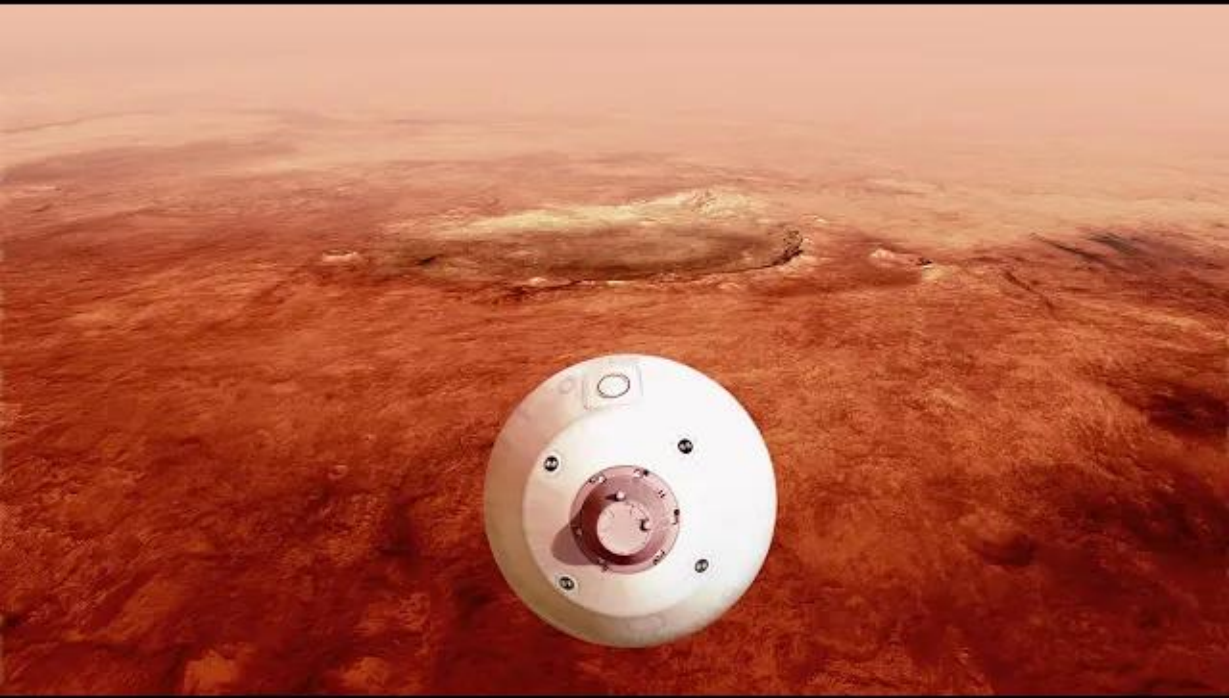

1
00:01:36,149 --> 00:01:33,749
and liftoff

2
00:01:37,510 --> 00:01:36,159
as the countdown to mars continues the

3
00:01:39,350 --> 00:01:37,520
perseverance of humanity

4
00:02:22,630 --> 00:01:39,360
launching the next generation of robotic

5
00:02:25,990 --> 00:02:25,190
nasa's mars perseverance rover left

6
00:02:28,550 --> 00:02:26,000
earth six

7
00:02:31,190 --> 00:02:28,560
months ago now we are preparing for

8
00:02:32,869 --> 00:02:31,200
touchdown on the red planet tomorrow

9
00:02:34,790 --> 00:02:32,879
the rover will attempt to land in

10
00:02:36,070 --> 00:02:34,800
jezreel crater which is the most

11
00:02:38,070 --> 00:02:36,080
difficult landing site

12
00:02:39,589 --> 00:02:38,080
on mars ever attempted but the

13
00:02:42,309 --> 00:02:39,599

perseverance rover

14
00:02:44,229 --> 00:02:42,319
and the team are ready welcome to nasa's

15
00:02:45,190 --> 00:02:44,239
jet propulsion laboratory in southern

16
00:02:47,830 --> 00:02:45,200
california

17
00:02:49,990 --> 00:02:47,840
i'm marina jurica your host today as we

18
00:02:52,390 --> 00:02:50,000
bring you a mission landing update

19
00:02:54,550 --> 00:02:52,400
as the team continues to prepare for

20
00:02:56,949 --> 00:02:54,560
tomorrow and what lies ahead

21
00:02:58,390 --> 00:02:56,959
on our panel today our nasa planetary

22
00:03:02,070 --> 00:02:58,400
science division director

23
00:03:02,710 --> 00:03:02,080
lori glaze perseverance deputy project

24
00:03:06,630 --> 00:03:02,720
manager

25
00:03:07,509 --> 00:03:06,640
matt wallace entry descent and landing

26
00:03:11,990 --> 00:03:07,519
phase lead

27
00:03:12,470 --> 00:03:12,000
al chen deputy chief engineer for medley

28
00:03:15,509 --> 00:03:12,480
2

29
00:03:17,589 --> 00:03:15,519
caitlin lyles project

30
00:03:20,710 --> 00:03:17,599
deputy project manager for surface

31
00:03:23,270 --> 00:03:20,720
activities jennifer trosper

32
00:03:24,949 --> 00:03:23,280
perseverance project scientist ken

33
00:03:26,630 --> 00:03:24,959
farley

34
00:03:28,789 --> 00:03:26,640
for anyone watching who would like to

35
00:03:30,869 --> 00:03:28,799
submit a question you can do so by using

36
00:03:32,789 --> 00:03:30,879
the countdown to mars hashtag

37
00:03:35,270 --> 00:03:32,799
our phone lines are now open to the

38
00:03:36,229 --> 00:03:35,280

media you can ask a question by pressing

39
00:03:39,190 --> 00:03:36,239
star one

40
00:03:39,750 --> 00:03:39,200
and enter the queue to start i'd like to

41
00:03:41,750 --> 00:03:39,760
welcome

42
00:03:43,750 --> 00:03:41,760
lori glaze good morning lori good

43
00:03:45,830 --> 00:03:43,760
morning great to see you

44
00:03:48,550 --> 00:03:45,840
wow i'm just i'm getting so excited

45
00:03:49,589 --> 00:03:48,560
we're now just a little over 26 hours

46
00:03:51,990 --> 00:03:49,599
away from

47
00:03:53,350 --> 00:03:52,000
touching down on the surface of mars and

48
00:03:55,110 --> 00:03:53,360
i was just thinking this morning

49
00:03:55,670 --> 00:03:55,120
remembering back to the launch back in

50
00:03:57,429 --> 00:03:55,680
july

51
00:03:59,670 --> 00:03:57,439
and that exciting moment when

52
00:04:02,229 --> 00:03:59,680
perseverance and ingenuity began this

53
00:04:03,509 --> 00:04:02,239
incredible journey from earth to mars

54
00:04:05,589 --> 00:04:03,519
and now we're here

55
00:04:06,949 --> 00:04:05,599
just six months later ready for that

56
00:04:08,630 --> 00:04:06,959
final leg

57
00:04:10,869 --> 00:04:08,640
of the journey to put us on the surface

58
00:04:13,750 --> 00:04:10,879
of mars so that we can really begin

59
00:04:14,949 --> 00:04:13,760
the the the overall objective of this

60
00:04:17,270 --> 00:04:14,959
mission which is to really do the

61
00:04:19,830 --> 00:04:17,280
exploration of jezreel crater

62
00:04:21,909 --> 00:04:19,840
um perseverance is taking our next step

63
00:04:23,270 --> 00:04:21,919

in exploration of mars especially

64
00:04:25,590 --> 00:04:23,280
addressing the question

65
00:04:26,469 --> 00:04:25,600
about whether life ever existed

66
00:04:29,749 --> 00:04:26,479
elsewhere

67
00:04:30,230 --> 00:04:29,759
in the universe and can i have the first

68
00:04:33,350 --> 00:04:30,240
graphic

69
00:04:36,469 --> 00:04:33,360
please thank you in studying mars

70
00:04:39,350 --> 00:04:36,479
we've taken a methodical approach

71
00:04:41,350 --> 00:04:39,360
to better understand how to even look

72
00:04:43,030 --> 00:04:41,360
for life and all of our rovers have

73
00:04:45,430 --> 00:04:43,040
played important roles

74
00:04:46,629 --> 00:04:45,440
uh in in trying to improve that

75
00:04:48,310 --> 00:04:46,639
understanding

76
00:04:50,310 --> 00:04:48,320
uh perseverance of course is going to be

77
00:04:53,030 --> 00:04:50,320
our fifth rover the first being

78
00:04:54,950 --> 00:04:53,040
sojourner which launched in 1997

79
00:04:56,230 --> 00:04:54,960
and that methodical approach started

80
00:04:58,870 --> 00:04:56,240
really with the

81
00:04:59,590 --> 00:04:58,880
spirit and opportunity rovers following

82
00:05:02,950 --> 00:04:59,600
the water

83
00:05:04,870 --> 00:05:02,960
trying to understand the the history of

84
00:05:06,150 --> 00:05:04,880
water on mars and understanding

85
00:05:07,590 --> 00:05:06,160
if there were ever a time when there was

86
00:05:08,870 --> 00:05:07,600
enough liquid water present on the

87
00:05:11,189 --> 00:05:08,880
surface of mars

88
00:05:13,110 --> 00:05:11,199

to support life and then that was

89
00:05:14,710 --> 00:05:13,120
followed of course by curiosity where we

90
00:05:16,950 --> 00:05:14,720
really took the next step which to

91
00:05:17,990 --> 00:05:16,960
understand the habitable environments

92
00:05:19,670 --> 00:05:18,000
whether there were habitable

93
00:05:20,790 --> 00:05:19,680
environments on mars and of course

94
00:05:23,270 --> 00:05:20,800
curiosity

95
00:05:24,150 --> 00:05:23,280
uh being able to confirm the presence of

96
00:05:29,189 --> 00:05:24,160
a

97
00:05:31,749 --> 00:05:29,199
time

98
00:05:33,189 --> 00:05:31,759
and also identifying the complex organic

99
00:05:33,830 --> 00:05:33,199
molecules that would be the building

100
00:05:37,029 --> 00:05:33,840
blocks

101
00:05:39,270 --> 00:05:37,039
for life and we've built on all of that

102
00:05:39,830 --> 00:05:39,280
knowledge to prepare ourselves now with

103
00:05:41,189 --> 00:05:39,840
the

104
00:05:43,749 --> 00:05:41,199
perseverance rover which is going to

105
00:05:46,629 --> 00:05:43,759
take that next step to really actually

106
00:05:47,270 --> 00:05:46,639
look for those signs of life and we've

107
00:05:50,390 --> 00:05:47,280
brought with

108
00:05:53,350 --> 00:05:50,400
us an incredible payload of instruments

109
00:05:55,510 --> 00:05:53,360
that can uh of course do incredible

110
00:05:58,390 --> 00:05:55,520
science on the surface and also

111
00:05:59,430 --> 00:05:58,400
help us to identify the the rocks that

112
00:06:01,110 --> 00:05:59,440
we'd like to take

113
00:06:02,629 --> 00:06:01,120

samples of and eventually bring back to

114
00:06:04,230 --> 00:06:02,639
work back to earth and if you can run

115
00:06:06,710 --> 00:06:04,240
the video please

116
00:06:08,390 --> 00:06:06,720
um this is just showing the the rover as

117
00:06:10,070 --> 00:06:08,400
it's drilling down into the surface to

118
00:06:12,070 --> 00:06:10,080
collect those samples we're going to try

119
00:06:13,830 --> 00:06:12,080
and bring back a scientifically diverse

120
00:06:16,150 --> 00:06:13,840
set of samples you'll hear more from ken

121
00:06:18,230 --> 00:06:16,160
farley later about that

122
00:06:19,990 --> 00:06:18,240
and this is just so incredibly important

123
00:06:23,430 --> 00:06:20,000
to bring these samples back to earth

124
00:06:25,590 --> 00:06:23,440
because we can then use the full breadth

125
00:06:27,110 --> 00:06:25,600
of our capabilities in the laboratories

126
00:06:28,950 --> 00:06:27,120
we have here on earth using

127
00:06:30,150 --> 00:06:28,960
all of the scientific expertise from

128
00:06:32,309 --> 00:06:30,160
around the world

129
00:06:33,990 --> 00:06:32,319
to address this incredibly hard question

130
00:06:36,230 --> 00:06:34,000
about whether or not those

131
00:06:38,390 --> 00:06:36,240
fossils of the microbes of microbes

132
00:06:41,189 --> 00:06:38,400
actually have been preserved

133
00:06:43,189 --> 00:06:41,199
in the deposits of jezreel crater and so

134
00:06:47,110 --> 00:06:43,199
with that i'd like to hand things over

135
00:06:48,870 --> 00:06:47,120
to matt thanks lori

136
00:06:51,589 --> 00:06:48,880
i just want to re-emphasize something

137
00:06:53,909 --> 00:06:51,599
that uh lori mentioned which uh

138
00:06:56,230 --> 00:06:53,919

this is really a different rover you saw

139
00:06:59,430 --> 00:06:56,240
uh the profiles of the previous

140
00:07:00,070 --> 00:06:59,440
uh four rovers i had a good fortune to

141
00:07:02,070 --> 00:07:00,080
work on

142
00:07:03,909 --> 00:07:02,080
on all of those and and this one's

143
00:07:04,710 --> 00:07:03,919
really at the top of the food chain i'd

144
00:07:07,189 --> 00:07:04,720
have to say

145
00:07:08,070 --> 00:07:07,199
you know we're carrying almost 50

146
00:07:10,390 --> 00:07:08,080
percent more

147
00:07:12,629 --> 00:07:10,400
science and technology payload than

148
00:07:15,430 --> 00:07:12,639
curiosity despite the similarities

149
00:07:16,710 --> 00:07:15,440
uh in the two vehicles uh this is really

150
00:07:19,830 --> 00:07:16,720
a much more

151
00:07:21,670 --> 00:07:19,840
capable system and i think

152
00:07:23,270 --> 00:07:21,680
not only do we have the transformative

153
00:07:24,469 --> 00:07:23,280
science which

154
00:07:27,029 --> 00:07:24,479
laurie and others are going to talk

155
00:07:29,189 --> 00:07:27,039
about today but as mentioned we have a

156
00:07:31,029 --> 00:07:29,199
lot of feed forward technology

157
00:07:33,110 --> 00:07:31,039
on this mission whether it's the

158
00:07:36,150 --> 00:07:33,120
ingenuity helicopter

159
00:07:39,589 --> 00:07:36,160
or the ability to make oxygen

160
00:07:42,390 --> 00:07:39,599
from the co2 atmosphere on mars

161
00:07:44,309 --> 00:07:42,400
a lot of exciting technology work that

162
00:07:45,830 --> 00:07:44,319
will feed in into future

163
00:07:47,430 --> 00:07:45,840

missions including some you'll hear

164
00:07:51,350 --> 00:07:47,440
about today

165
00:07:53,110 --> 00:07:51,360
the medley ii package so

166
00:07:54,790 --> 00:07:53,120
really just a great mission coming up

167
00:07:55,749 --> 00:07:54,800
but before we can get that surface

168
00:07:58,790 --> 00:07:55,759
mission going

169
00:07:59,670 --> 00:07:58,800
we we have to land safely on mars and

170
00:08:02,550 --> 00:07:59,680
that is always

171
00:08:04,790 --> 00:08:02,560
a challenging feat for us this is one of

172
00:08:08,390 --> 00:08:04,800
the most difficult maneuvers that we do

173
00:08:11,029 --> 00:08:08,400
in the space business you know almost

174
00:08:12,869 --> 00:08:11,039
50 percent of the spacecraft that have

175
00:08:16,390 --> 00:08:12,879
been sent to the surface of mars

176
00:08:16,869 --> 00:08:16,400
uh have failed and so we know we have

177
00:08:21,430 --> 00:08:16,879
our

178
00:08:24,950 --> 00:08:21,440
down to the surface safely at

179
00:08:26,070 --> 00:08:24,960
jezreel we're going to ballistically

180
00:08:29,270 --> 00:08:26,080
approach that planet

181
00:08:31,670 --> 00:08:29,280
at about 12 000 miles an hour and the

182
00:08:33,829 --> 00:08:31,680
trick we have to perform is to slow down

183
00:08:35,430 --> 00:08:33,839
uh to just a couple miles an hour so

184
00:08:35,909 --> 00:08:35,440
that we can gently touch the vehicle

185
00:08:39,990 --> 00:08:35,919
down

186
00:08:42,310 --> 00:08:40,000
on the surface and safely do so

187
00:08:43,430 --> 00:08:42,320
uh that all has to happen in about seven

188
00:08:45,829 --> 00:08:43,440

minutes

189
00:08:47,910 --> 00:08:45,839
uh and it all has to happen autonomously

190
00:08:49,829 --> 00:08:47,920
perseverance really has to fight our way

191
00:08:52,389 --> 00:08:49,839
down to the surface

192
00:08:55,350 --> 00:08:52,399
on our own it's something like a

193
00:08:58,710 --> 00:08:55,360
controlled disassembly of the spacecraft

194
00:09:01,030 --> 00:08:58,720
uh and it's uh and it's always uh

195
00:09:04,870 --> 00:09:01,040
something that uh we think a lot about

196
00:09:06,829 --> 00:09:04,880
we work hard on and we prepare for

197
00:09:08,710 --> 00:09:06,839
and once we get down to the surface of

198
00:09:10,470 --> 00:09:08,720
jezreel

199
00:09:12,310 --> 00:09:10,480
she won't necessarily find the most

200
00:09:14,470 --> 00:09:12,320
welcoming site we've ever been to

201
00:09:15,670 --> 00:09:14,480
jezreel is a fascinating scientific

202
00:09:18,790 --> 00:09:15,680
location

203
00:09:19,829 --> 00:09:18,800
it's got great craters it's got rock

204
00:09:21,350 --> 00:09:19,839
fields it's got

205
00:09:22,870 --> 00:09:21,360
sand dunes all of those things are

206
00:09:25,350 --> 00:09:22,880
interesting

207
00:09:26,949 --> 00:09:25,360
for the science community as you can see

208
00:09:28,710 --> 00:09:26,959
here in this imagery

209
00:09:31,509 --> 00:09:28,720
but all those things also represent

210
00:09:34,150 --> 00:09:31,519
landing hazards for the spacecraft

211
00:09:35,990 --> 00:09:34,160
and so we do have a new hazard avoidance

212
00:09:38,310 --> 00:09:36,000
capability we call terrain relative

213
00:09:39,350 --> 00:09:38,320

navigation which we'll employ for the

214
00:09:41,350 --> 00:09:39,360
first time

215
00:09:43,269 --> 00:09:41,360
that's really enabled on us to go to

216
00:09:48,070 --> 00:09:43,279
jezreel

217
00:09:50,710 --> 00:09:48,080
actually a site that was scientifically

218
00:09:52,310 --> 00:09:50,720
interesting to many previous missions

219
00:09:54,389 --> 00:09:52,320
and we just couldn't get there until

220
00:09:57,590 --> 00:09:54,399
this point when our technology was

221
00:10:01,190 --> 00:09:57,600
ready to support it so all that's

222
00:10:04,389 --> 00:10:01,200
coming up we are currently about 150

223
00:10:05,590 --> 00:10:04,399
000 miles from the planet we are picking

224
00:10:08,630 --> 00:10:05,600
up speed

225
00:10:10,069 --> 00:10:08,640
as we approach and the gravity starts to

226
00:10:14,069 --> 00:10:10,079
pull us in

227
00:10:16,470 --> 00:10:14,079
we have transitioned into our edl

228
00:10:18,710 --> 00:10:16,480
mode of operation on the spacecraft with

229
00:10:21,750 --> 00:10:18,720
the command we sent last friday

230
00:10:24,710 --> 00:10:21,760
called do edl to entry descent and

231
00:10:25,750 --> 00:10:24,720
and landing we're keeping a close eye on

232
00:10:28,150 --> 00:10:25,760
our navigation

233
00:10:29,590 --> 00:10:28,160
situation we have to hit an entry

234
00:10:32,230 --> 00:10:29,600
corridor that's really just

235
00:10:33,910 --> 00:10:32,240
a handful of kilometers across after

236
00:10:35,110 --> 00:10:33,920
traveling hundreds of millions of miles

237
00:10:36,710 --> 00:10:35,120
to mars

238
00:10:38,150 --> 00:10:36,720

uh and that's always something at this

239
00:10:40,790 --> 00:10:38,160
point of the mission that we're

240
00:10:42,230 --> 00:10:40,800
we're keeping a close eye on uh we're

241
00:10:44,470 --> 00:10:42,240
updating the parameters

242
00:10:45,269 --> 00:10:44,480
uh so we're ready to land uh right where

243
00:10:47,750 --> 00:10:45,279
we want to

244
00:10:49,509 --> 00:10:47,760
in in jezreel our batteries are now

245
00:10:50,790 --> 00:10:49,519
topped off at 100 percent state of

246
00:10:54,230 --> 00:10:50,800
charge

247
00:10:55,190 --> 00:10:54,240
uh our pyro systems uh are armed and

248
00:10:58,550 --> 00:10:55,200
ready to

249
00:10:59,509 --> 00:10:58,560
uh execute the deployments uh necessary

250
00:11:02,630 --> 00:10:59,519
to

251
00:11:04,550 --> 00:11:02,640
execute entry descent and landing we

252
00:11:06,069 --> 00:11:04,560
have tested out our engines and our

253
00:11:09,509 --> 00:11:06,079
guidance sensors

254
00:11:11,110 --> 00:11:09,519
they are ready to go and really just

255
00:11:12,550 --> 00:11:11,120
have a few more interactions with the

256
00:11:15,190 --> 00:11:12,560
spacecraft

257
00:11:15,750 --> 00:11:15,200
but if necessary perseverance could land

258
00:11:18,550 --> 00:11:15,760
itself

259
00:11:20,949 --> 00:11:18,560
uh already without any more help from us

260
00:11:22,949 --> 00:11:20,959
here on the ground

261
00:11:25,269 --> 00:11:22,959
so the spacecraft is ready i think the

262
00:11:26,790 --> 00:11:25,279
team is uh also ready

263
00:11:28,630 --> 00:11:26,800

we've been thinking about entry descent

264
00:11:30,949 --> 00:11:28,640
landing for uh probably

265
00:11:32,710 --> 00:11:30,959
every work day over the last eight or

266
00:11:35,990 --> 00:11:32,720
nine years

267
00:11:36,710 --> 00:11:36,000
it's always something that consumes our

268
00:11:41,110 --> 00:11:36,720
development

269
00:11:43,670 --> 00:11:41,120
