --> 00:47:06,880
uh so i worked on uh the mars science

1142
00:47:12,069 --> 00:47:08,480
lab for

1143
00:47:13,109 --> 00:47:12,079
seven years um and and then uh i

1144
00:47:16,309 --> 00:47:13,119
actually worked on

1145
00:47:19,190 --> 00:47:16,319
msl after it landed in operations

1146
00:47:20,390 --> 00:47:19,200
uh and and worked on march 20 20 half

1147
00:47:23,430 --> 00:47:20,400
and half so

1148
00:47:26,309 --> 00:47:23,440
uh that's anecdotally to say we

1149
00:47:26,630 --> 00:47:26,319
we have uh the same the same engineers

1150
00:47:30,549 --> 00:47:26,640
that

1151
00:47:33,270 --> 00:47:30,559
and carrying this

1152
00:47:34,710 --> 00:47:33,280
exceptional mars program forward of

1153
00:47:36,470 --> 00:47:34,720
project to project

1154
00:47:38,950 --> 00:47:36,480
and the same will be happening happening

1155
00:47:42,549 --> 00:47:38,960
with the sample return rover

1156
00:47:44,069 --> 00:47:42,559
so we and we have engineers go back and

1157
00:47:46,309 --> 00:47:44,079
forth scientists go back and forth

1158
00:47:48,870 --> 00:47:46,319
between the projects and share knowledge

1159
00:47:49,829 --> 00:47:48,880
between the projects and and i'll say

1160
00:47:53,589 --> 00:47:49,839
with this

1161
00:47:55,910 --> 00:47:53,599
first time that we've had

1162
00:47:57,030 --> 00:47:55,920
a system that's been designed so close

1163
00:47:59,510 --> 00:47:57,040

to

1164
00:48:00,950 --> 00:47:59,520
um or we started from kind of from a

1165
00:48:03,829 --> 00:48:00,960
heritage standpoint

1166
00:48:05,670 --> 00:48:03,839
we started from the msl design so all

1167
00:48:07,829 --> 00:48:05,680
the folks that designed and tested that

1168
00:48:10,309 --> 00:48:07,839
and put it on mars

1169
00:48:12,470 --> 00:48:10,319
they're all at jpl already working on

1170
00:48:13,430 --> 00:48:12,480
the project or around and so we're able

1171
00:48:16,790 --> 00:48:13,440
to

1172
00:48:18,950 --> 00:48:16,800
pick their brains as needed so i i'd say

1173
00:48:19,270 --> 00:48:18,960
it's not a drain between the projects

1174
00:48:21,670 --> 00:48:19,280
but

1175
00:48:24,069 --> 00:48:21,680
more a confluence that takes advantage

1176
00:48:25,829 --> 00:48:24,079
of all those same engineers who can

1177
00:48:28,950 --> 00:48:25,839
chip into these different missions in

1178
00:48:30,230 --> 00:48:28,960
each of their life cycles

1179
00:48:32,790 --> 00:48:30,240
and also from from a different

1180
00:48:33,510 --> 00:48:32,800
perspective many of our science team

1181
00:48:35,750 --> 00:48:33,520
members on

1182
00:48:37,430 --> 00:48:35,760
the perseverance mission also uh work on

1183
00:48:40,309 --> 00:48:37,440
curiosity and i'm one of them

1184
00:48:41,910 --> 00:48:40,319
i i did an msl op shift a week before we

1185
00:48:43,030 --> 00:48:41,920
landed and i actually have one coming up

1186
00:48:44,390 --> 00:48:43,040
in a couple of weeks

1187
00:48:45,990 --> 00:48:44,400
and so it's not uncommon for our

1188
00:48:46,710 --> 00:48:46,000

scientists to go back and forth between

1189
00:48:48,790 --> 00:48:46,720
missions

1190
00:48:50,470 --> 00:48:48,800
and while a lot of the science attention

1191
00:48:51,270 --> 00:48:50,480
right now is on perseverance in this

