1
00:00:05,110 --> 00:00:02,629
that a human being has ever seen from

2
00:00:08,710 --> 00:00:05,120
the surface of another planet on august

3
00:00:11,430 --> 00:00:08,720
20th 1975 the first viking spaceship was

4
00:00:14,390 --> 00:00:11,440
launched you were seeing something that

5
00:00:17,910 --> 00:00:14,400
no other human has ever seen before

6
00:00:22,950 --> 00:00:17,920
former seas and mountains huge canyons

7
00:00:27,509 --> 00:00:24,950
that sense of wonderment and achievement

8
00:00:31,509 --> 00:00:27,519
and always working towards your goal

9
00:00:32,910 --> 00:00:31,519
we can do and we will do

10
00:00:39,030 --> 00:00:32,920
and liftoff

11
00:00:44,069 --> 00:00:41,990
mars is unavoidably special we landed

12
00:00:45,270 --> 00:00:44,079
and we've scooped we've roved we've

13
00:00:48,150 --> 00:00:45,280

orbited

14
00:00:50,310 --> 00:00:48,160
together we did it but the attitude was

15
00:00:52,630 --> 00:00:50,320
together we can do it

16
00:00:57,990 --> 00:00:52,640
the future is what you make out of it

17
00:01:02,869 --> 00:01:00,869
and here we are with mars perseverance

18
00:01:05,750 --> 00:01:02,879
51 years later getting ready to do the

19
00:01:07,670 --> 00:01:05,760
first ever mars return mission

20
00:01:09,750 --> 00:01:07,680
eventually we can bring those samples

21
00:01:11,030 --> 00:01:09,760
back to earth and determine for the very

22
00:01:12,410 --> 00:01:11,040
first time

23
00:01:22,390 --> 00:01:12,420
did life exist on mars

24
00:01:26,469 --> 00:01:24,310
hello and welcome to kennedy space

25
00:01:28,230 --> 00:01:26,479
center my name is bettina and klon thank

26
00:01:31,190 --> 00:01:28,240
you for joining us for this pre-launch

27
00:01:33,350 --> 00:01:31,200
prescott pre-launch press conference

28
00:01:36,230 --> 00:01:33,360
moments ago the launch readiness review

29
00:01:38,390 --> 00:01:36,240
concluded for the mars 2020 mission

30
00:01:40,870 --> 00:01:38,400
which will carry the mars perseverance

31
00:01:42,230 --> 00:01:40,880
rover and the ingenuity helicopter to

32
00:01:44,550 --> 00:01:42,240
the red planet

33
00:01:47,429 --> 00:01:44,560
we're very excited about this new era in

34
00:01:49,350 --> 00:01:47,439
mars exploration you can catch the the

35
00:01:51,109 --> 00:01:49,360
launch here on nasa television with

36
00:01:53,830 --> 00:01:51,119
broadcast starting at 7 00 am and the

37
00:01:56,069 --> 00:01:53,840
launch will start at 7 50

38
00:01:58,149 --> 00:01:56,079

to learn more about this

39
00:02:01,749 --> 00:01:58,159
this mission to mars we are joined by a

40
00:02:04,630 --> 00:02:01,759
great panel to tell us about mars 2020

41
00:02:08,229 --> 00:02:04,640
and future plans to mars first we have

42
00:02:10,229 --> 00:02:08,239
nasa administrator jim bridenstine

43
00:02:13,670 --> 00:02:10,239
thomas sabukin associate administrator

44
00:02:15,750 --> 00:02:13,680
for nasa science mission directorate

45
00:02:18,309 --> 00:02:15,760
matt wallace deputy program manager for

46
00:02:20,949 --> 00:02:18,319
the jet propulsion lab

47
00:02:23,350 --> 00:02:20,959
omar bayes launch director for the nasa

48
00:02:26,309 --> 00:02:23,360
launch service program

49
00:02:27,990 --> 00:02:26,319
tour bruno president and ceo of united

50
00:02:30,470 --> 00:02:28,000
launch alliance

51
00:02:32,550 --> 00:02:30,480
and jessica williams 45th space wing

52
00:02:34,070 --> 00:02:32,560
weather officer

53
00:02:36,229 --> 00:02:34,080
as a reminder we'll start taking

54
00:02:38,309 --> 00:02:36,239
questions from our media who is joining

55
00:02:40,790 --> 00:02:38,319
us virtually on the phone range we'll

56
00:02:43,509 --> 00:02:40,800
also question to also take questions

57
00:02:45,430 --> 00:02:43,519
from social media using the hashtag

58
00:02:47,750 --> 00:02:45,440
countdown to mars

59
00:02:49,190 --> 00:02:47,760
so let's start with nasa administrator

60
00:02:51,830 --> 00:02:49,200
jim bradenstein

61
00:02:53,430 --> 00:02:51,840
well thank you so much bettina and i

62
00:02:56,710 --> 00:02:53,440
just want to say the launch readiness

63
00:02:59,110 --> 00:02:56,720

review is complete and we are indeed go

64
00:03:01,589 --> 00:02:59,120
for launch i want to thank our ula

65
00:03:03,270 --> 00:03:01,599
teammates and of course our jpl

66
00:03:05,190 --> 00:03:03,280
teammates as well

67
00:03:07,190 --> 00:03:05,200
this has been an amazing team effort and

68
00:03:09,430 --> 00:03:07,200
i remember when i first came to the

69
00:03:11,030 --> 00:03:09,440
agency thomas zurbukin

70
00:03:13,670 --> 00:03:11,040
came to me and said hey look we have a

71
00:03:15,030 --> 00:03:13,680
risk here the risk is mars 2020. i said

72
00:03:17,190 --> 00:03:15,040
well what's the risk he said well we

73
00:03:18,550 --> 00:03:17,200
might not go in 2020.