and our our testing and our design work

270
00:11:45,030 --> 00:11:43,680
and we've been practicing the the entry

271
00:11:46,710 --> 00:11:45,040
descent and landing

272
00:11:48,710 --> 00:11:46,720
process using something we call

273
00:11:51,269 --> 00:11:48,720
operational readiness testing especially

274
00:11:52,629 --> 00:11:51,279
over the last six months or so

275
00:11:54,629 --> 00:11:52,639
it's going to be a little bit different

276
00:11:57,030 --> 00:11:54,639
this time obviously

277
00:11:57,829 --> 00:11:57,040
on previous missions uh we're going to

278
00:12:01,190 --> 00:11:57,839
be

279
00:12:03,990 --> 00:12:01,200
having to deal with the same pandemic

280
00:12:06,230 --> 00:12:04,000
that everybody else is dealing with here

281
00:12:08,150 --> 00:12:06,240
so our workplace is is a little

282
00:12:10,150 --> 00:12:08,160
different we've got

283
00:12:11,590 --> 00:12:10,160
masking requirements and social

284
00:12:13,430 --> 00:12:11,600
distancing requirements

285
00:12:15,910 --> 00:12:13,440
our mission support area will be a

286
00:12:19,190 --> 00:12:15,920
little less dense than we have before

287
00:12:22,470 --> 00:12:19,200
you know but make no mistake

288
00:12:24,790 --> 00:12:22,480

this is going to be a landing on mars

289
00:12:26,470 --> 00:12:24,800
much like the previous that we've had on

290
00:12:27,829 --> 00:12:26,480
on other missions

291
00:12:29,910 --> 00:12:27,839
and so i think with that i'm going to

292
00:12:33,829 --> 00:12:29,920
turn it over to our entry descent and

293
00:12:35,350 --> 00:12:33,839
landing phase lead al chen thanks matt

294
00:12:37,750 --> 00:12:35,360
matt just told you a little bit about

295
00:12:39,190 --> 00:12:37,760
the spacecraft and team readiness so

296
00:12:41,269 --> 00:12:39,200
why don't i do the traffic and weather

297
00:12:42,870 --> 00:12:41,279
as we get them closer to mars here

298
00:12:44,389 --> 00:12:42,880
um if you bring up this next image here

299
00:12:46,870 --> 00:12:44,399
you can kind of see our martian

300
00:12:48,230 --> 00:12:46,880
dartboard if you will figuratively here

301
00:12:50,069 --> 00:12:48,240
if we're inside that green box that

302
00:12:50,870 --> 00:12:50,079
green box is our bullseye that's where

303
00:12:52,870 --> 00:12:50,880
we want to be

304
00:12:54,470 --> 00:12:52,880
and that's in that anywhere in that area

305
00:12:55,990 --> 00:12:54,480
the entry descent and landing system can

306
00:12:57,190 --> 00:12:56,000
finish the job of getting us down to

307
00:12:58,310 --> 00:12:57,200
jezreel crater

308
00:12:59,990 --> 00:12:58,320
as you can kind of see from those

309
00:13:01,430 --> 00:13:00,000
rainbows of the little ellipses there at

310
00:13:03,110 --> 00:13:01,440
the top of the box we are comfortably

311
00:13:04,949 --> 00:13:03,120
inside that box right now

312
00:13:07,190 --> 00:13:04,959
so we think that the landing system can

313
00:13:09,350 --> 00:13:07,200

finish the job from here

314
00:13:10,870 --> 00:13:09,360
so we have hit that bull's-eye that's

315
00:13:13,829 --> 00:13:10,880
pretty incredible considering our last

316
00:13:15,509 --> 00:13:13,839
maneuver was back in december now if we

317
00:13:17,430 --> 00:13:15,519
move on to the weather

318
00:13:18,710 --> 00:13:17,440
i guess we just entered spring in the

319
00:13:19,910 --> 00:13:18,720
northern hemisphere

320
00:13:21,829 --> 00:13:19,920
which is actually the beginning of the

321
00:13:23,750 --> 00:13:21,839
martian new year so i guess a happy

322
00:13:25,350 --> 00:13:23,760
belated new year martian new year to

323
00:13:26,710 --> 00:13:25,360
those of you who celebrate

324
00:13:28,389 --> 00:13:26,720
but the the weather conditions look

325
00:13:28,949 --> 00:13:28,399
pretty uh pretty favorable for us right

326
00:13:31,190 --> 00:13:28,959
now

327
00:13:32,710 --> 00:13:31,200
as you can see from this image the the

328
00:13:34,230 --> 00:13:32,720
conditions are seasonal

329
00:13:35,990 --> 00:13:34,240
there are some clouds that are out there

330
00:13:37,750 --> 00:13:36,000
and some polar cap edge storms but

331
00:13:39,350 --> 00:13:37,760
nothing near our jezreel landing site

332
00:13:41,990 --> 00:13:39,360
that's over there in the white

333
00:13:43,990 --> 00:13:42,000
the skies look very clear and good for

334
00:13:47,030 --> 00:13:44,000
landing tomorrow

335
00:13:48,230 --> 00:13:47,040
but even with clear skies landing is the

336
00:13:48,870 --> 00:13:48,240
most critical and dangerous part of the

337
00:13:51,430 --> 00:13:48,880
mission

338
00:13:52,550 --> 00:13:51,440

um we just can't guarantee success so

339
00:13:54,310 --> 00:13:52,560
let me walk you through the critical

340
00:13:54,949 --> 00:13:54,320
events of edl all of which need to

341
00:13:56,870 --> 00:13:54,959
happen

342
00:13:58,870 --> 00:13:56,880
uh without any help from us here on

343
00:14:00,389 --> 00:13:58,880
earth perseverance will have to do this

344
00:14:02,069 --> 00:14:00,399
all on our own

345
00:14:03,350 --> 00:14:02,079
so the topic before we get to the top of

346
00:14:04,629 --> 00:14:03,360
the atmosphere we separate the crew

347
00:14:05,189 --> 00:14:04,639
stage that's helped us all the way

348
00:14:06,949 --> 00:14:05,199
through the

349
00:14:09,030 --> 00:14:06,959
six or seven months since uh since

350
00:14:11,269 --> 00:14:09,040
launch uh we'll hit the atmosphere going

351
00:14:13,269 --> 00:14:11,279
at about 12 000 miles per hour

352
00:14:14,870 --> 00:14:13,279
and use that atmosphere to really slow

353
00:14:15,430 --> 00:14:14,880
down we'll have to survive the intense

354
00:14:17,110 --> 00:14:15,440
heating

355
00:14:19,189 --> 00:14:17,120
and gs the deceleration that come with

356
00:14:20,150 --> 00:14:19,199
that but also steer our way to the

357
00:14:21,829 --> 00:14:20,160
target

358
00:14:23,590 --> 00:14:21,839
as we use thrusters on the back of the

359
00:14:25,750 --> 00:14:23,600
vehicle to steer our

360
00:14:27,269 --> 00:14:25,760
vehicle all the way toward the target

361
00:14:28,790 --> 00:14:27,279
once we slow down to supersonic speeds

362
00:14:29,430 --> 00:14:28,800
going about a thousand miles an hour or

363
00:14:31,509 --> 00:14:29,440

so

364
00:14:32,870 --> 00:14:31,519
perseverance will deploy a large 70-foot

365
00:14:34,150 --> 00:14:32,880
diameter parachute

366
00:14:35,829 --> 00:14:34,160
while still traveling almost twice the

367
00:14:36,550 --> 00:14:35,839
speed of sound so that'll slow the

368
00:14:39,350 --> 00:14:36,560
spacecraft down

369
00:14:40,550 --> 00:14:39,360
even further while still slowing down on

370
00:14:41,670 --> 00:14:40,560
that parachute

371
00:14:43,430 --> 00:14:41,680
perseverance will need to figure out

372
00:14:44,790 --> 00:14:43,440
where she is so she'll separate that

373
00:14:45,350 --> 00:14:44,800
heat shield that's kind of like the lens

374
00:14:47,030 --> 00:14:45,360
gap

375
00:14:48,870 --> 00:14:47,040
for us but that heat shield protected us

376
00:14:50,710 --> 00:14:48,880
through entry and we'll get a good look

377
00:14:52,389 --> 00:14:50,720
at the ground using the radar system to

378
00:14:53,030 --> 00:14:52,399
figure out how high we are and how fast

379
00:14:54,550 --> 00:14:53,040
we're going

380
00:14:56,389 --> 00:14:54,560
and then also a new system that we call

381
00:14:58,069 --> 00:14:56,399
terrain relative navigation that gives

382
00:14:59,269 --> 00:14:58,079
our vehicle uh eyes

383
00:15:01,829 --> 00:14:59,279
and the ability to really see where

384
00:15:03,030 --> 00:15:01,839
she's going and figure out where she is

385
00:15:04,629 --> 00:15:03,040
but even when the parachute is done

386
00:15:06,069 --> 00:15:04,639
working done slowing us down

387
00:15:08,629 --> 00:15:06,079
perseverance will still be going about

388
00:15:11,030 --> 00:15:08,639

160 miles an hour down

389
00:15:13,030 --> 00:15:11,040
and that's too fast to land so at that

390
00:15:14,790 --> 00:15:13,040
point we'll drop out of the back shell

391
00:15:16,389 --> 00:15:14,800
fire up engines uh those engines that

392
00:15:17,910 --> 00:15:16,399
are on the descent stage that's the

393
00:15:20,389 --> 00:15:17,920
rocket powered jet pack that's holding

394
00:15:20,949 --> 00:15:20,399
on to the rover and fly to a nearby safe

395
00:15:22,389 --> 00:15:20,959
spot

396
00:15:25,509 --> 00:15:22,399
using that train relative navigation

397
00:15:26,790 --> 00:15:25,519
system to uh to target a nice safe spot

398
00:15:28,389 --> 00:15:26,800
once we're about 70 feet above the

399
00:15:29,110 --> 00:15:28,399
ground we'll start the sky crane

400
00:15:30,710 --> 00:15:29,120
maneuver

401
00:15:32,629 --> 00:15:30,720
and that's where we separate the rover

402
00:15:34,230 --> 00:15:32,639
below the below that rocket power jet

403
00:15:34,790 --> 00:15:34,240
pack deploy those wheels or the landing

404
00:15:36,310 --> 00:15:34,800
gear

405
00:15:37,990 --> 00:15:36,320
and put her down safely at a little less

406
00:15:40,150 --> 00:15:38,000
than two miles an hour

407
00:15:43,350 --> 00:15:40,160
once that's over the uh the descent

408
00:15:45,509 --> 00:15:43,360
stage will fly away to a safe distance

409
00:15:46,710 --> 00:15:45,519
so that's all about how how perseverance

410
00:15:48,230 --> 00:15:46,720
is going to land tomorrow

411
00:15:50,150 --> 00:15:48,240
let's talk a little bit about how we're

412
00:15:51,829 --> 00:15:50,160
going to hear about it

413
00:15:53,590 --> 00:15:51,839

so if you keep the next the next figure

414
00:15:54,550 --> 00:15:53,600
here there's a couple ways that we'll be

415
00:15:56,629 --> 00:15:54,560
able to hear

416
00:15:58,150 --> 00:15:56,639
uh what's going on from perseverance as

417
00:15:59,749 --> 00:15:58,160
uh as it's happening

418
00:16:01,590 --> 00:15:59,759
uh the first is this direct to earth

419
00:16:02,629 --> 00:16:01,600
path uh so the vehicle can communicate

420
00:16:04,949 --> 00:16:02,639
direct to earth

421
00:16:06,790 --> 00:16:04,959
uh via something we call tones um

422
00:16:08,389 --> 00:16:06,800
because perseverance is busy landing

423
00:16:10,310 --> 00:16:08,399
she can't really spend the time to point

424
00:16:11,509 --> 00:16:10,320
her antennas toward earth and earth is

425
00:16:13,110 --> 00:16:11,519
really far away as well

426
00:16:15,350 --> 00:16:13,120
so these tones are very limited in

427
00:16:16,550 --> 00:16:15,360
information all we have there going

428
00:16:19,110 --> 00:16:16,560
direct to earth

429
00:16:20,550 --> 00:16:19,120
is uh kind of one of 256 tones they're

430
00:16:22,790 --> 00:16:20,560
like keys on a on a big

431
00:16:24,150 --> 00:16:22,800
piano and sometimes we can use those uh

432
00:16:25,030 --> 00:16:24,160
we can use those tones to tell us

433
00:16:26,150 --> 00:16:25,040
different things like

434
00:16:28,230 --> 00:16:26,160
the heat shield has come off or

435
00:16:29,829 --> 00:16:28,240
something like that unfortunately

436
00:16:31,509 --> 00:16:29,839
once we get down to about back shell

437
00:16:32,790 --> 00:16:31,519
separation earth will set below the

438
00:16:34,790 --> 00:16:32,800

horizon

439
00:16:36,150 --> 00:16:34,800
for perseverance so the tones will end

440
00:16:37,430 --> 00:16:36,160
but that'll take us all the way from

441
00:16:39,670 --> 00:16:37,440
kind of before from cruise stage

442
00:16:42,550 --> 00:16:39,680
separation all the way down to

443
00:16:43,509 --> 00:16:42,560
back shell separation or so next we have

444
00:16:44,790 --> 00:16:43,519
a second path

445
00:16:46,949 --> 00:16:44,800
that's the through the mars

446
00:16:47,749 --> 00:16:46,959
reconnaissance orbiter we've developed a

447
00:16:49,509 --> 00:16:47,759
new system

448
00:16:51,269 --> 00:16:49,519
on the new set of software on the mars

449
00:16:52,150 --> 00:16:51,279
for constance orbiter to allow us to

450
00:16:54,470 --> 00:16:52,160
relay

451
00:16:55,829 --> 00:16:54,480
uh data as it's coming um from the

452
00:16:58,069 --> 00:16:55,839
vehicle so all the way

453
00:16:59,189 --> 00:16:58,079
up from perseverance while she's landing

454
00:17:01,030 --> 00:16:59,199
up through mro

455
00:17:02,389 --> 00:17:01,040
and then down to uh down all the way to

456
00:17:04,309 --> 00:17:02,399
earth

457
00:17:06,069 --> 00:17:04,319
that gives us about uh about eight

458
00:17:07,750 --> 00:17:06,079
kilobits per second of data that's kind

459
00:17:09,750 --> 00:17:07,760
of like uh half the speed of old-school

460
00:17:11,029 --> 00:17:09,760
dial-up if you uh if you remember that

461
00:17:12,390 --> 00:17:11,039
but that'll allow us to see a lot of

462
00:17:13,590 --> 00:17:12,400
different things like uh what the

463
00:17:14,789 --> 00:17:13,600

vehicle is doing if you queue up the

464
00:17:16,710 --> 00:17:14,799
next little video here

465
00:17:18,150 --> 00:17:16,720
um we'll show we'll be able to show you

466
00:17:19,270 --> 00:17:18,160
what's going on in real time and show

467
00:17:21,429 --> 00:17:19,280
ourselves as well

468
00:17:23,110 --> 00:17:21,439
we'll be able to see what mode we're in

469
00:17:25,510 --> 00:17:23,120
where we think perseverance is looking

470
00:17:26,870 --> 00:17:25,520
how fast we're going and you know how

471
00:17:28,390 --> 00:17:26,880
high we are above the ground

472
00:17:29,909 --> 00:17:28,400
even an estimate of how much fuel we

473
00:17:31,510 --> 00:17:29,919
have left as well

474
00:17:32,950 --> 00:17:31,520
so we hope to use that to assess what's

475
00:17:34,230 --> 00:17:32,960
going on and to show everybody else

476
00:17:36,390 --> 00:17:34,240
what's going on

477
00:17:37,510 --> 00:17:36,400
as it's happening there's also another

478
00:17:39,270 --> 00:17:37,520
path that we get

479
00:17:40,549 --> 00:17:39,280
data from uh that we get data from

480
00:17:41,750 --> 00:17:40,559
another orbiter that's going overhead

481
00:17:43,270 --> 00:17:41,760
the maven orbiter

482
00:17:45,590 --> 00:17:43,280
but that data won't be available until

483
00:17:47,830 --> 00:17:45,600
several hours after landing

484
00:17:49,510 --> 00:17:47,840
so i just want to be clear that uh with

485
00:17:51,270 --> 00:17:49,520
all these different communications paths

486
00:17:52,630 --> 00:17:51,280
to get uh to get data back down to earth

487
00:17:53,270 --> 00:17:52,640
about how enter descent and landing is

488
00:17:55,110 --> 00:17:53,280

happening

489
00:17:56,950 --> 00:17:55,120
none of them are required for landing

490
00:17:58,470 --> 00:17:56,960
perseverance will try to land herself no

491
00:17:59,510 --> 00:17:58,480
matter what even if we don't get any of

492
00:18:01,990 --> 00:17:59,520
that data

493
00:18:03,350 --> 00:18:02,000
tomorrow as it's happening or afterward

494
00:18:06,390 --> 00:18:03,360
the vehicle is programmed to try to

495
00:18:07,830 --> 00:18:06,400
finish the job on her own

496
00:18:09,750 --> 00:18:07,840
one of the things that we will get

497
00:18:11,590 --> 00:18:09,760
actually as part of the communication

498
00:18:13,590 --> 00:18:11,600
stream that we're sending back

499
00:18:15,029 --> 00:18:13,600
is information about the intense

500
00:18:16,230 --> 00:18:15,039
aerodynamic forces

501
00:18:18,230 --> 00:18:16,240
and heating that are happening to the

502
00:18:20,070 --> 00:18:18,240
vehicle and that'll be from

503
00:18:28,789 --> 00:18:20,080
from sensors on the medley ii system

504
00:18:31,350 --> 00:18:28,799
that caitlin will talk about next

505
00:18:32,310 --> 00:18:31,360
thanks al um i'm happy to be joining you

506
00:18:34,789 --> 00:18:32,320
all virtually

507
00:18:36,310 --> 00:18:34,799
on behalf of the medley ii team to talk

508
00:18:37,430 --> 00:18:36,320
about why we're excited to be part of

509
00:18:39,590 --> 00:18:37,440
this mission

510
00:18:41,029 --> 00:18:39,600
um so as you've heard landing on mars is

511
00:18:42,549 --> 00:18:41,039
a very difficult thing to do

512
00:18:44,470 --> 00:18:42,559
largely due to the fact that we don't

513
00:18:45,350 --> 00:18:44,480

fully understand the harsh entry descent

514
00:18:48,150 --> 00:18:45,360
and landing or

515
00:18:50,070 --> 00:18:48,160
edl environment so the goal of medli 2

516
00:18:51,430 --> 00:18:50,080
is to collect data to help us better

517
00:18:53,190 --> 00:18:51,440
understand that environment

518
00:18:55,029 --> 00:18:53,200
specifically the heating and pressure

519
00:18:57,510 --> 00:18:55,039
that mars 2020 experiences

520
00:18:58,870 --> 00:18:57,520
as it passes through the mars atmosphere

521
00:19:01,350 --> 00:18:58,880
this will also help us to understand

522
00:19:03,350 --> 00:19:01,360
what we can expect for future missions

523
00:19:05,909 --> 00:19:03,360
so medley 2 stands for mars entry

524
00:19:07,990 --> 00:19:05,919
descent and landing instrumentation 2.

525
00:19:09,510 --> 00:19:08,000
the 2 is there because it's a follow-on

526
00:19:11,350 --> 00:19:09,520
to a set of sensors that flew on the

527
00:19:14,470 --> 00:19:11,360
mars science laboratory which delivered

528
00:19:17,110 --> 00:19:14,480
curiosity to mars in 2012.