1192
00:48:53,670 --> 00:48:51,280
landing site

1193
00:48:55,190 --> 00:48:53,680
uh curiosity is getting into some really

1194
00:48:57,510 --> 00:48:55,200
exciting things and so

1195
00:48:59,430 --> 00:48:57,520
uh the science team is many are going

1196
00:49:01,270 --> 00:48:59,440
back and forth between the missions

1197
00:49:03,190 --> 00:49:01,280
and um we've got we've got exciting

1198
00:49:04,790 --> 00:49:03,200
missions on uh exciting science to do on

1199
00:49:06,470 --> 00:49:04,800
both and what ends up happening which is

1200
00:49:08,069 --> 00:49:06,480
really a great synergy

1201
00:49:09,990 --> 00:49:08,079
is that once you have folks who are

1202
00:49:11,750 --> 00:49:10,000
working on two different places on mars

1203
00:49:13,109 --> 00:49:11,760
as scientists we can kind of kick our

1204
00:49:14,710 --> 00:49:13,119
brains into thinking about well how does

1205
00:49:16,230 --> 00:49:14,720
this site compare to this site

1206
00:49:17,589 --> 00:49:16,240
and and what are we learning here at

1207
00:49:19,109 --> 00:49:17,599
this landing site that can help us

1208
00:49:19,910 --> 00:49:19,119
understand the geology of this other

1209
00:49:21,829 --> 00:49:19,920
location

1210
00:49:23,430 --> 00:49:21,839
and so we we're able to think about it

1211
00:49:24,950 --> 00:49:23,440
in that way which when

1212
00:49:26,390 --> 00:49:24,960
you know you've got a single place that

1213
00:49:27,910 --> 00:49:26,400

the science team is working on you can't

1214
00:49:29,270 --> 00:49:27,920
do that kind of comparison

1215
00:49:31,270 --> 00:49:29,280
and so it's really exciting to be able

1216
00:49:32,790 --> 00:49:31,280
to compare different places on mars

1217
00:49:36,069 --> 00:49:32,800
because we learn more about the geology

1218
00:49:39,829 --> 00:49:36,079
when thinking about that comparison

1219
00:49:43,190 --> 00:49:42,150
thank you and to our reporters again

1220
00:49:46,710 --> 00:49:43,200
when you're finished

1221
00:49:49,829 --> 00:49:46,720
asking your question please hit mute

1222
00:49:53,030 --> 00:49:49,839
i'm going to move on now to leo enright

1223
00:49:55,030 --> 00:49:53,040
with irish television

1224
00:49:57,510 --> 00:49:55,040
thanks very much and we journalists are

1225
00:50:00,150 --> 00:49:57,520
multitasking on multiple missions

1226
00:50:00,790 --> 00:50:00,160
as well i can assure you um i had a

1227
00:50:03,910 --> 00:50:00,800
question

1228
00:50:05,990 --> 00:50:03,920
for katie morgan just to clarify where

1229
00:50:09,109 --> 00:50:06,000
these layered rocks are

1230
00:50:13,109 --> 00:50:09,119
um are they the the prominent feature

1231
00:50:15,670 --> 00:50:13,119
in katmai are are they seems less likely

1232
00:50:18,790 --> 00:50:15,680
the the the feature down at the very

1233
00:50:21,990 --> 00:50:18,800
south of big bend and uh

1234
00:50:23,589 --> 00:50:22,000
if second question if i may also related

1235
00:50:26,750 --> 00:50:23,599
to the delta remnant

1236
00:50:29,190 --> 00:50:26,760
issue if you do decide to go

1237
00:50:31,750 --> 00:50:29,200
counter-clockwise would you be tempted

1238
00:50:34,950 --> 00:50:31,760

to scoot over to channel islands

1239
00:50:38,230 --> 00:50:34,960
um i mean it would take i guess 10 days