74
00:03:21,350 --> 00:03:18,560
and here we are

75
00:03:22,949 --> 00:03:21,360
just uh a number of years later

76
00:03:25,589 --> 00:03:22,959
but we are in fact going to launch what

77
00:03:27,750 --> 00:03:25,599
we now call mars perseverance

78
00:03:30,869 --> 00:03:27,760
in the year 2020 and i think the the

79
00:03:33,270 --> 00:03:30,879
name is is perfectly appropriate

80
00:03:36,550 --> 00:03:33,280
a young man in virginia named alex

81
00:03:38,070 --> 00:03:36,560
mather a a seventh grader is the person

82
00:03:40,309 --> 00:03:38,080
who named it and so

83
00:03:43,910 --> 00:03:40,319
um we are we are in extraordinary times

84
00:03:46,229 --> 00:03:43,920
right now with the coronavirus pandemic

85
00:03:48,070 --> 00:03:46,239
and yet we have in fact persevered and

86
00:03:50,229 --> 00:03:48,080
we have protected this mission because

87
00:03:52,390 --> 00:03:50,239
it is so important we declare this

88
00:03:54,630 --> 00:03:52,400

mission to be essential and there's a

89
00:03:56,229 --> 00:03:54,640
number of reasons why and i'll just give

90
00:03:57,910 --> 00:03:56,239
you a few of them

91
00:03:58,949 --> 00:03:57,920
some of the reasons that excite me the

92
00:04:01,030 --> 00:03:58,959
most

93
00:04:02,789 --> 00:04:01,040
first of all you know the president gave

94
00:04:05,830 --> 00:04:02,799
us an objective to go to mars with

95
00:04:07,429 --> 00:04:05,840
humans to plant an american flag on mars

96
00:04:10,149 --> 00:04:07,439
well in order to do that we have to be

97
00:04:12,470 --> 00:04:10,159
able to sustain human life on mars so

98
00:04:15,750 --> 00:04:12,480
there's a mission on perseverance called

99
00:04:18,390 --> 00:04:15,760
moxie it's a technology demonstrator how

100
00:04:21,270 --> 00:04:18,400
do we use the carbon dioxide atmosphere

101
00:04:23,430 --> 00:04:21,280
of mars and create pure oxygen that we

102
00:04:25,110 --> 00:04:23,440
can use for life support so that's a

103
00:04:27,590 --> 00:04:25,120
really exciting mission that is a

104
00:04:28,790 --> 00:04:27,600
precursor to an eventual human mission

105
00:04:30,950 --> 00:04:28,800
to mars

106
00:04:33,430 --> 00:04:30,960
but there's so much more when we think

107
00:04:36,629 --> 00:04:33,440
about the mars perseverance rover for

108
00:04:39,430 --> 00:04:36,639
the first time ever we're going to fly a

109
00:04:42,230 --> 00:04:39,440
a helicopter on another planet we call

110
00:04:43,990 --> 00:04:42,240
it ingenuity and of course

111
00:04:46,790 --> 00:04:44,000
ingenuity is going to be a tech

112
00:04:49,510 --> 00:04:46,800
demonstrator for this particular mission

113
00:04:52,310 --> 00:04:49,520

but in the future it could transform how

114
00:04:53,430 --> 00:04:52,320
we do planetary science on these other

115
00:04:55,590 --> 00:04:53,440
worlds

116
00:04:57,830 --> 00:04:55,600
and eventually be a scout so that we can

117
00:05:00,390 --> 00:04:57,840
figure out where exactly do we need to

118
00:05:02,230 --> 00:05:00,400
send our our robots

119
00:05:03,909 --> 00:05:02,240
but i think the other thing that's very

120
00:05:07,029 --> 00:05:03,919
important about this mission this is the

121
00:05:09,790 --> 00:05:07,039