529
00:19:18,230 --> 00:19:17,120
both the medley and medley ii sensor

530
00:19:20,870 --> 00:19:18,240
suites were developed through a

531
00:19:23,830 --> 00:19:20,880
partnership between nasa langley ames

532
00:19:25,190 --> 00:19:23,840
jpl and lockheed martin space systems

533
00:19:26,950 --> 00:19:25,200
and in fact our centers have been

534
00:19:27,669 --> 00:19:26,960
working together for many years on mars

535
00:19:29,909 --> 00:19:27,679
missions

536
00:19:31,190 --> 00:19:29,919
particularly on edl technology and

537
00:19:32,470 --> 00:19:31,200
trajectory development

538
00:19:34,789 --> 00:19:32,480

going all the way back to the viking

539
00:19:36,150 --> 00:19:34,799
days um if you could pull up that first

540
00:19:38,630 --> 00:19:36,160
image please

541
00:19:39,510 --> 00:19:38,640
this shows an overview of our sensor

542
00:19:42,150 --> 00:19:39,520
locations

543
00:19:43,190 --> 00:19:42,160
medley 2 has 28 sensors on the mars 2020

544
00:19:44,789 --> 00:19:43,200
aeroshell

545
00:19:46,150 --> 00:19:44,799
the air shell consists of the heat

546
00:19:47,510 --> 00:19:46,160
shield which is shown in the back of the

547
00:19:50,150 --> 00:19:47,520
image sort of the tan

548
00:19:51,990 --> 00:19:50,160
brown colored item and that's what faces

549
00:19:54,070 --> 00:19:52,000
the atmosphere during entry

550
00:19:55,990 --> 00:19:54,080
um and then also the back shell which is

551
00:19:58,470 --> 00:19:56,000
the white piece you see up front and

552
00:20:00,070 --> 00:19:58,480
that's what covers perseverance

553
00:20:01,830 --> 00:20:00,080
medley ii has sensors on both the heat

554
00:20:03,510 --> 00:20:01,840
shield and the back shell

555
00:20:05,110 --> 00:20:03,520
we have seven different types of sensors

556
00:20:05,990 --> 00:20:05,120
that fall basically into three different

557
00:20:07,590 --> 00:20:06,000
categories

558
00:20:09,590 --> 00:20:07,600
pressure transducers which measure

559
00:20:11,510 --> 00:20:09,600
pressure thermocouples which measure

560
00:20:13,029 --> 00:20:11,520
temperature and heat flux sensors which

561
00:20:14,470 --> 00:20:13,039
measure the heating in the vicinity of

562
00:20:16,390 --> 00:20:14,480
the spacecraft

563
00:20:18,230 --> 00:20:16,400

we'll start taking our data a few hours

564
00:20:20,470 --> 00:20:18,240
before entry and will continue through

565
00:20:22,070 --> 00:20:20,480
parachute deployment and all of that

566
00:20:24,549 --> 00:20:22,080
data will help us to understand several

567
00:20:26,470 --> 00:20:24,559
things about the extreme edl environment

568
00:20:28,630 --> 00:20:26,480
one of those is what's the impact of

569
00:20:31,110 --> 00:20:28,640
wind on the vehicle's trajectory

570
00:20:32,950 --> 00:20:31,120
we learned with medley that msl's path

571
00:20:34,390 --> 00:20:32,960
was affected by winds in the seconds

572
00:20:35,669 --> 00:20:34,400
before the parachute deployed

573
00:20:37,990 --> 00:20:35,679
and so we'd like to learn more about

574
00:20:39,750 --> 00:20:38,000
that this time around we'll also learn

575
00:20:41,350 --> 00:20:39,760
about the energy and the hot gases that

576
00:20:43,430 --> 00:20:41,360
are close to the vehicle

577
00:20:44,789 --> 00:20:43,440
and that heat is really generated in a

578
00:20:46,470 --> 00:20:44,799
couple of different ways

579
00:20:48,070 --> 00:20:46,480
one is just from the friction that comes

580
00:20:50,390 --> 00:20:48,080
from flying so fast

581
00:20:52,149 --> 00:20:50,400
through the atmosphere and another is

582
00:20:53,590 --> 00:20:52,159
radiant heat so if you think of what it

583
00:20:55,190 --> 00:20:53,600
feels like to put your hands in front of

584
00:20:56,710 --> 00:20:55,200
a fireplace and you can kind of feel the

585
00:20:57,909 --> 00:20:56,720
heat coming off of it

586
00:20:59,909 --> 00:20:57,919
that's the type of heat that we're

587
00:21:01,190 --> 00:20:59,919
trying to measure there and finally

588
00:21:03,029 --> 00:21:01,200

we'll be looking at the

589
00:21:04,630 --> 00:21:03,039
performance of the insulation material

590
00:21:06,230 --> 00:21:04,640
that protects perseverance from the

591
00:21:08,310 --> 00:21:06,240
extreme heating environment

592
00:21:09,590 --> 00:21:08,320
and the way we do that is to put take

593
00:21:12,070 --> 00:21:09,600
temperature measurements at different

594
00:21:13,909 --> 00:21:12,080
places throughout that material

595
00:21:15,990 --> 00:21:13,919
so what differentiates medley 2 from the

596
00:21:17,909 --> 00:21:16,000
first medley is that we're going to be

597
00:21:19,270 --> 00:21:17,919
collecting better data over more of the

598
00:21:20,870 --> 00:21:19,280
entry timeline

599
00:21:22,310 --> 00:21:20,880
we'll do that by spreading out our

600
00:21:24,870 --> 00:21:22,320
sensors in more locations

601
00:21:26,149 --> 00:21:24,880
gives us better coverage and we're also

602
00:21:27,190 --> 00:21:26,159
measuring three different pressure

603
00:21:29,909 --> 00:21:27,200
ranges this time

604
00:21:31,669 --> 00:21:29,919
whereas we only had one on medley we

605
00:21:33,510 --> 00:21:31,679
also have heat flux sensors which

606
00:21:35,190 --> 00:21:33,520
actually touch the atmosphere so rather

607
00:21:36,789 --> 00:21:35,200
than sitting below the surface of the

608
00:21:37,669 --> 00:21:36,799
material these are actually right out

609
00:21:39,350 --> 00:21:37,679
there on the

610
00:21:40,710 --> 00:21:39,360
on the surface of the vehicle touching

611
00:21:42,310 --> 00:21:40,720
the atmosphere and that gives us more

612
00:21:43,990 --> 00:21:42,320
accurate measurements

613
00:21:45,510 --> 00:21:44,000

and all of that allows us to seek

614
00:21:47,430 --> 00:21:45,520
answers to questions that were raised by

615
00:21:49,350 --> 00:21:47,440
medley and to explore areas that we

616
00:21:51,270 --> 00:21:49,360
couldn't address last time

617
00:21:52,870 --> 00:21:51,280
and when we combine the data of medley

618
00:21:54,630 --> 00:21:52,880
ii with the first medley we're going to

619
00:21:55,830 --> 00:21:54,640
be able to really improve designs for

620
00:21:58,549 --> 00:21:55,840
future entry systems

621
00:22:00,149 --> 00:21:58,559
both for robotic and for human missions

622
00:22:01,990 --> 00:22:00,159
and the way it'll do that is to help us

623
00:22:03,830 --> 00:22:02,000
to improve the computer codes we use to

624
00:22:05,430 --> 00:22:03,840
predict the environments

625
00:22:07,190 --> 00:22:05,440
because the mars atmosphere is so

626
00:22:07,830 --> 00:22:07,200
different from earth it's very difficult

627
00:22:10,470 --> 00:22:07,840
to test

628
00:22:12,470 --> 00:22:10,480
for mars entry conditions here and so we

629
00:22:14,390 --> 00:22:12,480
rely on computer code to essentially

630
00:22:15,830 --> 00:22:14,400
over design the vehicle

631
00:22:18,149 --> 00:22:15,840
to make sure that we can survive worst

632
00:22:19,909 --> 00:22:18,159
case conditions but that means the

633
00:22:21,190 --> 00:22:19,919
vehicle probably ends up heavier than it

634
00:22:22,630 --> 00:22:21,200
needs to be

635
00:22:24,149 --> 00:22:22,640
so if we can understand the heating

636
00:22:24,950 --> 00:22:24,159
better then we can make the heat shield

637
00:22:27,350 --> 00:22:24,960
much lighter

638
00:22:29,110 --> 00:22:27,360

by up to about 35 percent and that'll

639
00:22:33,029 --> 00:22:29,120
translate to lower cost

640
00:22:33,990 --> 00:22:33,039
more science and more supplies for human

641
00:22:35,590 --> 00:22:34,000
missions

642
00:22:37,590 --> 00:22:35,600
and then if we can better understand how

643
00:22:38,950 --> 00:22:37,600
the vehicle flies we can have safer more

644
00:22:40,149 --> 00:22:38,960
reliable landings

645
00:22:42,070 --> 00:22:40,159
and that'll help us to reduce the

646
00:22:43,590 --> 00:22:42,080
footprint for landing which means we can

647
00:22:44,310 --> 00:22:43,600
put landers closer to interesting

648
00:22:46,230 --> 00:22:44,320
science

649
00:22:48,870 --> 00:22:46,240
or put people closer to the supplies

650
00:22:50,549 --> 00:22:48,880
that we sent to mars ahead of them

651
00:22:52,149 --> 00:22:50,559
um so not only can we extend what we

652
00:22:54,070 --> 00:22:52,159
learn to future mars missions but

653
00:22:55,909 --> 00:22:54,080
like marsh sample return but we can also

654
00:22:56,630 --> 00:22:55,919
extend it to edl missions at other

655
00:22:58,789 --> 00:22:56,640
planets

656
00:22:59,909 --> 00:22:58,799
or moons like venus or saturn's moon

657
00:23:01,190 --> 00:22:59,919
titan

658
00:23:03,669 --> 00:23:01,200
um if you could please pull up the

659
00:23:04,549 --> 00:23:03,679
second image this is an image of a few

660
00:23:06,789 --> 00:23:04,559
of our team members

661
00:23:08,230 --> 00:23:06,799
after we completed the final medley 2

662
00:23:11,110 --> 00:23:08,240
end to end-to-end checkout

663
00:23:12,710 --> 00:23:11,120

uh in late 2019. and this was

664
00:23:14,390 --> 00:23:12,720
essentially when all of our hardware was

665
00:23:15,190 --> 00:23:14,400
installed on the heat shield which you

666
00:23:17,029 --> 00:23:15,200
see on the

667
00:23:18,710 --> 00:23:17,039
right and then the back shell on the

668
00:23:20,310 --> 00:23:18,720
left so everything was installed and

669
00:23:21,830 --> 00:23:20,320
hooked up and we verified that it worked

670
00:23:23,990 --> 00:23:21,840
so we're all given the thumbs up because

671
00:23:25,510 --> 00:23:24,000
that was a pretty good day for us

672
00:23:27,029 --> 00:23:25,520
and i just want to wrap up by saying

673
00:23:28,390 --> 00:23:27,039
that we're very excited

674
00:23:30,630 --> 00:23:28,400
for medley 2 to extend the

675
00:23:32,310 --> 00:23:30,640
groundbreaking entry data that was

676
00:23:34,070 --> 00:23:32,320
collected by the first medley

677
00:23:35,669 --> 00:23:34,080
it's going to tell us what mars 2020

678
00:23:37,750 --> 00:23:35,679
actually experiences during those

679
00:23:39,669 --> 00:23:37,760
important few minutes of edl

680
00:23:41,909 --> 00:23:39,679
and it fills critical gaps in knowledge

681
00:23:43,110 --> 00:23:41,919
necessary to advance edl technology in

682
00:23:44,950 --> 00:23:43,120
the future

683
00:23:46,870 --> 00:23:44,960
and in fact the back shell sensor suite

684
00:23:47,750 --> 00:23:46,880
is going to collect nasa's first ever

685
00:23:49,510 --> 00:23:47,760
measurements

686
00:23:51,430 --> 00:23:49,520
of the heat experience by the back shell

687
00:23:52,950 --> 00:23:51,440
of a mars entry vehicle so we're excited

688
00:23:54,549 --> 00:23:52,960

about that too

689
00:23:56,390 --> 00:23:54,559
but overall medley ii will give us the

690
00:23:57,190 --> 00:23:56,400
most complete data set ever collected

691
00:23:59,750 --> 00:23:57,200
from a mars

692
00:24:00,950 --> 00:23:59,760
entry and with that i'll hand it over to

693
00:24:02,789 --> 00:24:00,960
jennifer who will talk about what

694
00:24:05,909 --> 00:24:02,799
happens after landing

695
00:24:09,029 --> 00:24:05,919
thanks caitlin well it turns out

696
00:24:10,630 --> 00:24:09,039
after landing it's not over over in fact

697
00:24:11,510 --> 00:24:10,640
it's just beginning the science mission

698
00:24:13,830 --> 00:24:11,520
is just beginning

699
00:24:15,350 --> 00:24:13,840
i say that but i definitely know that

700
00:24:16,870 --> 00:24:15,360
all of us up here

701
00:24:18,390 --> 00:24:16,880
along with all of you out there will be

702
00:24:20,390 --> 00:24:18,400
breathing a great sigh of

703
00:24:22,710 --> 00:24:20,400
relief when we get down safely on the

704
00:24:23,830 --> 00:24:22,720
surface but once we do get down safely

705
00:24:25,510 --> 00:24:23,840
on the surface

706
00:24:27,029 --> 00:24:25,520
we're all on the edge of our seats to

707
00:24:28,870 --> 00:24:27,039
get those first images

708
00:24:30,710 --> 00:24:28,880
from mars and so i want to talk a little

709
00:24:32,789 --> 00:24:30,720
bit about how we get those first images

710
00:24:34,230 --> 00:24:32,799
when they might come and then i'll also

711
00:24:36,549 --> 00:24:34,240
talk just in general

712
00:24:38,310 --> 00:24:36,559
about the things that we do afterward we

713
00:24:39,750 --> 00:24:38,320

land on mars to get the rover ready for

714
00:24:41,830 --> 00:24:39,760
the science mission

715
00:24:44,149 --> 00:24:41,840
so the images during entry descent and

716
00:24:46,230 --> 00:24:44,159
landing at the very end of that uhf

717
00:24:48,549 --> 00:24:46,240
pass with mro we talked about it's

718
00:24:50,149 --> 00:24:48,559
possible that we will get hazcam images

719
00:24:50,789 --> 00:24:50,159
the hazcams are on the front and rear of

720
00:24:52,710 --> 00:24:50,799
the rover

721
00:24:54,390 --> 00:24:52,720
that we'll get hazcam images with the

722
00:24:56,390 --> 00:24:54,400
lens covers still on

723
00:24:58,470 --> 00:24:56,400
in that pass if we get that that's

724
00:25:00,310 --> 00:24:58,480
golden everybody's very excited

725
00:25:01,990 --> 00:25:00,320
we may not get that for the reasons al

726
00:25:05,110 --> 00:25:02,000
talked about some of these links drop

727
00:25:06,950 --> 00:25:05,120
out then we have an opportunity

728
00:25:09,029 --> 00:25:06,960
in the later afternoon about three and a

729
00:25:10,870 --> 00:25:09,039
half hours after landing there's the

730
00:25:11,510 --> 00:25:10,880
odyssey orbiter flies over but it's a

731
00:25:14,549 --> 00:25:11,520
very

732
00:25:16,390 --> 00:25:14,559
low data volume pass so we will get data

733
00:25:18,549 --> 00:25:16,400
on that if things have gone well but we

734
00:25:20,630 --> 00:25:18,559
likely wouldn't necessarily get images

735
00:25:22,710 --> 00:25:20,640
so we have to wait until our 6 30 pm

736
00:25:23,430 --> 00:25:22,720