1240
00:50:41,829 --> 00:50:38,240
if you're driving and chewing gum at the

1241
00:50:44,870 --> 00:50:41,839
same time

1242
00:50:45,270 --> 00:50:44,880
yes um thanks for that question uh so

1243
00:50:55,430 --> 00:50:45,280
the

1244
00:50:57,349 --> 00:50:55,440
something that that we are certainly

1245
00:51:00,150 --> 00:50:57,359
uh very interested in considering along

1246
00:51:02,950 --> 00:51:00,160
this clockwise route

1247
00:51:04,630 --> 00:51:02,960
if we do end up thinking about the the

1248
00:51:07,190 --> 00:51:04,640
counterclockwise route

1249
00:51:08,710 --> 00:51:07,200
i think the science team will be

1250
00:51:11,990 --> 00:51:08,720
interested in considering

1251
00:51:13,990 --> 00:51:12,000
um a diversion over to the what we are

1252
00:51:15,910 --> 00:51:14,000
we think very likely may be delta

1253
00:51:17,030 --> 00:51:15,920
remnants as well over in the channel

1254
00:51:18,870 --> 00:51:17,040
islands quad

1255
00:51:20,950 --> 00:51:18,880
and for folks in the line uh different

1256
00:51:22,870 --> 00:51:20,960
quads that we have in the landing area

1257
00:51:24,470 --> 00:51:22,880
for perseverance we have named after

1258
00:51:26,150 --> 00:51:24,480
national parks and preserves and so

1259
00:51:27,510 --> 00:51:26,160
those are the names that i'm referring

1260
00:51:29,990 --> 00:51:27,520
to right now

1261
00:51:31,190 --> 00:51:30,000
and so yes along both of those paths we

1262
00:51:33,589 --> 00:51:31,200
have the potential

1263
00:51:34,390 --> 00:51:33,599

uh to study what could be remnants of

1264
00:51:35,750 --> 00:51:34,400
the delta

1265
00:51:37,510 --> 00:51:35,760
and that's going to factor into the

1266
00:51:38,870 --> 00:51:37,520
science team's discussions

1267
00:51:41,190 --> 00:51:38,880
about about these roots and the

1268
00:51:44,150 --> 00:51:41,200
scientific potential uh

1269
00:51:46,870 --> 00:51:44,160
of each of the options anticipating that

1270
00:51:48,829 --> 00:51:46,880
we can again preview the delta

1271
00:51:55,030 --> 00:51:48,839
before actually arriving at the main

1272
00:51:58,630 --> 00:51:57,270
thank you katie up next on the phone

1273
00:52:03,349 --> 00:51:58,640
lines is

1274
00:52:04,630 --> 00:52:03,359
david curley with the discovery channel

1275
00:52:06,549 --> 00:52:04,640
thanks very much for taking the call

1276
00:52:07,990 --> 00:52:06,559
some spectacular images you guys must be

1277
00:52:10,309 --> 00:52:08,000
very excited i don't want to get

1278
00:52:13,109 --> 00:52:10,319
too far ahead since you haven't even

1279
00:52:15,030 --> 00:52:13,119
checked out the sampling system but

1280
00:52:17,109 --> 00:52:15,040
with the contract now being out for the

1281
00:52:17,990 --> 00:52:17,119
retrieval spacecraft to go get those

1282
00:52:20,549 --> 00:52:18,000
samples it

1283
00:52:22,069 --> 00:52:20,559
becomes more real can you just give me a

1284
00:52:24,630 --> 00:52:22,079
sense of what you thought that

1285
00:52:26,549 --> 00:52:24,640
you know in seven eight nine ten years

1286
00:52:30,829 --> 00:52:26,559
you may actually be looking at material

1287
00:52:34,950 --> 00:52:32,390
monitoring

1288
00:52:36,470 --> 00:52:34,960

uh sure i'll i'll start with that uh