first time in history when nasa has

122
00:05:13,590 --> 00:05:09,800
dedicated a mission to what we call

123
00:05:16,469 --> 00:05:13,600
astrobiology the search for life either

124
00:05:17,670 --> 00:05:16,479
maybe maybe now or ancient life on

125
00:05:19,350 --> 00:05:17,680
another world

126
00:05:21,029 --> 00:05:19,360
and of course when we go to the jezreel

127
00:05:23,350 --> 00:05:21,039
crater which is

128
00:05:25,990 --> 00:05:23,360
obviously a big crater on mars but it's

129
00:05:27,909 --> 00:05:26,000
also a former lake bed and it had a

130
00:05:30,230 --> 00:05:27,919
river that flowed into it and that river

131
00:05:31,350 --> 00:05:30,240
delta is a place where we believe there

132
00:05:32,950 --> 00:05:31,360
could be

133
00:05:34,550 --> 00:05:32,960
not saying there is we don't know but

134
00:05:35,670 --> 00:05:34,560
there could have been at one point in

135
00:05:36,950 --> 00:05:35,680
time

136
00:05:39,990 --> 00:05:36,960
life

137
00:05:42,550 --> 00:05:40,000
we know that mars had a very active

138
00:05:44,469 --> 00:05:42,560

atmosphere and a very active hydrosphere

139
00:05:46,870 --> 00:05:44,479
that it was protected from the radiation

140
00:05:48,390 --> 00:05:46,880
of of deep space at one time three

141
00:05:50,629 --> 00:05:48,400
billion years ago in other words mars

142
00:05:52,710 --> 00:05:50,639
was at one time habitable we know that

143
00:05:54,790 --> 00:05:52,720
because of past missions spirit and

144
00:05:57,430 --> 00:05:54,800
opportunity and now that we know what

145
00:05:59,590 --> 00:05:57,440
the history of mars was we can say okay

146
00:06:02,230 --> 00:05:59,600
maybe there was life there let's go find

147
00:06:04,309 --> 00:06:02,240
out if there was life on mars and in

148
00:06:06,230 --> 00:06:04,319
fact the other exciting thing is we're

149
00:06:08,230 --> 00:06:06,240
going to cash samples we're going to

150
00:06:11,830 --> 00:06:08,240
cash samples on the surface of another

151
00:06:13,990 --> 00:06:11,840
world for a future mission in 2026 to

152
00:06:15,909 --> 00:06:14,000
bring those samples back to earth that

153
00:06:18,790 --> 00:06:15,919
will be the first time in history that

154
00:06:20,070 --> 00:06:18,800
we've done a mars return mission in fact

155
00:06:22,629 --> 00:06:20,080
it's the first time in history we've

156
00:06:24,390 --> 00:06:22,639
done a return mission from any planet so

157
00:06:26,710 --> 00:06:24,400
it's uh these are very very exciting

158
00:06:29,029 --> 00:06:26,720
times very important mission for the

159
00:06:30,950 --> 00:06:29,039
united states of america and of course a

160
00:06:32,070 --> 00:06:30,960
very very important mission for the

161
00:06:33,909 --> 00:06:32,080
world

162
00:06:36,390 --> 00:06:33,919
and with that i'm going to turn it over

163
00:06:39,189 --> 00:06:36,400

to the associate administrator of the

164
00:06:41,110 --> 00:06:39,199
science mission directorate at nasa who

165
00:06:43,110 --> 00:06:41,120
has done just amazing work helping us

166
00:06:45,590 --> 00:06:43,120
get to where we are today um and

167
00:06:48,150 --> 00:06:45,600
somebody who understands how uniting

168
00:06:50,309 --> 00:06:48,160