pass which is the trace gas orbiter

737
00:25:26,230 --> 00:25:23,440
european

738
00:25:28,149 --> 00:25:26,240

asset where we can get a lot more data

739
00:25:30,310 --> 00:25:28,159
volume and hopefully we'll be getting

740
00:25:32,789 --> 00:25:30,320
some initial images on that those would

741
00:25:34,870 --> 00:25:32,799
be the front and rear haz cams with the

742
00:25:36,710 --> 00:25:34,880
lens covers deployed because the rover

743
00:25:39,110 --> 00:25:36,720
will have deployed them by then

744
00:25:41,350 --> 00:25:39,120
we potentially would get some of those

745
00:25:41,990 --> 00:25:41,360
thumbnail movies for edl cameras if all

746
00:25:43,909 --> 00:25:42,000
has gone well

747
00:25:45,909 --> 00:25:43,919
so we're going to start getting some

748
00:25:48,950 --> 00:25:45,919
fantastic imagery and see

749
00:25:51,830 --> 00:25:48,960
our new landing site here on mars from

750
00:25:53,430 --> 00:25:51,840
from the rover's point of view now the

751
00:25:55,510 --> 00:25:53,440
internal checks that we do right after

752
00:25:58,070 --> 00:25:55,520
landing are somewhat limited

753
00:25:59,990 --> 00:25:58,080
rover's had a long day so mostly just

754
00:26:00,789 --> 00:26:00,000
does a few releases of our high gain

755
00:26:03,510 --> 00:26:00,799
antenna

756
00:26:03,990 --> 00:26:03,520
those lens covers i talked about and

757
00:26:06,950 --> 00:26:04,000
then

758
00:26:08,870 --> 00:26:06,960
we we go we take a nap and we charge the

759
00:26:10,230 --> 00:26:08,880
batteries up to get ready for

760
00:26:12,549 --> 00:26:10,240
all the things that are happening the

761
00:26:12,870 --> 00:26:12,559
next several saws so if you can go ahead

762
00:26:14,630 --> 00:26:12,880
and

763
00:26:16,630 --> 00:26:14,640

enroll the next video one of the things

764
00:26:17,590 --> 00:26:16,640
that we do across the first few saws on

765
00:26:19,990 --> 00:26:17,600
mars

766
00:26:21,190 --> 00:26:20,000
is we try to we know the tilt of the

767
00:26:23,909 --> 00:26:21,200
rover we have a

768
00:26:26,630 --> 00:26:23,919
imu data but we don't actually know the

769
00:26:28,310 --> 00:26:26,640
orientation of the rover that accurately

770
00:26:30,230 --> 00:26:28,320
and so what you see here is the remote

771
00:26:32,070 --> 00:26:30,240
sensing mask that was folded up

772
00:26:34,230 --> 00:26:32,080
on the rover so we could fit in the back

773
00:26:35,909 --> 00:26:34,240
shell has to be deployed

774
00:26:37,750 --> 00:26:35,919
the high gain antenna you can see is

775
00:26:39,430 --> 00:26:37,760
over to the right of the image in flat

776
00:26:39,990 --> 00:26:39,440
that needs to be deployed and pointed

777
00:26:41,830 --> 00:26:40,000
earth

778
00:26:43,590 --> 00:26:41,840
we actually use the cameras on that

779
00:26:46,230 --> 00:26:43,600
remote sensing mass to

780
00:26:47,110 --> 00:26:46,240
look around and find the sun once we

781
00:26:50,310 --> 00:26:47,120
know where the sun

782
00:26:52,470 --> 00:26:50,320
is we're actually able to put that data

783
00:26:54,230 --> 00:26:52,480
into the rover's computer and we have

784
00:26:56,230 --> 00:26:54,240
all the other information we need to

785
00:26:59,029 --> 00:26:56,240
point that high gain antenna at earth

786
00:27:00,230 --> 00:26:59,039
and that's what we'll do to command the

787
00:27:02,230 --> 00:27:00,240
rover we send

788
00:27:03,350 --> 00:27:02,240

commands through that high gain antenna

789
00:27:05,590 --> 00:27:03,360
so that will happen

790
00:27:06,710 --> 00:27:05,600
that first week on mars we'll be doing

791
00:27:09,669 --> 00:27:06,720
those things

792
00:27:10,549 --> 00:27:09,679
and then we hope to be driving in a few

793
00:27:12,789 --> 00:27:10,559
weeks to the

794
00:27:14,789 --> 00:27:12,799
helicopter flight demo site so we'll be

795
00:27:17,029 --> 00:27:14,799
looking for a good site flat site not

796
00:27:19,269 --> 00:27:17,039
many rocks so we can fly the helicopter

797
00:27:20,389 --> 00:27:19,279
and then after that we will be driving

798
00:27:22,389 --> 00:27:20,399
to our first

799
00:27:24,630 --> 00:27:22,399
science sampling site that we hope to

800
00:27:27,669 --> 00:27:24,640
get to in in the summer so

801
00:27:29,750 --> 00:27:27,679
so with that i will say i'm very excited

802
00:27:31,110 --> 00:27:29,760
the team is now shifting their schedules

803
00:27:33,029 --> 00:27:31,120
to be on mars time

804
00:27:34,549 --> 00:27:33,039
right now on mars at our landing site

805
00:27:37,190 --> 00:27:34,559
it's about 2 p.m

806
00:27:37,830 --> 00:27:37,200
local solar so the team is going to get

807
00:27:40,230 --> 00:27:37,840
used to

808
00:27:41,909 --> 00:27:40,240
getting up later and then working a

809
00:27:43,909 --> 00:27:41,919
little bit into the night

810
00:27:45,590 --> 00:27:43,919
that's not bad to be on a different

811
00:27:47,350 --> 00:27:45,600
shift but the problem with mars time is

812
00:27:49,110 --> 00:27:47,360
that the mars days are 40 minutes longer

813
00:27:51,510 --> 00:27:49,120

than the earth days and so

814
00:27:53,510 --> 00:27:51,520
you're always shifting by 40 minutes

815
00:27:55,190 --> 00:27:53,520
every day and that gets you jet lagged

816
00:27:56,549 --> 00:27:55,200
but we do this because we want to be

817
00:27:57,990 --> 00:27:56,559
very efficient

818
00:27:59,590 --> 00:27:58,000
with the mission that we're doing and

819
00:28:01,350 --> 00:27:59,600
get the rover unfolded

820
00:28:03,909 --> 00:28:01,360
get it get the helicopter mission going

821
00:28:05,990 --> 00:28:03,919
and get there getting our first samples

822
00:28:07,830 --> 00:28:06,000
and i have to say after five missions i

823
00:28:08,870 --> 00:28:07,840
finally yesterday somebody asked me

824
00:28:10,549 --> 00:28:08,880
what are you what are you doing to

825
00:28:11,669 --> 00:28:10,559
prepare for mars time and i thought i

826
00:28:13,990 --> 00:28:11,679
finally

827
00:28:15,350 --> 00:28:14,000
have purchased a sleep mask which i

828
00:28:17,029 --> 00:28:15,360
didn't have maybe it took me five

829
00:28:18,870 --> 00:28:17,039
missions to figure this out but

830
00:28:20,470 --> 00:28:18,880
sometimes it's hard you know to sleep

831
00:28:21,350 --> 00:28:20,480
and everybody's sleeping in the middle

832
00:28:24,149 --> 00:28:21,360
of the day

833
00:28:25,590 --> 00:28:24,159
so i'm ready have my ear plugs and we'll

834
00:28:27,750 --> 00:28:25,600
be on mars time

835
00:28:31,269 --> 00:28:27,760
and to talk more about the science

836
00:28:34,630 --> 00:28:31,279
mission i'll hand this off to ken farley

837
00:28:38,070 --> 00:28:34,640
thanks jennifer tomorrow's landing of

838
00:28:40,549 --> 00:28:38,080

perseverance on mars is the spectacular

839
00:28:41,590 --> 00:28:40,559
crux move of this mission and it really

840
00:28:43,510 --> 00:28:41,600
marks the

841
00:28:44,950 --> 00:28:43,520
fundamental transition from the getting

842
00:28:47,669 --> 00:28:44,960
there phase of the mission

843
00:28:48,789 --> 00:28:47,679
to the doing phase to actually exploring

844
00:28:52,149 --> 00:28:48,799
jezreel crater as

845
00:28:53,909 --> 00:28:52,159
as laurie mentioned there are 450

846
00:28:56,230 --> 00:28:53,919
science team members from around the

847
00:28:56,950 --> 00:28:56,240
world and i will say we are very much

848
00:28:59,029 --> 00:28:56,960
ready to

849
00:29:00,630 --> 00:28:59,039
take the stage i want to tell you a

850
00:29:01,990 --> 00:29:00,640
little bit about what we have been doing

851
00:29:04,149 --> 00:29:02,000
for the last few years

852
00:29:05,750 --> 00:29:04,159
and what we will be doing in the next

853
00:29:07,510 --> 00:29:05,760
few weeks

854
00:29:08,870 --> 00:29:07,520
the first important thing to understand

855
00:29:11,350 --> 00:29:08,880
is that

856
00:29:13,669 --> 00:29:11,360
perseverance is a very capable but a

857
00:29:16,870 --> 00:29:13,679
very complicated piece of hardware

858
00:29:19,350 --> 00:29:16,880
to operate and it's autonomous

859
00:29:20,310 --> 00:29:19,360
but we have to tell it everything that

860
00:29:21,909 --> 00:29:20,320
it is going to do

861
00:29:23,750 --> 00:29:21,919
we have to tell it where to drive we

862
00:29:24,789 --> 00:29:23,760
have to tell it what observations to

863
00:29:26,470 --> 00:29:24,799

make

864
00:29:27,990 --> 00:29:26,480
we have to tell it what samples to

865
00:29:30,549 --> 00:29:28,000
collect and

866
00:29:31,909 --> 00:29:30,559
this leads to a daily cycle in which

867
00:29:34,789 --> 00:29:31,919
data flows back

868
00:29:35,590 --> 00:29:34,799
from the rover to the science team the

869
00:29:37,750 --> 00:29:35,600
science team

870
00:29:39,029 --> 00:29:37,760
needs to digest that data interpret it

871
00:29:41,190 --> 00:29:39,039
scientifically

872
00:29:42,470 --> 00:29:41,200
and then together come up with a plan

873
00:29:44,789 --> 00:29:42,480
for what we are going to do

874
00:29:46,310 --> 00:29:44,799
tomorrow and then that plan needs to be

875
00:29:46,950 --> 00:29:46,320
turned into code and beamed up to the

876
00:29:50,149 --> 00:29:46,960
rover

877
00:29:53,990 --> 00:29:50,159
to execute this is a very

878
00:29:56,389 --> 00:29:54,000
fast-paced high-stakes operation

879
00:29:57,110 --> 00:29:56,399
it's kind of a race to get it done and

880
00:29:59,510 --> 00:29:57,120
it also

881
00:30:00,789 --> 00:29:59,520
involves literally hundreds of people

882
00:30:02,870 --> 00:30:00,799
having to work together

883
00:30:05,350 --> 00:30:02,880
seamlessly and i can tell you this is

884
00:30:07,029 --> 00:30:05,360
not what scientists usually do

885
00:30:08,789 --> 00:30:07,039
scientists do not usually perform under

886
00:30:12,149 --> 00:30:08,799
these kinds of circumstances

887
00:30:15,830 --> 00:30:12,159
and what that means is we have had to

888
00:30:17,990 --> 00:30:15,840

train and so i want to tell you

889
00:30:19,590 --> 00:30:18,000
exactly how we went about doing this we

890
00:30:21,909 --> 00:30:19,600
need to get really good at this

891
00:30:23,350 --> 00:30:21,919
daily cycle and if i can have the first

892
00:30:25,430 --> 00:30:23,360
video

893
00:30:26,710 --> 00:30:25,440
here you see an example of one of our

894
00:30:28,389 --> 00:30:26,720
training exercises

895
00:30:30,789 --> 00:30:28,399
in which we sent a small team of

896
00:30:32,710 --> 00:30:30,799
scientists out to the nevada desert

897
00:30:33,830 --> 00:30:32,720
with instruments to simulate what was on

898
00:30:36,070 --> 00:30:33,840
the rover

899
00:30:37,830 --> 00:30:36,080
meanwhile the rest of the science team

900
00:30:39,190 --> 00:30:37,840
some at jpl and some of their home

901
00:30:41,269 --> 00:30:39,200
institutions

902
00:30:42,310 --> 00:30:41,279
did a full up role playing exercise for

903
00:30:44,230 --> 00:30:42,320
about a week

904
00:30:46,230 --> 00:30:44,240
where we went through this daily cycle

905
00:30:48,470 --> 00:30:46,240
and and we learned a lot about how this

906
00:30:49,669 --> 00:30:48,480
is going to unfold so so we have gotten

907
00:30:51,909 --> 00:30:49,679
better at it

908
00:30:54,070 --> 00:30:51,919
and through this kind of exercise and a

909
00:30:56,549 --> 00:30:54,080
variety of other kinds of training

910
00:30:57,909 --> 00:30:56,559
exercises we um we've really sharpened

911
00:30:59,909 --> 00:30:57,919
our skills

912
00:31:01,909 --> 00:30:59,919
and one special skill we've had to pay

913
00:31:04,789 --> 00:31:01,919

attention to and it's different than

914
00:31:06,070 --> 00:31:04,799
than ever before is the science team is

915
00:31:08,149 --> 00:31:06,080
not going to be

916
00:31:09,430 --> 00:31:08,159
shoulder to shoulder doing this uh for

917
00:31:12,710 --> 00:31:09,440
the foreseeable future

918
00:31:14,950 --> 00:31:12,720
we are going to be operating remotely so

919
00:31:16,389 --> 00:31:14,960
so literally um the science mission is

920
00:31:17,430 --> 00:31:16,399
going to be executed from people's

921
00:31:19,750 --> 00:31:17,440
living rooms and

922
00:31:20,789 --> 00:31:19,760
bedrooms all around the country and and

923
00:31:22,710 --> 00:31:20,799
all around the world it's

924
00:31:24,149 --> 00:31:22,720
it's a it's spectacular that we are able

925
00:31:27,750 --> 00:31:24,159
to do that it's a big challenge and i

926
00:31:30,630 --> 00:31:29,350
immediately after we land jennifer's

927
00:31:31,110 --> 00:31:30,640
told you a little bit about what's going

928
00:31:33,830 --> 00:31:31,120
to happen

929
00:31:35,750 --> 00:31:33,840
we are going to get some images and

930
00:31:37,509 --> 00:31:35,760
those images will be

931
00:31:39,909 --> 00:31:37,519
enormously important for the science

932
00:31:42,230 --> 00:31:39,919
team we have a lot of

933
00:31:43,190 --> 00:31:42,240
orbital data pictures taken from from

934
00:31:45,190 --> 00:31:43,200
orbiters

935
00:31:47,029 --> 00:31:45,200
but there's nothing like actually seeing

936
00:31:48,870 --> 00:31:47,039
images on on the ground to get kind of

937
00:31:50,870 --> 00:31:48,880
situational awareness

938
00:31:51,909 --> 00:31:50,880

and for a geologist that is very

939
00:31:53,590 --> 00:31:51,919
important the first

940
00:31:55,590 --> 00:31:53,600
few minutes on the field site when you

941
00:31:57,990 --> 00:31:55,600
can look around is is

942
00:31:59,509 --> 00:31:58,000
enormously enlightening so we'll use

943
00:32:02,149 --> 00:31:59,519
that kind of information

944
00:32:03,909 --> 00:32:02,159
images we get as well as a little bit of

945
00:32:05,509 --> 00:32:03,919
initial exploration

946
00:32:07,990 --> 00:32:05,519
to decide what to do and if i could have

947
00:32:11,350 --> 00:32:08,000
the next image

948
00:32:14,950 --> 00:32:11,360
we are very likely to move towards

949
00:32:16,470 --> 00:32:14,960
a one of several pathways that we have