1289
00:52:38,630 --> 00:52:36,480
yeah this is

1290
00:52:40,630 --> 00:52:38,640
first i have to say the imagery coming

1291
00:52:42,549 --> 00:52:40,640
down we the cameras that we have on this

1292
00:52:43,670 --> 00:52:42,559
rover the 25 cameras and the the

1293
00:52:45,510 --> 00:52:43,680
resolution

1294
00:52:46,870 --> 00:52:45,520
the colors and the spectrums it's just

1295
00:52:49,910 --> 00:52:46,880
been amazing we've never

1296
00:52:53,510 --> 00:52:49,920
been able to explore mars uh

1297
00:52:56,710 --> 00:52:53,520
in this way and then the prospect

1298
00:52:59,990 --> 00:52:56,720
of really in earnest

1299
00:53:03,190 --> 00:53:00,000
starting the sample return mission

1300
00:53:05,190 --> 00:53:03,200
this is this is one for the ages for

1301
00:53:07,109 --> 00:53:05,200
for jpl and nasa we've been talking

1302
00:53:09,510 --> 00:53:07,119
about this for for decades

1303
00:53:10,470 --> 00:53:09,520
engineers and scientists around here

1304
00:53:13,270 --> 00:53:10,480
wanting to do this

1305
00:53:13,990 --> 00:53:13,280
and and uh we've also had a first with

1306
00:53:17,349 --> 00:53:14,000
this project

1307
00:53:18,870 --> 00:53:17,359
as far as i know the the next rover to

1308
00:53:21,589 --> 00:53:18,880
return the samples was

1309
00:53:22,390 --> 00:53:21,599
was baseline was given the green light

1310
00:53:26,390 --> 00:53:22,400
um before

1311
00:53:28,150 --> 00:53:26,400
launch and so all things considered that

1312
00:53:31,430 --> 00:53:28,160
that's a huge uh

1313
00:53:33,990 --> 00:53:31,440

you know um confidence

1314
00:53:35,190 --> 00:53:34,000
um statement in in this project and what

1315
00:53:38,390 --> 00:53:35,200
we're doing and

1316
00:53:41,510 --> 00:53:38,400
and the institution's ability to land

1317
00:53:42,470 --> 00:53:41,520
systems on the surface of another solar

1318
00:53:46,870 --> 00:53:42,480
body

1319
00:53:49,750 --> 00:53:46,880
um with with high confidence so

1320
00:53:51,430 --> 00:53:49,760
it's been incredible uh being on the

1321
00:53:54,710 --> 00:53:51,440
surface for 14 days now

1322
00:53:56,230 --> 00:53:54,720
being able to uh get into a position to

1323
00:53:59,910 --> 00:53:56,240
actually start

1324
00:54:00,950 --> 00:53:59,920
the sample mission and uh i'll let katie

1325
00:54:02,630 --> 00:54:00,960
talk to

1326
00:54:04,150 --> 00:54:02,640
the excitement of the samples that we

1327
00:54:05,910 --> 00:54:04,160
might be able to get

1328
00:54:07,589 --> 00:54:05,920
and the prospect even though it seems

1329
00:54:10,150 --> 00:54:07,599
like a long time away

1330
00:54:11,670 --> 00:54:10,160
it's gonna pass in the blink of an eye

1331
00:54:13,589 --> 00:54:11,680
when we'll be able to get these uh

1332
00:54:16,710 --> 00:54:13,599
coming back to earth for scientists

1333
00:54:18,630 --> 00:54:16,720
all over the world to analyze

1334
00:54:19,829 --> 00:54:18,640
yeah and we've been thinking on the

1335
00:54:22,230 --> 00:54:19,839
science team about

1336
00:54:24,150 --> 00:54:22,240
notional samples to collect in jezreel

1337
00:54:26,390 --> 00:54:24,160
crater for for years now

1338
00:54:27,270 --> 00:54:26,400

and thinking about the the potential

1339
00:54:29,670 --> 00:54:27,280
there for