950
00:32:19,110 --> 00:32:16,480
already identified from

951
00:32:21,590 --> 00:32:19,120
orbit um one of which you can see here

952
00:32:23,669 --> 00:32:21,600
the green line snaking across the delta

953
00:32:26,070 --> 00:32:23,679
this is a pathway that the science team

954
00:32:29,509 --> 00:32:26,080
has identified over the last few years

955
00:32:30,230 --> 00:32:29,519
that strings together the key scientific

956
00:32:32,310 --> 00:32:30,240
targets

957
00:32:33,750 --> 00:32:32,320
that we wish to investigate these are

958
00:32:35,830 --> 00:32:33,760
places where rocks

959
00:32:37,669 --> 00:32:35,840
outcrop that we think will tell us the

960
00:32:39,830 --> 00:32:37,679
most about the geologic history

961
00:32:41,909 --> 00:32:39,840
of jezreel crater they are the places

962
00:32:43,430 --> 00:32:41,919
where we think there may be evidence for

963
00:32:44,630 --> 00:32:43,440

past life on mars where we might find

964
00:32:46,070 --> 00:32:44,640
biosignatures

965
00:32:48,149 --> 00:32:46,080
and places where we are likely to

966
00:32:49,750 --> 00:32:48,159
collect samples so getting onto that

967
00:32:50,549 --> 00:32:49,760
trajectory will be something that we do

968
00:32:53,509 --> 00:32:50,559
very early

969
00:32:55,190 --> 00:32:53,519
in the mission so i can tell you that

970
00:32:59,590 --> 00:32:55,200
the science team is very excited

971
00:33:02,630 --> 00:32:59,600
for this transition and i i personally

972
00:33:04,149 --> 00:33:02,640
am extremely excited for those first

973
00:33:06,549 --> 00:33:04,159
images that are going to come back

974
00:33:07,350 --> 00:33:06,559
they will be fabulous from a scientific

975
00:33:10,149 --> 00:33:07,360
point of view and

976
00:33:11,909 --> 00:33:10,159
and also as a as a huge milestone after

977
00:33:14,230 --> 00:33:11,919
so many years of effort

978
00:33:14,950 --> 00:33:14,240
in this mission and now i will turn it

979
00:33:18,470 --> 00:33:14,960
back to

980
00:33:19,190 --> 00:33:18,480
marina to handle questions thank you so

981
00:33:20,789 --> 00:33:19,200
much ken

982
00:33:22,230 --> 00:33:20,799
and thank you so much to all our

983
00:33:24,389 --> 00:33:22,240
panelist presenters

984
00:33:26,549 --> 00:33:24,399
we are now ready to take media questions

985
00:33:27,430 --> 00:33:26,559
remember to press star one to get put in

986
00:33:29,509 --> 00:33:27,440
the queue

987
00:33:30,549 --> 00:33:29,519
and please direct your questions to one

988
00:33:32,470 --> 00:33:30,559

of the panelists

989
00:33:33,830 --> 00:33:32,480
we're also taking questions through the

990
00:33:37,430 --> 00:33:33,840
countdown to mars

991
00:33:40,789 --> 00:33:37,440
hashtag our first question comes from

992
00:33:47,909 --> 00:33:40,799
chelsea goad from space.com good morning

993
00:33:52,149 --> 00:33:51,509
chelsea good morning good morning can

994
00:33:55,509 --> 00:33:52,159
you hear me

995
00:33:56,549 --> 00:33:55,519
yes we can hear you okay great thank you

996
00:33:59,669 --> 00:33:56,559
so much

997
00:34:00,149 --> 00:33:59,679
uh my question is for matt uh you

998
00:34:01,750 --> 00:34:00,159
mentioned

999
00:34:03,350 --> 00:34:01,760
the similarities and also the

1000
00:34:07,190 --> 00:34:03,360
differences between

1001
00:34:10,230 --> 00:34:07,200
curiosity and perseverance i'm curious

1002
00:34:12,230 --> 00:34:10,240
how similar or dissimilar is

1003
00:34:13,669 --> 00:34:12,240
entry descent and landing from what we

1004
00:34:16,550 --> 00:34:13,679
saw with curiosity

1005
00:34:18,550 --> 00:34:16,560
and and what is so different about

1006
00:34:21,909 --> 00:34:18,560
perseverances entry descent and landing

1007
00:34:24,869 --> 00:34:23,270
yeah that's a great question i'm

1008
00:34:27,109 --> 00:34:24,879
actually gonna uh go ahead and throw

1009
00:34:29,990 --> 00:34:27,119
this over to al chen he is our

1010
00:34:31,589 --> 00:34:30,000
edl phase lead and he'll uh he'll give

1011
00:34:33,030 --> 00:34:31,599
you a rundown

1012
00:34:35,030 --> 00:34:33,040
yeah from the outside the entry descent

1013
00:34:36,389 --> 00:34:35,040

landing system looks pretty similar to

1014
00:34:38,629 --> 00:34:36,399
curiosity but there's a lot of

1015
00:34:39,829 --> 00:34:38,639
under the hood smarts if you will there

1016
00:34:41,430 --> 00:34:39,839
are two pieces of

1017
00:34:42,950 --> 00:34:41,440
new technology that are helping us land

1018
00:34:44,069 --> 00:34:42,960
at this rugged site

1019
00:34:46,149 --> 00:34:44,079
the first is something we call range

1020
00:34:47,589 --> 00:34:46,159
trigger that's using the ability of the

1021
00:34:49,909 --> 00:34:47,599
vehicle to know where it is

1022
00:34:51,510 --> 00:34:49,919
to deploy the parachute previously on

1023
00:34:52,710 --> 00:34:51,520
curiosity we deployed the supersonic

1024
00:34:53,190 --> 00:34:52,720
parachute just based on hitting a

1025
00:34:55,510 --> 00:34:53,200
particular

1026
00:34:57,109 --> 00:34:55,520
velocity but this time we're actually

1027
00:34:58,470 --> 00:34:57,119
asking the vehicle to figure out how far

1028
00:35:00,710 --> 00:34:58,480
she's flown since entry

1029
00:35:01,990 --> 00:35:00,720
and deploy the parachute based on that

1030
00:35:03,430 --> 00:35:02,000
that reduces the area

1031
00:35:05,430 --> 00:35:03,440
that we're going to land in that landing

1032
00:35:07,829 --> 00:35:05,440
error uncertainty ellipse quite a bit

1033
00:35:10,390 --> 00:35:07,839
uh almost a factor of 10 in area versus

1034
00:35:12,470 --> 00:35:10,400
what we had promised for curiosity

1035
00:35:13,589 --> 00:35:12,480
the second major piece of new technology

1036
00:35:15,670 --> 00:35:13,599
that's helped in this land

1037
00:35:17,349 --> 00:35:15,680
is terrain relative navigation um so

1038
00:35:18,790 --> 00:35:17,359

whereas on curiosity we took pictures

1039
00:35:20,310 --> 00:35:18,800
after the heat shield came off but

1040
00:35:21,270 --> 00:35:20,320
didn't really do anything with them on

1041
00:35:23,270 --> 00:35:21,280
the fly they're kind of like

1042
00:35:24,390 --> 00:35:23,280
like tourist pictures in some sense

1043
00:35:25,109 --> 00:35:24,400
perseverance will be taking those

1044
00:35:26,470 --> 00:35:25,119
pictures

1045
00:35:28,870 --> 00:35:26,480
and then matching them up with an

1046
00:35:30,390 --> 00:35:28,880
onboard map based on images from the

1047
00:35:32,390 --> 00:35:30,400
mars reconnaissance orbiter

1048
00:35:33,910 --> 00:35:32,400
it'll use that those that uh that set of

1049
00:35:35,510 --> 00:35:33,920
images it's taking and that map to

1050
00:35:37,270 --> 00:35:35,520
figure out where she is

1051
00:35:38,870 --> 00:35:37,280
and based on that that she can then fly

1052
00:35:40,150 --> 00:35:38,880
to a nearby safe spot

1053
00:35:42,550 --> 00:35:40,160
once she's done with the parachute and

1054
00:35:43,510 --> 00:35:42,560
on engines so that allows us to make

1055
00:35:45,430 --> 00:35:43,520
sure that

1056
00:35:47,270 --> 00:35:45,440
to allow a site like jezreel where the

1057
00:35:48,790 --> 00:35:47,280
whole landing error ellipse is not a

1058
00:35:50,310 --> 00:35:48,800
giant flat parking lot

1059
00:35:51,589 --> 00:35:50,320
uh it's full of the stuff that the

1060
00:35:53,349 --> 00:35:51,599
scientists want to see but the stuff

1061
00:35:54,950 --> 00:35:53,359
that i don't want to land on

1062
00:35:57,109 --> 00:35:54,960
so that allows us to find little kind of

1063
00:35:58,310 --> 00:35:57,119

small parking lots amongst those

1064
00:36:00,390 --> 00:35:58,320
so those are really pretty key

1065
00:36:02,470 --> 00:36:00,400
technologies to help in this land

1066
00:36:03,910 --> 00:36:02,480
there are also a couple of new systems

1067
00:36:05,270 --> 00:36:03,920
on board as well to help us understand

1068
00:36:06,790 --> 00:36:05,280
what it's like to land

1069
00:36:08,710 --> 00:36:06,800
the first is that medley ii system

1070
00:36:09,430 --> 00:36:08,720
that's an upgrade of the medley system

1071
00:36:13,109 --> 00:36:09,440
that was on

1072
00:36:14,710 --> 00:36:13,119
is an edl camera system

1073
00:36:16,390 --> 00:36:14,720
uh that will also have a microphone so

1074
00:36:17,670 --> 00:36:16,400
we'll have a lot of uh new imagery and

1075
00:36:19,990 --> 00:36:17,680
high resolution imagery

1076
00:36:21,589 --> 00:36:20,000
and high frame rate video of what it's

1077
00:36:23,510 --> 00:36:21,599
like to actually land on mars so i'm

1078
00:36:27,109 --> 00:36:23,520
really excited to hear and see

1079
00:36:30,150 --> 00:36:27,119
uh what landing on mars is really like

1080
00:36:32,550 --> 00:36:30,160
absolutely i'll just said uh

1081
00:36:33,990 --> 00:36:32,560
i'll just add two uh two more uh

1082
00:36:36,710 --> 00:36:34,000
comments which is there's a couple

1083
00:36:38,950 --> 00:36:36,720
pieces of hardware which we've improved

1084
00:36:40,710 --> 00:36:38,960
uh since uh curiosity and i'll just make

1085
00:36:42,630 --> 00:36:40,720
mention of them one is the heat shield

1086
00:36:44,630 --> 00:36:42,640
and we found in our static testing of

1087
00:36:47,430 --> 00:36:44,640
the heat shield that there were some

1088
00:36:49,190 --> 00:36:47,440

strength vulnerabilities there and so we

1089
00:36:51,109 --> 00:36:49,200
improved not only the design but the

1090
00:36:52,230 --> 00:36:51,119
manufacturing techniques for that heat

1091
00:36:53,670 --> 00:36:52,240
shield

1092
00:36:56,630 --> 00:36:53,680
the other significant one is the

1093
00:36:58,390 --> 00:36:56,640
parachute this big 70-foot supersonic

1094
00:37:01,109 --> 00:36:58,400
parachute

1095
00:37:02,550 --> 00:37:01,119
on one of the technology programs in in

1096
00:37:05,589 --> 00:37:02,560
the mars program

1097
00:37:06,470 --> 00:37:05,599
area we found a potential vulnerability

1098
00:37:09,190 --> 00:37:06,480
with

1099
00:37:10,870 --> 00:37:09,200
transient loading as that parachute is

1100
00:37:13,829 --> 00:37:10,880
inflating and in different

1101
00:37:15,510 --> 00:37:13,839
configurations and that led us to

1102
00:37:16,310 --> 00:37:15,520
conclude that we should strengthen the

1103
00:37:18,390 --> 00:37:16,320
canopy

1104
00:37:19,829 --> 00:37:18,400
of the parachute that's something we did

1105
00:37:20,870 --> 00:37:19,839
and not only did we strengthen the

1106
00:37:23,270 --> 00:37:20,880
canopy

1107
00:37:24,870 --> 00:37:23,280
but we took the parachute off and we did

1108
00:37:27,430 --> 00:37:24,880
supersonic high altitude

1109
00:37:29,430 --> 00:37:27,440
parachute testing using sounding rockets

1110
00:37:31,589 --> 00:37:29,440
out of the wallops facility

1111
00:37:32,790 --> 00:37:31,599
it's a major test campaign something

1112
00:37:36,230 --> 00:37:32,800
that really hasn't been done

1113
00:37:37,910 --> 00:37:36,240

in more than 40 years and the team

1114
00:37:42,870 --> 00:37:37,920
pulled it off successfully so

1115
00:37:47,670 --> 00:37:45,109
thank you al and matt and thank you

1116
00:37:50,150 --> 00:37:47,680
chelsea our next caller is irene

1117
00:37:51,910 --> 00:37:50,160
klotz from aviation week good morning

1118
00:37:54,630 --> 00:37:51,920
irene

1119
00:37:55,109 --> 00:37:54,640
hi there thanks so much my questions for

1120
00:37:58,069 --> 00:37:55,119
either

1121
00:37:58,870 --> 00:37:58,079
matt wallace or jennifer trosporum i

1122
00:38:02,870 --> 00:37:58,880
appreciate

1123
00:38:05,829 --> 00:38:02,880
the downplaying expectations with the 50

1124
00:38:07,829 --> 00:38:05,839
of mars missions failed but nasa has

1125
00:38:11,109 --> 00:38:07,839
successfully landed

1126
00:38:12,150 --> 00:38:11,119
eight of its nine um spacecraft on mars

1127
00:38:15,270 --> 00:38:12,160
including the four

1128
00:38:16,790 --> 00:38:15,280
previous rovers and and landers dating

1129
00:38:20,950 --> 00:38:16,800
back to viking

1130
00:38:24,710 --> 00:38:20,960
so do you have a um what is the risk

1131
00:38:28,390 --> 00:38:24,720
of the perseverance landing

1132
00:38:30,790 --> 00:38:28,400
um overall and what's the riskiest part

1133
00:38:34,870 --> 00:38:32,950
yeah it's a good it's a good question

1134
00:38:37,190 --> 00:38:34,880
and it's a a valid

1135
00:38:38,069 --> 00:38:37,200
observation um i guess i'll say a few

1136
00:38:39,589 --> 00:38:38,079
things and

1137
00:38:41,430 --> 00:38:39,599
see if any of the other panelists want

1138
00:38:43,109 --> 00:38:41,440

to say a few words

1139
00:38:44,630 --> 00:38:43,119
uh we've never really come up with a

1140
00:38:47,190 --> 00:38:44,640
good way of calculating

1141
00:38:48,230 --> 00:38:47,200
the probability of success these systems

1142
00:38:50,470 --> 00:38:48,240
are

1143
00:38:51,910 --> 00:38:50,480
so complex and they're interacting with

1144
00:38:55,349 --> 00:38:51,920
uh

1145
00:38:58,630 --> 00:38:55,359
an undefined environment in many ways

1146
00:39:00,069 --> 00:38:58,640
that it's very very hard to uh to give

1147
00:39:03,109 --> 00:39:00,079
you a number

1148
00:39:05,510 --> 00:39:03,119
um you know i think that uh

1149
00:39:06,150 --> 00:39:05,520
but it's those two factors really that

1150
00:39:08,310 --> 00:39:06,160
lead us

1151
00:39:09,270 --> 00:39:08,320
to tell you that there's never any

1152
00:39:14,069 --> 00:39:09,280
guarantees

1153
00:39:16,630 --> 00:39:14,079
on this on this process uh you know mars

1154
00:39:17,990 --> 00:39:16,640
still has things we don't understand

1155
00:39:21,109 --> 00:39:18,000
about it this is still

1156
00:39:23,670 --> 00:39:21,119
exploration we're going places that

1157
00:39:24,390 --> 00:39:23,680
we uh where we're trying to answer

1158
00:39:26,550 --> 00:39:24,400
questions

1159
00:39:28,150 --> 00:39:26,560
uh that that we don't have the the

1160
00:39:31,190 --> 00:39:28,160
answers to yet

1161
00:39:33,190 --> 00:39:31,200
um you know on on curiosity and now can

1162
00:39:35,430 --> 00:39:33,200
say a word or two about it we found that

1163
00:39:36,710 --> 00:39:35,440

the local gravity field at gale crater

1164
00:39:38,630 --> 00:39:36,720
where we landed

1165
00:39:39,910 --> 00:39:38,640
affected our control system that was a

1166
00:39:41,670 --> 00:39:39,920
somewhat unexpected

1167
00:39:44,230 --> 00:39:41,680
thing you know it was within the

1168
00:39:46,950 --> 00:39:44,240
capability of the system to handle it

1169
00:39:48,710 --> 00:39:46,960
uh but but those are the types of uh

1170
00:39:50,230 --> 00:39:48,720
uncertainties in the environment that

1171
00:39:52,069 --> 00:39:50,240
we're dealing with

1172
00:39:54,390 --> 00:39:52,079
i think it also you just also have to

1173
00:39:56,390 --> 00:39:54,400
factor in again the complexity of

1174
00:39:59,430 --> 00:39:56,400
of this system you know we've got 2

1175
00:40:01,430 --> 00:39:59,440
million lines of software code running

1176
00:40:02,870 --> 00:40:01,440
hundreds of thousands of electronic

1177
00:40:06,069 --> 00:40:02,880
parts

1178
00:40:09,109 --> 00:40:06,079
you know miles of copper

1179
00:40:09,990 --> 00:40:09,119
conductors we've got more than 70

1180
00:40:12,870 --> 00:40:10,000
pyrotechnic

1181
00:40:13,270 --> 00:40:12,880
devices that all have to fire closed

1182
00:40:15,589 --> 00:40:13,280
loop

1183
00:40:17,829 --> 00:40:15,599
guidance and navigation control systems

1184
00:40:20,710 --> 00:40:17,839
that really have to operate

1185
00:40:21,990 --> 00:40:20,720
with sub-second precision for all this

1186
00:40:25,990 --> 00:40:22,000
to work you know

1187
00:40:28,150 --> 00:40:26,000
there's no go backs there's no retries

1188
00:40:29,829 --> 00:40:28,160

it's it's a difficult and dangerous part

1189
00:40:31,430 --> 00:40:29,839
of the mission

1190
00:40:33,190 --> 00:40:31,440
and i think you have to always respect

1191
00:40:34,630 --> 00:40:33,200
that as a development team and i think

1192
00:40:36,309 --> 00:40:34,640
our team has

1193
00:40:38,150 --> 00:40:36,319
so i don't have a specific answer for

1194
00:40:39,829 --> 00:40:38,160
you on the probability of success

1195
00:40:41,670 --> 00:40:39,839
um i think we've done everything we can

1196
00:40:44,950 --> 00:40:41,680
to make it successful

1197
00:40:46,550 --> 00:40:44,960
and uh we'll see how it goes tomorrow

1198
00:40:48,150 --> 00:40:46,560
did you want to add anything out or yeah

1199
00:40:49,430 --> 00:40:48,160
i mean i guess i'd say that there's uh

1200
00:40:50,790 --> 00:40:49,440
there's nothing like trying to do

1201
00:40:52,630 --> 00:40:50,800
at least use the same kind of landing

1202
00:40:53,109 --> 00:40:52,640
system again to really find the warts in

1203
00:40:54,870 --> 00:40:53,119
it

1204
00:40:56,230 --> 00:40:54,880
and as matt mentioned right we were able

1205
00:40:58,230 --> 00:40:56,240
to find uh

1206
00:40:59,510 --> 00:40:58,240
a handful of things that didn't go quite

1207
00:41:00,710 --> 00:40:59,520
the way we expected them to go on

1208
00:41:02,470 --> 00:41:00,720
curiosity

1209
00:41:04,630 --> 00:41:02,480
and that's humbling right i think as

1210
00:41:05,589 --> 00:41:04,640
soon as you uh

1211
00:41:07,589 --> 00:41:05,599
if you don't stay humble in this

1212
00:41:09,109 --> 00:41:07,599
business and especially going to mars

1213
00:41:11,670 --> 00:41:09,119

you're going to pay for it

1214
00:41:13,430 --> 00:41:11,680
so the i think it's it's been key for us

1215
00:41:14,550 --> 00:41:13,440
to to learn from the the things we

1216
00:41:16,150 --> 00:41:14,560
didn't get quite right

1217
00:41:17,670 --> 00:41:16,160
but i think as matt said we don't know

1218
00:41:19,589 --> 00:41:17,680
that we have caught them all yet we've

1219
00:41:20,950 --> 00:41:19,599
just done our best to make sure

1220
00:41:22,550 --> 00:41:20,960
that we've done everything we can think

1221
00:41:25,589 --> 00:41:22,560
of to make sure that we have a good day

1222
00:41:28,870 --> 00:41:27,510
thanks is there one part of the system

1223
00:41:31,190 --> 00:41:28,880
in particular that

1224
00:41:32,390 --> 00:41:31,200
gives you greater pause than something

1225
00:41:33,750 --> 00:41:32,400
else

1226
00:41:35,829 --> 00:41:33,760
am i supposed to pick a favorite child

1227
00:41:37,270 --> 00:41:35,839
now

1228
00:41:39,430 --> 00:41:37,280
you're supposed to pick your least

1229
00:41:41,349 --> 00:41:39,440
favorite cut

1230
00:41:42,630 --> 00:41:41,359
um you know i i think it's hard pointed

1231
00:41:43,750 --> 00:41:42,640
i mean i think the part of it is just

1232
00:41:44,790 --> 00:41:43,760
the overall complexity right everything

1233
00:41:46,230 --> 00:41:44,800
that has to happen

1234
00:41:48,230 --> 00:41:46,240
obviously there's a lot of concentrated

1235
00:41:48,870 --> 00:41:48,240
risk in in that supersonic parachute

1236
00:41:51,190 --> 00:41:48,880
opening

1237
00:41:52,470 --> 00:41:51,200
um you know that that it's a very big

1238
00:41:53,430 --> 00:41:52,480

parachute right that's the size of a

1239
00:41:56,069 --> 00:41:53,440
little league in field

1240
00:41:56,870 --> 00:41:56,079
in size and it snaps open in about 0.6

1241
00:41:58,950 --> 00:41:56,880
seconds

1242
00:42:00,309 --> 00:41:58,960
uh while going mach almost mach 2. uh so

1243
00:42:01,510 --> 00:42:00,319
there's a lot of risk concentrated there

1244
00:42:03,190 --> 00:42:01,520
but as matt noted

1245
00:42:04,870 --> 00:42:03,200
um you know something we haven't done

1246
00:42:06,870 --> 00:42:04,880
for for four decades plus we actually

1247
00:42:08,790 --> 00:42:06,880
did high altitude supersonic testing

1248
00:42:09,990 --> 00:42:08,800
uh this time as part of uh as part of

1249
00:42:11,750 --> 00:42:10,000
this project

1250
00:42:15,190 --> 00:42:11,760
so we have uh perhaps a little bit more

1251
00:42:19,030 --> 00:42:17,670
thanks very much thank you irene and

1252
00:42:21,589 --> 00:42:19,040
thank you to matt and

1253
00:42:23,349 --> 00:42:21,599
al our third call is from marcia dunn

1254
00:42:25,030 --> 00:42:23,359
with the associated press good morning

1255
00:42:28,470 --> 00:42:25,040
marcia

1256
00:42:31,030 --> 00:42:28,480
yes hello um this question is for can

1257
00:42:32,550 --> 00:42:31,040
i i enjoyed seeing your road map with

1258
00:42:35,670 --> 00:42:32,560
the squiggly line

1259
00:42:37,030 --> 00:42:35,680
is is that um for all two years of

1260
00:42:39,670 --> 00:42:37,040
operations

1261
00:42:41,670 --> 00:42:39,680
and and i'm wondering um what's the

1262
00:42:44,309 --> 00:42:41,680
total mileage you expect to

1263
00:42:45,270 --> 00:42:44,319

put on the odometer over the for over

1264
00:42:47,829 --> 00:42:45,280
these two years

1265
00:42:49,030 --> 00:42:47,839
for a nominal mission and when do you

1266
00:42:51,990 --> 00:42:49,040
expect to actually

1267
00:42:52,630 --> 00:42:52,000
drill for the first time to collect the

1268
00:42:55,829 --> 00:42:52,640
sample

1269
00:42:57,670 --> 00:42:55,839
in the in the tubes when might that be

1270
00:42:59,349 --> 00:42:57,680
happening thank you

1271
00:43:00,870 --> 00:42:59,359
yeah the the traverse that i showed

1272
00:43:03,510 --> 00:43:00,880
there is uh for

1273
00:43:04,309 --> 00:43:03,520
an extended period of time uh we expect

1274
00:43:07,190 --> 00:43:04,319
that we might

1275
00:43:08,230 --> 00:43:07,200
traverse up to about 10 miles in the uh

1276
00:43:11,430 --> 00:43:08,240
in the prime mission the

1277
00:43:13,190 --> 00:43:11,440
the two earth years one mars year and we

1278
00:43:18,069 --> 00:43:13,200
expect that sometime in the summer we'll

1279
00:43:21,829 --> 00:43:20,550
thank you ken and thank you to marcia

1280
00:43:24,630 --> 00:43:21,839
our fourth call

1281
00:43:26,550 --> 00:43:24,640
comes from amina khan with the la times

1282
00:43:28,230 --> 00:43:26,560
good morning amina

1283
00:43:30,309 --> 00:43:28,240
good morning um thanks for taking my

1284
00:43:32,630 --> 00:43:30,319
call um i just had a few questions

1285
00:43:34,069 --> 00:43:32,640
about firsts uh three so i'm wondering

1286
00:43:35,670 --> 00:43:34,079
you can bear with me here um

1287
00:43:37,270 --> 00:43:35,680
first one would be you know is

1288
00:43:40,150 --> 00:43:37,280

perseverance the first

1289
00:43:41,510 --> 00:43:40,160
uh machine i guess we've we've designed

1290
00:43:43,750 --> 00:43:41,520
uh that could

1291
00:43:44,710 --> 00:43:43,760
harvest an essential human resource

1292
00:43:46,630 --> 00:43:44,720
oxygen

1293
00:43:49,430 --> 00:43:46,640
on another world or has that been done

1294
00:43:54,630 --> 00:43:52,470
uh do you want to take that laurie yeah

1295
00:43:57,750 --> 00:43:54,640
i'll take that um

1296
00:43:59,030 --> 00:43:57,760
it's it's a good question um i believe

1297
00:43:59,510 --> 00:43:59,040
and i hopefully i'm not misspeaking here

1298
00:44:01,670 --> 00:43:59,520
that that

1299
00:44:03,589 --> 00:44:01,680
moxie is the first experiment that was

1300
00:44:06,390 --> 00:44:03,599
specifically designed

1301
00:44:07,349 --> 00:44:06,400
uh to to execute in-situ resource

1302
00:44:09,030 --> 00:44:07,359
utilization

1303
00:44:10,550 --> 00:44:09,040
you know to take advantage of the the

1304
00:44:12,470 --> 00:44:10,560
local environment um

1305
00:44:14,230 --> 00:44:12,480
to transfer that and transform that

1306
00:44:17,349 --> 00:44:14,240
material into something that's

1307
00:44:18,390 --> 00:44:17,359
usable either by uh astronauts or humans

1308
00:44:20,550 --> 00:44:18,400
or or for other

1309
00:44:22,390 --> 00:44:20,560
other purposes you know of course we're

1310
00:44:24,230 --> 00:44:22,400
looking at at lots of other types of

1311
00:44:26,069 --> 00:44:24,240
institute resource utilization for other

1312
00:44:27,430 --> 00:44:26,079
destinations such as the moon through

1313
00:44:30,069 --> 00:44:27,440

artemis but

1314
00:44:32,150 --> 00:44:30,079
we haven't flown those yet so but yes i

1315
00:44:34,870 --> 00:44:32,160
think moxie is the first

1316
00:44:35,349 --> 00:44:34,880
very cool thank you and is it the first

1317
00:44:41,430 --> 00:44:35,359
in

1318
00:44:41,670 --> 00:44:41,440
uh landed to actively search for signs

1319
00:44:43,829 --> 00:44:41,680
of

1320
00:44:44,950 --> 00:44:43,839
extraterrestrial microbial life or have

1321
00:44:45,270 --> 00:44:44,960
there been any missions that have done

1322
00:44:48,550 --> 00:44:45,280
that

1323
00:44:49,990 --> 00:44:48,560
in the interim so ken do you want me to

1324
00:44:53,589 --> 00:44:50,000
take that one or would you like to take

1325
00:44:56,630 --> 00:44:53,599
that oh you can go ahead lori okay

1326
00:44:57,670 --> 00:44:56,640
uh yes i would say that uh perseverance

1327
00:45:00,309 --> 00:44:57,680
is the first

1328
00:45:01,270 --> 00:45:00,319
real uh astrobiology mission uh since

1329
00:45:03,990 --> 00:45:01,280
viking of course

1330
00:45:05,430 --> 00:45:04,000
viking uh had an intent to look for life

1331
00:45:07,109 --> 00:45:05,440
but it wasn't actually

1332
00:45:09,349 --> 00:45:07,119
now that we've learned and know so much

1333
00:45:12,550 --> 00:45:09,359
more not just about mars but about how

1334
00:45:14,069 --> 00:45:12,560
life forms and how it how it exists

1335
00:45:16,470 --> 00:45:14,079
uh we know that the experiments that we

1336
00:45:18,230 --> 00:45:16,480
designed probably uh weren't quite

1337
00:45:19,510 --> 00:45:18,240
the right way to to go about that

1338
00:45:22,390 --> 00:45:19,520

exercise

1339
00:45:24,230 --> 00:45:22,400
and so we really have followed this more

1340
00:45:26,710 --> 00:45:24,240
methodical approach this time first

1341
00:45:29,910 --> 00:45:26,720
making sure that we had the ingredients

1342
00:45:31,349 --> 00:45:29,920
present on mars and that we actually had

1343
00:45:33,109 --> 00:45:31,359
those habitable environments that were

1344
00:45:35,109 --> 00:45:33,119
sustained over a long enough period of

1345
00:45:35,910 --> 00:45:35,119
time at about the right time in mars's

1346
00:45:39,270 --> 00:45:35,920
history

1347
00:45:41,349 --> 00:45:39,280
to really help set us up for for success

1348
00:45:42,710 --> 00:45:41,359
and so as a result of all of that new

1349
00:45:44,230 --> 00:45:42,720
knowledge that we've gained over the

1350
00:45:46,390 --> 00:45:44,240
last couple decades

1351
00:45:48,950 --> 00:45:46,400
has really helped us to design as i said

1352
00:45:51,270 --> 00:45:48,960
this our first mobile astrobiologist

1353
00:45:52,150 --> 00:45:51,280
that really is you know it's one of its

1354
00:45:55,270 --> 00:45:52,160
main purposes

1355
00:45:58,390 --> 00:45:55,280
is to seek out those signs of past life

1356
00:46:00,390 --> 00:45:58,400
on mars thanks um and when it comes to

1357
00:46:02,790 --> 00:46:00,400
ingenuity um is it fair to call it

1358
00:46:05,349 --> 00:46:02,800
basically the sojourner of flying

1359
00:46:06,870 --> 00:46:05,359
planetary drones you know in that you

1360
00:46:08,630 --> 00:46:06,880
know this is basically here to prove

1361
00:46:09,589 --> 00:46:08,640
that you can fly and in the future we

1362
00:46:12,470 --> 00:46:09,599
might expect

1363
00:46:16,630 --> 00:46:12,480

more um flying clenched explorers with

1364
00:46:17,990 --> 00:46:16,640
more science capabilities on board

1365
00:46:19,670 --> 00:46:18,000
i think you're right on with that

1366
00:46:22,630 --> 00:46:19,680
comparison i think uh

1367
00:46:23,670 --> 00:46:22,640
ingenuity is today's uh sojourner you

1368
00:46:27,190 --> 00:46:23,680
know when

1369
00:46:28,790 --> 00:46:27,200
i worked on soderner and uh you know

1370
00:46:30,470 --> 00:46:28,800
there was a lot of uncertainty at the