1340
00:54:31,030 --> 00:54:29,680
sample mars sample return and return

1341
00:54:33,430 --> 00:54:31,040
sample science once those

1342
00:54:34,790 --> 00:54:33,440
once those samples get back to earth but

1343
00:54:36,470 --> 00:54:34,800
of course that's always at a very high

1344
00:54:39,109 --> 00:54:36,480
level because what we had to work on

1345
00:54:40,710 --> 00:54:39,119
were only the orbiter images uh so now

1346
00:54:42,390 --> 00:54:40,720
that we're on the surface seeing the

1347
00:54:44,870 --> 00:54:42,400
actual rocks through the eyes of the

1348
00:54:47,589 --> 00:54:44,880
rover uh it adds a whole other level of

1349
00:54:49,510 --> 00:54:47,599
detail and excitement about the sampling

1350
00:54:50,950 --> 00:54:49,520
uh that this rover is going to do on the

1351
00:54:52,309 --> 00:54:50,960
surface of mars and so

1352
00:54:54,230 --> 00:54:52,319
you know we're already starting to think

1353
00:54:55,670 --> 00:54:54,240
about you know are these rocks in and

1354
00:54:57,109 --> 00:54:55,680
around where the landing

1355
00:54:59,030 --> 00:54:57,119
area is are these rocks that we're going

1356
00:55:01,270 --> 00:54:59,040
to want to put in our sample cache

1357
00:55:02,150 --> 00:55:01,280
um and and what would come next heading

1358
00:55:03,990 --> 00:55:02,160
to the delta

1359
00:55:05,910 --> 00:55:04,000
and so we're actually talking about real

1360
00:55:07,829 --> 00:55:05,920
rocks now uh and that's that's so

1361
00:55:09,270 --> 00:55:07,839
exciting to us in the science team

1362
00:55:11,990 --> 00:55:09,280
because we can start to really think

1363
00:55:14,150 --> 00:55:12,000

about uh the impact that these samples

1364
00:55:16,309 --> 00:55:14,160
uh will have on on future scientific

1365
00:55:18,230 --> 00:55:16,319
endeavors and our understanding of these

1366
00:55:19,910 --> 00:55:18,240
big questions we have about life beyond

1367
00:55:23,430 --> 00:55:19,920
earth and the evolution of planets in

1368
00:55:29,190 --> 00:55:26,549
thank you thank you

1369
00:55:30,150 --> 00:55:29,200
we also have a social media question

1370
00:55:34,309 --> 00:55:30,160
coming in

1371
00:55:37,589 --> 00:55:34,319
anais ed on facebook asks when driving

1372
00:55:39,829 --> 00:55:37,599
do you just lay in a course and let ai

1373
00:55:40,870 --> 00:55:39,839
handle the details or do you have a

1374
00:55:42,630 --> 00:55:40,880
program

1375
00:55:49,109 --> 00:55:42,640
that's a mechanic for each wheels

1376
00:55:51,430 --> 00:55:49,119
according to the specific typography

1377
00:55:53,510 --> 00:55:51,440
yeah so i mean there are a couple

1378
00:55:55,030 --> 00:55:53,520
different ways to drive a rover right if

1379
00:55:56,549 --> 00:55:55,040
you know what the terrain in front of

1380
00:55:58,950 --> 00:55:56,559
you looks like

1381
00:55:59,670 --> 00:55:58,960
um you can give the rover very specific

1382
00:56:01,510 --> 00:55:59,680
instructions

1383
00:56:03,109 --> 00:56:01,520
like we did on our first drive right you

1384
00:56:05,750 --> 00:56:03,119
can say drive

1385
00:56:06,950 --> 00:56:05,760
so many meters forward turn left then

1386
00:56:09,349 --> 00:56:06,960
drive this far

1387
00:56:10,069 --> 00:56:09,359
then do this thing but you can only do