1371
00:46:31,910 --> 00:46:30,480
time as to whether or not we'd ever

1372
00:46:33,829 --> 00:46:31,920
really be able to utilize this

1373
00:46:34,950 --> 00:46:33,839
technology and we found very quickly

1374
00:46:36,870 --> 00:46:34,960
that having

1375
00:46:38,950 --> 00:46:36,880
a mobile capability on the surface of

1376
00:46:41,109 --> 00:46:38,960
mars was incredibly valuable

1377
00:46:43,349 --> 00:46:41,119
um there's a lot of heterogeneity

1378
00:46:45,750 --> 00:46:43,359
scientifically on the surface

1379
00:46:47,670 --> 00:46:45,760
and just being able to move even a small

1380
00:46:50,470 --> 00:46:47,680
amount that sojourner gave us

1381
00:46:52,230 --> 00:46:50,480
was valuable and i think i think in

1382
00:46:55,109 --> 00:46:52,240
almost every way when you look at

1383
00:46:56,069 --> 00:46:55,119
ingenuity it looks very much the same

1384
00:46:58,630 --> 00:46:56,079
it's a technology

1385
00:47:01,190 --> 00:46:58,640
demonstration its objective is is not

1386
00:47:03,109 --> 00:47:01,200
tied into the science of this mission

1387
00:47:04,710 --> 00:47:03,119
but the potential for aerial

1388
00:47:07,430 --> 00:47:04,720

reconnaissance and

1389
00:47:09,510 --> 00:47:07,440
exploration in the future using this

1390
00:47:11,990 --> 00:47:09,520
type of technology is

1391
00:47:13,430 --> 00:47:12,000
is terrific it's uh and not just on mars

1392
00:47:15,829 --> 00:47:13,440
and other places as well

1393
00:47:16,870 --> 00:47:15,839
and so uh i think it's a great

1394
00:47:19,349 --> 00:47:16,880
comparison and

1395
00:47:20,390 --> 00:47:19,359
in every way looking at the team they

1396
00:47:22,630 --> 00:47:20,400
remind me

1397
00:47:23,589 --> 00:47:22,640
a lot of our team from 20 years ago to

1398
00:47:26,950 --> 00:47:23,599
be honest with you

1399
00:47:30,710 --> 00:47:26,960
yeah so good comparison very cool and

1400
00:47:34,150 --> 00:47:30,720
say that you guys don't find any signs

1401
00:47:36,470 --> 00:47:34,160
of life in the samples using um

1402
00:47:37,510 --> 00:47:36,480
using the you know tools on hand on mars

1403
00:47:39,670 --> 00:47:37,520
and say that

1404
00:47:41,190 --> 00:47:39,680
you know years from now um scientists

1405
00:47:43,270 --> 00:47:41,200
look at the samples sent back

1406
00:47:45,109 --> 00:47:43,280
successfully to earth and don't find

1407
00:47:49,109 --> 00:47:45,119
anything there as well

1408
00:47:51,270 --> 00:47:49,119
what is that what could that mean for

1409
00:47:53,270 --> 00:47:51,280
the future in the direction of space

1410
00:47:55,670 --> 00:47:53,280
exploration what does it mean

1411
00:47:58,470 --> 00:47:55,680
for our search for life on other planets

1412
00:48:01,829 --> 00:47:58,480
far outside our solar system

1413
00:48:03,190 --> 00:48:01,839

ken can you take that sure the uh

1414
00:48:05,109 --> 00:48:03,200
i think the important thing to

1415
00:48:05,990 --> 00:48:05,119
understand about the search that we are

1416
00:48:08,790 --> 00:48:06,000
about to embark

1417
00:48:10,069 --> 00:48:08,800
on is that this will be the first time

1418
00:48:13,430 --> 00:48:10,079
that we have

1419
00:48:15,430 --> 00:48:13,440
peered in great detail into a

1420
00:48:17,430 --> 00:48:15,440
past habitable environment both both

1421
00:48:20,390 --> 00:48:17,440
with the tools on the rover

1422
00:48:21,349 --> 00:48:20,400
and with the samples when they when they

1423
00:48:23,670 --> 00:48:21,359
come back

1424
00:48:25,430 --> 00:48:23,680
and we either will find life is there

1425
00:48:27,910 --> 00:48:25,440
and that will be a spectacular discovery

1426
00:48:29,829 --> 00:48:27,920
or as you suggest maybe we won't but

1427
00:48:31,990 --> 00:48:29,839
this isn't a very important

1428
00:48:33,750 --> 00:48:32,000
observation because it would suggest

1429
00:48:34,630 --> 00:48:33,760
that not all habitable environments that

1430
00:48:37,349 --> 00:48:34,640
exist

1431
00:48:38,069 --> 00:48:37,359
uh are inhabited and i think what that

1432
00:48:42,470 --> 00:48:38,079
would

1433
00:48:43,750 --> 00:48:42,480
elsewhere it isn't going to be a slam

1434
00:48:44,309 --> 00:48:43,760
dunk we can't just assume that

1435
00:48:46,950 --> 00:48:44,319
everywhere

1436
00:48:48,230 --> 00:48:46,960
that is habitable has had life originate

1437
00:48:50,390 --> 00:48:48,240
and thrive in it

1438
00:48:51,270 --> 00:48:50,400

and i think there are already ideas of

1439
00:48:53,349 --> 00:48:51,280
other places

1440
00:48:54,390 --> 00:48:53,359
that can be looked at both on mars in

1441
00:48:56,790 --> 00:48:54,400
the subsurface and

1442
00:48:57,750 --> 00:48:56,800
as well as other environments um for

1443
00:49:00,390 --> 00:48:57,760
example in the

1444
00:49:01,589 --> 00:49:00,400
the moons of the giant planets so it

1445
00:49:03,349 --> 00:49:01,599
would be an observation

1446
00:49:04,630 --> 00:49:03,359
uh but i don't think it actually fun

1447
00:49:06,870 --> 00:49:04,640
fundamentally changes

1448
00:49:09,990 --> 00:49:06,880
uh the direction that uh this that

1449
00:49:11,910 --> 00:49:10,000
astrobiology is pursuing

1450
00:49:13,190 --> 00:49:11,920
would it mean the end of mars

1451
00:49:17,030 --> 00:49:13,200
exploration um

1452
00:49:18,230 --> 00:49:17,040
in terms of the search for life

1453
00:49:20,069 --> 00:49:18,240
i think that's probably a question for

1454
00:49:23,670 --> 00:49:20,079
laurie

1455
00:49:25,829 --> 00:49:23,680
sure uh and and i'll i'll go out and and

1456
00:49:27,589 --> 00:49:25,839
speculate slightly to say that i

1457
00:49:29,109 --> 00:49:27,599
i don't necessarily think it will be the

1458
00:49:32,390 --> 00:49:29,119
end of exploration

1459
00:49:32,790 --> 00:49:32,400
and looking for life on mars what i

1460
00:49:36,069 --> 00:49:32,800
think

1461
00:49:37,349 --> 00:49:36,079
is the most likely outcome um would be

1462
00:49:39,510 --> 00:49:37,359
you know if we don't actually get

1463
00:49:40,630 --> 00:49:39,520

confirmation of past life would be an

1464
00:49:43,030 --> 00:49:40,640
inconclusive

1465
00:49:44,710 --> 00:49:43,040
uh result which would mean we still need

1466
00:49:47,349 --> 00:49:44,720
to keep looking and look harder

1467
00:49:48,230 --> 00:49:47,359
maybe in other places but again you know

1468
00:49:52,069 --> 00:49:48,240
if we are

1469
00:49:53,670 --> 00:49:52,079
uh able to uh even even conclusively

1470
00:49:55,109 --> 00:49:53,680
determine that there's no longer life

1471
00:49:58,150 --> 00:49:55,119
there are still incredible

1472
00:50:00,710 --> 00:49:58,160
uh science to be done at mars mars has

1473
00:50:01,990 --> 00:50:00,720
so much to tell us about the early

1474
00:50:03,750 --> 00:50:02,000
history of the

1475
00:50:05,510 --> 00:50:03,760
of the solar system of the formation of

1476
00:50:07,750 --> 00:50:05,520
the planets and of the uh

1477
00:50:09,750 --> 00:50:07,760
the evolution of the rocky planets uh

1478
00:50:11,349 --> 00:50:09,760
you know being able to have

1479
00:50:13,030 --> 00:50:11,359
mars in a you know in our kind of

1480
00:50:15,190 --> 00:50:13,040
nursery of planets here

1481
00:50:16,230 --> 00:50:15,200
in the solar system is a is a fantastic

1482
00:50:17,990 --> 00:50:16,240
laboratory

1483
00:50:19,829 --> 00:50:18,000
to really understand the diversity of

1484
00:50:22,230 --> 00:50:19,839
planets and the diversity of

1485
00:50:23,030 --> 00:50:22,240
uh geologic and climate evolution so

1486
00:50:25,349 --> 00:50:23,040
absolutely

1487
00:50:27,910 --> 00:50:25,359
an incredibly compelling destination for

1488
00:50:31,750 --> 00:50:27,920

for many decades to come

1489
00:50:34,950 --> 00:50:33,030
now we're going to head to a couple

1490
00:50:38,150 --> 00:50:34,960
social media questions

1491
00:50:39,589 --> 00:50:38,160
sid double x on instagram asks what is

1492
00:50:41,670 --> 00:50:39,599
the heat shield

1493
00:50:45,430 --> 00:50:41,680
made of caitlyn would you like to take

1494
00:50:50,390 --> 00:50:49,430
um yeah so um the heat shield and back

1495
00:50:52,150 --> 00:50:50,400
shell are made of

1496
00:50:53,990 --> 00:50:52,160
two different types of what we call

1497
00:50:57,190 --> 00:50:54,000
thermal protection system

1498
00:50:59,829 --> 00:50:57,200
material the heat shield is

1499
00:51:02,710 --> 00:50:59,839
made from pica which stands for phenolic

1500
00:51:04,870 --> 00:51:02,720
impregnated carbon ablator

1501
00:51:05,990 --> 00:51:04,880
and i won't go into a whole lot more

1502
00:51:08,549 --> 00:51:06,000
detail than that

1503
00:51:10,630 --> 00:51:08,559
but it's a it's a you know complex

1504
00:51:11,270 --> 00:51:10,640
combination of different materials that

1505
00:51:12,950 --> 00:51:11,280
have

1506
00:51:15,030 --> 00:51:12,960
um there's a whole lot of work that goes

1507
00:51:16,309 --> 00:51:15,040
into developing these thermal protection

1508
00:51:18,309 --> 00:51:16,319
system or tps

1509
00:51:19,670 --> 00:51:18,319
materials a lot of testing a lot of

1510
00:51:23,030 --> 00:51:19,680
trying different things

1511
00:51:24,549 --> 00:51:23,040
um to determine what will work and so um

1512
00:51:26,790 --> 00:51:24,559
pika is on the heat shield and then

1513
00:51:28,710 --> 00:51:26,800

super lightweight ablator or sla's the

1514
00:51:31,190 --> 00:51:28,720
back shell

1515
00:51:31,829 --> 00:51:31,200
thank you caitlyn and back to the phone

1516
00:51:34,309 --> 00:51:31,839
lines

1517
00:51:35,349 --> 00:51:34,319
the fifth call is from jeff faust of

1518
00:51:38,950 --> 00:51:35,359
space news

1519
00:51:41,670 --> 00:51:38,960
good morning jeff hi quick question

1520
00:51:43,270 --> 00:51:41,680
for uh matt wallace or al chen uh you

1521
00:51:45,910 --> 00:51:43,280
showed the landing ellipse

1522
00:51:48,150 --> 00:51:45,920
um chart it's in that green box where

1523
00:51:50,790 --> 00:51:48,160
you want it although it's near a corner

1524
00:51:51,190 --> 00:51:50,800
have you ruled out any further maneuvers

1525
00:51:53,190 --> 00:51:51,200
or

1526
00:51:55,030 --> 00:51:53,200
are you satisfied with that what's the

1527
00:51:56,710 --> 00:51:55,040
last time that you could make a decision

1528
00:51:57,910 --> 00:51:56,720
in terms of making a maneuver if you

1529
00:52:00,710 --> 00:51:57,920
needed to for some reason

1530
00:52:02,230 --> 00:52:00,720
thanks i can take that one uh we do have

1531
00:52:04,069 --> 00:52:02,240
one other contingency maneuver

1532
00:52:06,069 --> 00:52:04,079
opportunity uh late tonight

1533
00:52:07,510 --> 00:52:06,079
if we decide to use it however i think

1534
00:52:08,470 --> 00:52:07,520
it's very unlikely we're going to do

1535
00:52:11,670 --> 00:52:08,480
that

1536
00:52:12,790 --> 00:52:11,680
the uh the the tcm decision criteria

1537
00:52:14,390 --> 00:52:12,800
here this bullseye we're very

1538
00:52:15,510 --> 00:52:14,400

comfortable pretty much anywhere within

1539
00:52:17,430 --> 00:52:15,520
that green box

1540
00:52:18,549 --> 00:52:17,440
uh even here on the edge i mean really

1541
00:52:20,069 --> 00:52:18,559
all that this is saying is that we've

1542
00:52:21,510 --> 00:52:20,079
got a little bit more crosstrack error

1543
00:52:23,589 --> 00:52:21,520
i think the key thing to remember for

1544
00:52:25,349 --> 00:52:23,599
our system is that we have guided entry

1545
00:52:27,510 --> 00:52:25,359
and we have the ability to correct our

1546
00:52:28,710 --> 00:52:27,520
trajectory in the atmosphere

1547
00:52:32,549 --> 00:52:28,720
so we're just going to take advantage of

1548
00:52:35,190 --> 00:52:32,559
it that's all

1549
00:52:35,589 --> 00:52:35,200
thank you jeff and thanks to al our next

1550
00:52:37,910 --> 00:52:35,599
call

1551
00:52:40,790 --> 00:52:37,920
is from leo and wright from irish

1552
00:52:43,270 --> 00:52:40,800
television good morning leo

1553
00:52:44,150 --> 00:52:43,280
thanks marina and good evening from

1554
00:52:47,750 --> 00:52:44,160
europe

1555
00:52:51,030 --> 00:52:47,760
um my question i'm trying to nail down

1556
00:52:52,230 --> 00:52:51,040
the hover time that is available to the

1557
00:52:54,870 --> 00:52:52,240
sky crane

1558
00:52:58,309 --> 00:52:54,880
uh it's it's going to be placed in an

1559
00:53:01,910 --> 00:52:58,319
area of 120 football fields

1560
00:53:03,750 --> 00:53:01,920
uh of size if it comes down right at the

1561
00:53:05,030 --> 00:53:03,760
you know if it lands right at the side

1562
00:53:07,670 --> 00:53:05,040
of that

1563
00:53:10,150 --> 00:53:07,680

no need for a lot of fuel but if it has

1564
00:53:12,069 --> 00:53:10,160
to go 120 football fields

1565
00:53:14,390 --> 00:53:12,079
that's very different what what is the

1566
00:53:17,829 --> 00:53:14,400
hover time available

1567
00:53:20,390 --> 00:53:17,839
and if i may add a supplementary um

1568
00:53:20,950 --> 00:53:20,400
based on this uh traverse map we just

1569
00:53:23,990 --> 00:53:20,960
saw

1570
00:53:26,390 --> 00:53:24,000
it looks awfully close to those cliffs

1571
00:53:28,470 --> 00:53:26,400
um how big are those cliffs and how

1572
00:53:31,349 --> 00:53:28,480
close do you imagine you might land

1573
00:53:32,790 --> 00:53:31,359
to them i think i can take uh those uh

1574
00:53:34,230 --> 00:53:32,800
good question about the hover uh kind of

1575
00:53:35,589 --> 00:53:34,240
an interesting uh misconception about

1576
00:53:36,790 --> 00:53:35,599
our system is that we actually are never

1577
00:53:38,790 --> 00:53:36,800
hovering basically

1578
00:53:39,829 --> 00:53:38,800
except for the one second where we cut

1579
00:53:40,950 --> 00:53:39,839
the rover loose

1580
00:53:42,790 --> 00:53:40,960
that's the only time the system's

1581
00:53:44,710 --> 00:53:42,800
hovering we're on our way down for the

1582
00:53:46,230 --> 00:53:44,720
the whole rest of the time actually

1583
00:53:48,069 --> 00:53:46,240
but i think you're really asking you

1584
00:53:50,230 --> 00:53:48,079
know basically how far can we go and how

1585
00:53:52,390 --> 00:53:50,240
much additional time that might add

1586
00:53:54,710 --> 00:53:52,400
if we were to fly further away we can

1587
00:53:56,230 --> 00:53:54,720
divert up to about 700 meters

1588
00:53:58,230 --> 00:53:56,240

in distance from the back shell

1589
00:53:59,990 --> 00:53:58,240
separation point roughly

1590
00:54:01,109 --> 00:54:00,000
and that only adds because we know we're

1591
00:54:02,150 --> 00:54:01,119
doing that right away and we're making

1592
00:54:03,430 --> 00:54:02,160
that correction

1593
00:54:05,430 --> 00:54:03,440
almost immediately after back shell

1594
00:54:06,710 --> 00:54:05,440
separation that only adds a couple of

1595
00:54:09,430 --> 00:54:06,720
seconds to our flight

1596
00:54:11,349 --> 00:54:09,440
uh basically none at all um and uh you

1597
00:54:12,150 --> 00:54:11,359
know if you if you just sat there trying

1598
00:54:14,230 --> 00:54:12,160
to hover

1599
00:54:16,069 --> 00:54:14,240
uh our vehicle about that touchdown will

1600
00:54:17,190 --> 00:54:16,079
consume up to about four kilograms of

1601
00:54:18,710 --> 00:54:17,200
fuel per second

1602
00:54:20,390 --> 00:54:18,720
so you can kind of understand it that

1603
00:54:21,910 --> 00:54:20,400
way uh that uh you know

1604
00:54:23,589 --> 00:54:21,920
we're adding a few seconds a few more

1605
00:54:26,470 --> 00:54:23,599
extra seconds of fuel

1606
00:54:28,230 --> 00:54:26,480
to go the the maximum distances you know

1607
00:54:29,510 --> 00:54:28,240
it's on the order of 20 kilos of

1608
00:54:31,030 --> 00:54:29,520
variation or so

1609
00:54:32,470 --> 00:54:31,040
so that's kind of the the first question

1610
00:54:33,750 --> 00:54:32,480
i think you were asking uh the second

1611
00:54:34,230 --> 00:54:33,760
question we're asking i think was about

1612
00:54:38,710 --> 00:54:34,240
the

1613
00:54:40,230 --> 00:54:38,720

about 200 feet 200 to 300 feet tall

1614
00:54:42,230 --> 00:54:40,240
and you might have noticed that we're

1615
00:54:44,710 --> 00:54:42,240
aiming right at the edge of the uh

1616
00:54:46,549 --> 00:54:44,720
of that delta and that's not an accident

1617
00:54:48,230 --> 00:54:46,559
uh the safest place in the ellipse that

1618
00:54:50,309 --> 00:54:48,240
we would like to come down

1619
00:54:51,990 --> 00:54:50,319
is at the base of the delta we call that

1620
00:54:53,030 --> 00:54:52,000
the landing strip it's kind of that flat

1621
00:54:55,670 --> 00:54:53,040
area that you can kind of see in the

1622
00:54:57,030 --> 00:54:55,680
images that's at the foot of the

1623
00:54:58,870 --> 00:54:57,040
foot of the delta so that isn't an

1624
00:55:00,710 --> 00:54:58,880
accident if i had

1625
00:55:01,990 --> 00:55:00,720
if i had my way we'll end up there we of

1626
00:55:03,349 --> 00:55:02,000
course can end up in other places in

1627
00:55:05,589 --> 00:55:03,359
lips and are happy landing in other

1628
00:55:07,829 --> 00:55:05,599
small parking lots around the place

1629
00:55:09,829 --> 00:55:07,839
but our desires end up in that landing

1630
00:55:12,390 --> 00:55:09,839
strip

1631
00:55:12,950 --> 00:55:12,400
thank you al and thank you leo another

1632
00:55:16,470 --> 00:55:12,960
call

1633
00:55:19,349 --> 00:55:16,480
from ken cramer from space up close

1634
00:55:19,990 --> 00:55:19,359
good morning ken good morning thank you

1635
00:55:22,630 --> 00:55:20,000
thanks for taking

1636
00:55:24,710 --> 00:55:22,640
my question and good luck tomorrow um my

1637
00:55:26,390 --> 00:55:24,720
question is for ken farley actually i'm

1638
00:55:27,990 --> 00:55:26,400

interested in the in the map if we go

1639
00:55:30,549 --> 00:55:28,000
back to the map maybe you could show

1640
00:55:32,390 --> 00:55:30,559
that map again can you can you talk a

1641
00:55:34,789 --> 00:55:32,400
little bit more detail about why you

1642
00:55:37,589 --> 00:55:34,799
selected that route uh what what rocks

1643
00:55:39,430 --> 00:55:37,599
and minerals are you expecting to find

1644
00:55:40,789 --> 00:55:39,440
and and where would you find them and

1645
00:55:44,150 --> 00:55:40,799
where would be

1646
00:55:45,670 --> 00:55:44,160
like the first le sampling site that you

1647
00:55:46,829 --> 00:55:45,680
you take you mentioned in the summer

1648
00:55:49,589 --> 00:55:46,839
sometime

1649
00:55:51,910 --> 00:55:49,599
thanks yeah so the

1650
00:55:53,270 --> 00:55:51,920
the uh traverse that you see there is

1651
00:55:55,910 --> 00:55:53,280
based on orbital data

1652
00:55:57,430 --> 00:55:55,920
and the and the data that we have first

1653
00:55:59,990 --> 00:55:57,440
and foremost tells us where rock

1654
00:56:01,829 --> 00:56:00,000
outcrops and if you want to understand

1655
00:56:03,430 --> 00:56:01,839
any sort of geologic system you don't

1656
00:56:04,789 --> 00:56:03,440
want to analyze you don't want to study

1657
00:56:05,910 --> 00:56:04,799
in great detail the rubble that's just

1658
00:56:08,390 --> 00:56:05,920
laying around

1659
00:56:10,710 --> 00:56:08,400
so the first thing we did is identify

1660
00:56:13,750 --> 00:56:10,720
where there is outcrop

1661
00:56:16,309 --> 00:56:13,760
and then we created a geologic map tells

1662
00:56:18,150 --> 00:56:16,319
us how rock units relate to each other

1663
00:56:19,750 --> 00:56:18,160

and from that we were able to raise

1664
00:56:21,349 --> 00:56:19,760
certain kinds of questions like is this

1665
00:56:22,230 --> 00:56:21,359
rock older than this rock or is this

1666
00:56:24,309 --> 00:56:22,240
rock younger than

1667
00:56:26,470 --> 00:56:24,319
this other rock and so these become

1668
00:56:29,109 --> 00:56:26,480
hypotheses that we wish to test

1669
00:56:30,309 --> 00:56:29,119
at each of these locations so that's one

1670
00:56:32,309 --> 00:56:30,319
whole set of criteria

1671
00:56:33,670 --> 00:56:32,319
for where we're going to go is where

1672
00:56:35,109 --> 00:56:33,680
there is outcrop that can tell us

1673
00:56:36,870 --> 00:56:35,119
something important

1674
00:56:38,950 --> 00:56:36,880
and then a whole other set of criteria

1675
00:56:41,510 --> 00:56:38,960
have to do with the goals of the mission

1676
00:56:42,470 --> 00:56:41,520
uh in particular this uh seeking

1677
00:56:45,670 --> 00:56:42,480
biosignatures

1678
00:56:46,630 --> 00:56:45,680
so we want a place that is both a record

1679
00:56:48,950 --> 00:56:46,640
of a habitable

1680
00:56:50,950 --> 00:56:48,960
a past habitable environment for example

1681
00:56:52,870 --> 00:56:50,960
mud deposited in the bottom of a lake

1682
00:56:55,990 --> 00:56:52,880
that is a wonderful place to look

1683
00:56:58,630 --> 00:56:56,000
so we prioritize targets like that

1684
00:56:59,030 --> 00:56:58,640
and also we prioritize targets that

1685
00:57:01,670 --> 00:56:59,040
could

1686
00:57:03,430 --> 00:57:01,680
tell us things uh when samples come back

1687
00:57:04,549 --> 00:57:03,440
to earth that we simply cannot answer

1688
00:57:07,670 --> 00:57:04,559

with the rover

1689
00:57:09,670 --> 00:57:07,680
and as an example um we have

1690
00:57:11,190 --> 00:57:09,680
tentatively identified places where

1691
00:57:13,190 --> 00:57:11,200
there are volcanic rocks

1692
00:57:15,109 --> 00:57:13,200
volcanic rocks would be spectacular to

1693
00:57:16,150 --> 00:57:15,119
bring back because then we can date them

1694
00:57:18,549 --> 00:57:16,160
quantitatively and

1695
00:57:20,150 --> 00:57:18,559
understand how to pin this entire

1696
00:57:23,670 --> 00:57:20,160
geologic record into

1697
00:57:25,270 --> 00:57:23,680
geologic time so the

1698
00:57:26,710 --> 00:57:25,280
that's how we put the traverse together

1699
00:57:29,109 --> 00:57:26,720
it is just an idea

1700
00:57:30,309 --> 00:57:29,119
and we are certainly going to divert

1701
00:57:32,789 --> 00:57:30,319
from it in

1702
00:57:34,870 --> 00:57:32,799
in either large or small ways as we move

1703
00:57:36,069 --> 00:57:34,880
along and discover new things

1704
00:57:38,390 --> 00:57:36,079
and then i think the other question you

1705
00:57:38,789 --> 00:57:38,400
asked is what would be the most likely

1706
00:57:40,630 --> 00:57:38,799
first

1707
00:57:42,870 --> 00:57:40,640
target that's going to depend a lot on

1708
00:57:44,549 --> 00:57:42,880
where we land but if as al said

1709
00:57:45,990 --> 00:57:44,559
we land right in front of the delta i

1710
00:57:47,750 --> 00:57:46,000
would you know thumbs up al

1711
00:57:49,670 --> 00:57:47,760
we are super excited about that because

1712
00:57:51,430 --> 00:57:49,680
the delta is what brought us to this

1713
00:57:54,069 --> 00:57:51,440

location in the first place

1714
00:57:55,589 --> 00:57:54,079
spectacular piece of geology and i think

1715
00:57:58,710 --> 00:57:55,599
we would very likely

1716
00:58:01,589 --> 00:57:58,720
look at the um base of the delta

1717
00:58:03,510 --> 00:58:01,599
where uh there is mud that was deposited

1718
00:58:04,950 --> 00:58:03,520
billions of years ago and this is as i

1719
00:58:06,630 --> 00:58:04,960
just said a wonderful place to look for

1720
00:58:08,870 --> 00:58:06,640
biosignatures and so i think there's a

1721
00:58:10,470 --> 00:58:08,880
high probability that that will be

1722
00:58:13,349 --> 00:58:10,480
if not the first place amongst the first

1723
00:58:15,750 --> 00:58:13,359
places that we will take a sample

1724
00:58:17,270 --> 00:58:15,760
thank you so much for that ken we

1725
00:58:19,750 --> 00:58:17,280
unfortunately can't answer

1726
00:58:21,670 --> 00:58:19,760
all the media questions on air for those

1727
00:58:21,990 --> 00:58:21,680
of you with additional questions please

1728
00:58:24,870 --> 00:58:22,000
call

1729
00:58:26,470 --> 00:58:24,880
jpl's digital news and media office

1730
00:58:29,510 --> 00:58:26,480
we'll also continue to answer

1731
00:58:31,750 --> 00:58:29,520
social media questions online thank you

1732
00:58:34,309 --> 00:58:31,760
for your questions and thank you so much

1733
00:58:35,910 --> 00:58:34,319
for our panelists joining us today to

1734
00:58:37,349 --> 00:58:35,920
celebrate perseverance perseverance's

1735
00:58:39,589 --> 00:58:37,359
red planet landing

1736
00:58:41,109 --> 00:58:39,599
cities around the country are lighting

1737
00:58:43,270 --> 00:58:41,119
the town red

1738
00:58:44,150 --> 00:58:43,280

here's a great look from new york

1739
00:58:46,390 --> 00:58:44,160
yesterday

1740
00:58:48,309 --> 00:58:46,400
the empire state building lit up its

1741
00:58:50,470 --> 00:58:48,319
tower for the red planet

1742
00:58:51,990 --> 00:58:50,480
later today here in los angeles the

1743
00:58:54,230 --> 00:58:52,000
pylons at lax

1744
00:58:56,710 --> 00:58:54,240
will be turning red and several

1745
00:58:59,589 --> 00:58:56,720
buildings along the chicago skyline

1746
00:59:00,950 --> 00:58:59,599
including the adler planetarium we'll

1747
00:59:03,510 --> 00:59:00,960
also be joining in

1748
00:59:03,990 --> 00:59:03,520
so stay tuned today at 12 p.m pacific

1749
00:59:06,470 --> 00:59:04,000
standard

1750
00:59:08,470 --> 00:59:06,480
time as our next briefing will dive into

1751
00:59:09,109 --> 00:59:08,480
the search for signs of ancient life on

1752
00:59:11,349 --> 00:59:09,119
mars

1753
00:59:12,230 --> 00:59:11,359
and in samples we will be bringing back

1754
00:59:14,390 --> 00:59:12,240
to earth

1755
00:59:17,109 --> 00:59:14,400
perseverance is set to land on mars

1756
00:59:21,030 --> 00:59:17,119
tomorrow with commentary beginning at 11

1757
00:59:22,470 --> 00:59:21,040
15 a.m pacific standard time 2 15 p.m

1758
00:59:24,789 --> 00:59:22,480
eastern standard time

1759
00:59:26,069 --> 00:59:24,799
and we are offering lots of ways to ride

1760
00:59:28,069 --> 00:59:26,079
along with us

1761
00:59:29,589 --> 00:59:28,079
to join the virtual nasa social and

1762
00:59:31,510 --> 00:59:29,599
virtual guest events

1763
00:59:33,829 --> 00:59:31,520

register for the mission to mars student

1764
00:59:34,470 --> 00:59:33,839
challenge and live stream the mars

1765
00:59:39,109 --> 00:59:34,480
landing

1766
00:59:40,870 --> 00:59:39,119
visit go.nasa.gov mars 2020 toolkit

1767
00:59:43,270 --> 00:59:40,880
for those of you interested in a deeper

1768
00:59:44,309 --> 00:59:43,280
dive we have a new press kit available

1769
00:59:46,390 --> 00:59:44,319
online too

1770
00:59:48,710 --> 00:59:46,400
with lots of information and graphics

1771
00:59:50,710 --> 00:59:48,720
describing the rover and its mission

1772
00:59:53,589 --> 00:59:50,720
there you'll also have a chance to sign

1773
00:59:55,349 --> 00:59:53,599
up and send your name to mars on nasa's

1774
00:59:57,829 --> 00:59:55,359
next flight to the red planet

1775
01:00:00,069 --> 00:59:57,839
and put yourself right into the action

1776
01:00:01,910 --> 01:00:00,079
with our perseverance photo booth you

1777
01:00:04,150 --> 01:00:01,920
can pose next to the rover

1778
01:00:05,109 --> 01:00:04,160
place yourself in our mission control

1779
01:00:07,190 --> 01:00:05,119
and even see

1780
01:00:08,630 --> 01:00:07,200
what you might look like taking a selfie

1781
01:00:13,349 --> 01:00:08,640
on the red planet

1782
01:00:16,789 --> 01:00:13,359
again it's all available at go.nasa.gov

1783
01:00:17,510 --> 01:00:16,799
mars 2020 toolkit if you're on social

1784
01:00:19,349 --> 01:00:17,520
media

1785
01:00:21,190 --> 01:00:19,359
join the conversation with the mission

1786
01:00:23,829 --> 01:00:21,200
on facebook and twitter

1787
01:00:24,630 --> 01:00:23,839
follow at nasa persevere and use the

1788
01:00:27,349 --> 01:00:24,640

hashtag

1789
01:00:29,430 --> 01:00:27,359
countdown to mars thank you again for