1388
00:56:12,630 --> 00:56:10,079

that for

1389
00:56:14,069 --> 00:56:12,640
so long right a few tens of meters as

1390
00:56:15,430 --> 00:56:14,079
long as you know what the terrain

1391
00:56:17,670 --> 00:56:15,440
underneath you look like and you know

1392
00:56:19,910 --> 00:56:17,680
that it's safe to drive on

1393
00:56:21,109 --> 00:56:19,920
but once you get into longer distances

1394
00:56:23,910 --> 00:56:21,119
that's where our ai

1395
00:56:25,750 --> 00:56:23,920
and our auto nav comes in so over longer

1396
00:56:27,589 --> 00:56:25,760
distances so we're trying like tens of

1397
00:56:29,030 --> 00:56:27,599
meters

1398
00:56:31,910 --> 00:56:29,040
you don't necessarily know what the

1399
00:56:33,190 --> 00:56:31,920
ground looks like underneath you at all

1400
00:56:36,549 --> 00:56:33,200
times or you don't know

1401
00:56:38,309 --> 00:56:36,559
in that grade of detail so you will give

1402
00:56:39,750 --> 00:56:38,319
or what we'll do is give the rover a

1403
00:56:41,670 --> 00:56:39,760
goal

1404
00:56:43,270 --> 00:56:41,680
um you know sometimes meters away

1405
00:56:45,990 --> 00:56:43,280
wherever we want it to go

1406
00:56:47,990 --> 00:56:46,000
and then from there that's where ai

1407
00:56:48,710 --> 00:56:48,000
kicks in it'll start taking stereo pairs

1408
00:56:52,069 --> 00:56:48,720
and images

1409
00:56:55,349 --> 00:56:52,079
processing those images now on our vce

1410
00:56:57,270 --> 00:56:55,359
instead of our main computer

1411
00:56:59,430 --> 00:56:57,280
and it'll identify hazards in the

1412
00:57:02,309 --> 00:56:59,440
terrain and then

1413
00:57:03,510 --> 00:57:02,319

decide on its next drive step

1414
00:57:07,910 --> 00:57:03,520
essentially

1415
00:57:10,710 --> 00:57:07,920
forward you know as far as

1416
00:57:13,270 --> 00:57:10,720
how it decides what's safe it kind of

1417
00:57:16,630 --> 00:57:13,280
like you mentioned right

1418
00:57:21,030 --> 00:57:16,640
it analyzes what is going to sit

1419
00:57:23,589 --> 00:57:21,040
under each individual wheel and then

1420
00:57:25,430 --> 00:57:23,599
from that determines whether or not it's

1421
00:57:27,589 --> 00:57:25,440
going to be safe to drive over that

1422
00:57:29,750 --> 00:57:27,599
you know her rock is too tall we're not

1423
00:57:31,349 --> 00:57:29,760
going there mark that spot bad don't

1424
00:57:36,870 --> 00:57:31,359
drive over it

1425
00:57:40,390 --> 00:57:39,589
thank you and we have a reporter

1426
00:57:43,990 --> 00:57:40,400
question

1427
00:57:45,750 --> 00:57:44,000
mike howard from american spectator

1428
00:57:48,950 --> 00:57:45,760
thanks a lot and thanks for doing these

1429
00:57:51,349 --> 00:57:48,960
calls i got a question for robert

1430
00:57:53,270 --> 00:57:51,359
the perseverance has a twin rover on

1431
00:57:54,630 --> 00:57:53,280
earth i think it's called optimism

1432
00:57:56,470 --> 00:57:54,640
you can use that to work out any

1433
00:57:59,990 --> 00:57:56,480
potential issues that

1434
00:58:01,670 --> 00:58:00,000
perseverance comes across does ingenuity

1435
00:58:04,630 --> 00:58:01,680
have a similar twin

1436
00:58:06,630 --> 00:58:04,640
and for katie is there any scientific

1437
00:58:07,109 --> 00:58:06,640
data to be gleaned in visiting the sky

1438
00:58:11,109 --> 00:58:07,119

crane

1439
00:58:17,750 --> 00:58:14,950
uh sure so uh the uh

1440
00:58:19,430 --> 00:58:17,760
so i'm not on the the helicopter project

1441
00:58:22,069 --> 00:58:19,440
but to my knowledge

1442
00:58:24,470 --> 00:58:22,079
um i don't think there's an exact

1443
00:58:27,829 --> 00:58:24,480
duplicate of ingenuity but there is

1444
00:58:30,150 --> 00:58:27,839
a a test set of electronics

1445
00:58:31,990 --> 00:58:30,160
and some other mock-ups and prototypes

1446
00:58:35,430 --> 00:58:32,000
and stuff and obviously

1447
00:58:36,069 --> 00:58:35,440
flying a helicopter in the mars yard at

1448
00:58:37,670 --> 00:58:36,079
jpl

1449
00:58:39,349 --> 00:58:37,680
is a different story because of the uh

1450
00:58:41,670 --> 00:58:39,359
difference in in the

1451
00:58:43,349 --> 00:58:41,680
atmosphere between the two planets but

1452
00:58:46,150 --> 00:58:43,359
of course that was done

1453
00:58:46,789 --> 00:58:46,160
with uh the the flight helicopter and

1454
00:58:50,069 --> 00:58:46,799
and other

1455
00:58:52,789 --> 00:58:50,079
test versions in a vacuum

1456
00:58:53,670 --> 00:58:52,799
chamber earlier at jpl so don't hold me

1457
00:58:57,349 --> 00:58:53,680
to that but

1458
00:58:57,589 --> 00:58:57,359
for sure there are significant parts of

1459
00:59:00,390 --> 00:58:57,599
it

1460
00:59:01,349 --> 00:59:00,400
that have a duplicate for testing and

1461
00:59:04,230 --> 00:59:01,359
we've used those

1462
00:59:06,069 --> 00:59:04,240
for tests with the rover in the mars

1463
00:59:09,829 --> 00:59:06,079

yard and other places

1464
00:59:13,910 --> 00:59:11,270
and in terms of the second part of your

1465
00:59:16,549 --> 00:59:13,920
question the entry descent landing

1466
00:59:18,069 --> 00:59:16,559
engineers would would certainly probably

1467
00:59:18,870 --> 00:59:18,079
appreciate if we drove over to the

1468
00:59:21,910 --> 00:59:18,880
places where

1469
00:59:23,430 --> 00:59:21,920
the the edl hardware has has crashed on

1470
00:59:24,950 --> 00:59:23,440
mars so they can take a look at how it

1471
00:59:25,589 --> 00:59:24,960
interacted with the surface and where it

1472
00:59:27,589 --> 00:59:25,599
is

1473
00:59:29,190 --> 00:59:27,599
um but from a science perspective we

1474
00:59:31,670 --> 00:59:29,200
typically steer clear

1475
00:59:32,630 --> 00:59:31,680
of places that that the the mission has

1476
00:59:36,549 --> 00:59:32,640
uh

1477
00:59:38,150 --> 00:59:36,559
the surface of mars

1478
00:59:40,470 --> 00:59:38,160
in that we're looking now at this point

1479
00:59:41,030 --> 00:59:40,480
uh for pristine parts of mars that we

1480
00:59:44,549 --> 00:59:41,040
have not

1481
00:59:45,990 --> 00:59:44,559
any way

1482
00:59:47,670 --> 00:59:46,000
and that's particularly important for

1483
00:59:48,069 --> 00:59:47,680
our sampling objectives and making sure

1484
00:59:50,470 --> 00:59:48,079
that

1485
00:59:52,069 --> 00:59:50,480
our samples uh really really represent

1486
00:59:53,589 --> 00:59:52,079
what mars has to offer as opposed to

1487
00:59:56,549 --> 00:59:53,599
what we've brought with us

1488
00:59:58,069 --> 00:59:56,559

and so we typically steer clear of of

1489
00:59:59,990 --> 00:59:58,079
thinking about science in and around

1490
01:00:06,390 --> 01:00:00,000
places where the edl hardware has

1491
01:00:10,470 --> 01:00:09,190
thank you and that is all the time we

1492
01:00:11,829 --> 01:00:10,480
have for questions today

1493
01:00:13,990 --> 01:00:11,839
unfortunately we can't get to all of

1494
01:00:20,069 --> 01:00:14,000
them but reporters you can

1495
01:00:22,150 --> 01:00:20,079
call 818-354-5011

1496
01:00:23,190 --> 01:00:22,160
and we will get you follow-ups and

1497
01:00:25,109 --> 01:00:23,200
continue to answer

1498
01:00:26,950 --> 01:00:25,119
any questions that you might have we'll

1499
01:00:30,470 --> 01:00:26,960
also do be doing that via

1500
01:00:31,270 --> 01:00:30,480
social media now for more updates on the

1501
01:00:34,870 --> 01:00:31,280
mission

1502
01:00:39,030 --> 01:00:34,880
visit nasa.gov perseverance

1503
01:00:41,990 --> 01:00:39,040
and mars.nasa.gov perseverance

1504
01:00:42,710 --> 01:00:42,000
you can also follow us on social media

1505
01:00:45,750 --> 01:00:42,720
at

1506
01:00:48,630 --> 01:00:45,760
nasa persevere and to those

1507
01:00:49,750 --> 01:00:48,640
following perseverance's journey you

1508
01:00:52,230 --> 01:00:49,760
inspire us

1509
01:00:54,549 --> 01:00:52,240
as much as we hope this mission will

1510
01:00:56,150 --> 01:00:54,559
continue to inspire you

1511
01:00:58,150 --> 01:00:56,160
thank you for being with us on this

1512
01:00:59,990 --> 01:00:58,160
journey of exploration

1513
01:01:01,430 --> 01:01:00,000

we're going to close this briefing with

1514
01:01:03,589 --> 01:01:01,440
a video looking back

1515
01:01:04,870 --> 01:01:03,599
at the landing that happened just two

1516
01:01:06,789 --> 01:01:04,880
weeks ago

1517
01:01:08,549 --> 01:01:06,799
and the people around the world who

1518
01:01:16,309 --> 01:01:08,559
joined us and supported us

1519
01:01:22,470 --> 01:01:20,150
propulsion go edl sleep

1520
01:01:24,789 --> 01:01:22,480
we have deemed perseverance ready to

1521
01:01:26,549 --> 01:01:24,799
execute entry descent and landing on her

1522
01:01:28,789 --> 01:01:26,559
own

1523
01:01:31,349 --> 01:01:28,799
confirmation of entry interface

1524
01:01:33,829 --> 01:01:31,359
presidents is currently going 5.3

1525
01:01:38,230 --> 01:01:33,839
kilometers per second about 120

1526
01:01:40,789 --> 01:01:38,240
kilometers from the surface of mars

1527
01:01:45,030 --> 01:01:40,799
it will start controlling its path to

1528
01:01:55,190 --> 01:01:46,870
parachute has deployed and we are seeing

1529
01:02:01,270 --> 01:01:57,750
the heat shield has been separated first

1530
01:02:06,230 --> 01:02:01,280
now has radar lock on the ground

1531
01:02:08,549 --> 01:02:06,240
the battle has separated

1532
01:02:15,750 --> 01:02:08,559
skycam maneuver has started about 20

1533
01:02:20,630 --> 01:02:19,589
tango delta nominal touchdown confirmed

1534
01:02:23,430 --> 01:02:20,640
faithfully

1535
01:02:34,810 --> 01:02:23,440
on the surface of mars ready to begin

1536
01:02:35,190 --> 01:02:34,820
seeking the fans of past life

1537
01:02:40,480 --> 01:02:35,200
[Music]

1538
01:02:48,700 --> 01:02:40,490

[Applause]

1539
01:03:04,040 --> 01:02:48,710
[Music]

1540
01:03:04,050 --> 01:03:10,820
[Applause]