this mission actually is so dr thomas

169
00:06:52,150 --> 00:06:50,319
irbukin over to you thank you so much

170
00:06:54,710 --> 00:06:52,160
administrator and thanks to you for your

171
00:06:56,469 --> 00:06:54,720
commitment to success uh without which

172
00:06:58,790 --> 00:06:56,479
we wouldn't be here today i really

173
00:07:00,950 --> 00:06:58,800
really appreciate that and i just

174
00:07:03,589 --> 00:07:00,960
couldn't uh be more happy to be here

175
00:07:05,749 --> 00:07:03,599
today and have this amazing mission on

176
00:07:07,830 --> 00:07:05,759
top of a rocket ready to go

177
00:07:09,909 --> 00:07:07,840
and actually from this uh launch

178
00:07:13,029 --> 00:07:09,919
readiness review know

179
00:07:13,749 --> 00:07:13,039
that all the issues are addressed and we

180
00:07:15,670 --> 00:07:13,759
are

181
00:07:18,150 --> 00:07:15,680
in fact ready now we're just counting

182
00:07:19,430 --> 00:07:18,160
down and just really celebrating with

183
00:07:21,029 --> 00:07:19,440
the team

184
00:07:22,790 --> 00:07:21,039
you already mentioned the administrator

185
00:07:24,710 --> 00:07:22,800
why we want to go to mars and i'm not

186
00:07:27,110 --> 00:07:24,720
going to repeat it for me the most

187
00:07:28,150 --> 00:07:27,120
exciting part is to really go land in

188
00:07:31,270 --> 00:07:28,160

this

189
00:07:33,430 --> 00:07:31,280
river delta that we think has so many

190
00:07:35,990 --> 00:07:33,440
promising landscapes kind of

191
00:07:38,070 --> 00:07:36,000
rocks that in fact we want to not only

192
00:07:41,350 --> 00:07:38,080
see images often measurements of we want

193
00:07:43,350 --> 00:07:41,360
to see back in the best labs that is are

194
00:07:44,469 --> 00:07:43,360
available to humanity which is of course

195
00:07:47,990 --> 00:07:44,479
on earth

196
00:07:49,990 --> 00:07:48,000
with our sample return being a reality

197
00:07:51,029 --> 00:07:50,000
we're excited to go learn about the

198
00:07:53,670 --> 00:07:51,039
climate

199
00:07:55,670 --> 00:07:53,680
of mars the weather there with

200
00:07:58,390 --> 00:07:55,680
unprecedented weather information that

201
00:07:59,749 --> 00:07:58,400
is right there also and uh teaches us

202
00:08:02,390 --> 00:07:59,759
about that

203
00:08:05,189 --> 00:08:02,400
and uh needless to say uh we're gonna

204
00:08:06,950 --> 00:08:05,199
make amazing surprising discoveries kind

205
00:08:08,790 --> 00:08:06,960
of in a way that

206
00:08:10,469 --> 00:08:08,800
it always happens the most important

207
00:08:12,309 --> 00:08:10,479
thing that happens in these missions are

208
00:08:14,309 --> 00:08:12,319
the things we did not plan those are

209
00:08:17,110 --> 00:08:14,319
discoveries that are

210
00:08:18,150 --> 00:08:17,120
rewriting uh uh school books uh all over

211
00:08:19,909 --> 00:08:18,160
the world

212
00:08:21,350 --> 00:08:19,919
well there are two things that really

213
00:08:23,430 --> 00:08:21,360

are important to me today i want to

214
00:08:25,189 --> 00:08:23,440
focus on the first one is perseverance

215
00:08:27,909 --> 00:08:25,199
you already mentioned how appropriate

216
00:08:30,150 --> 00:08:27,919
this name is perseverance

217
00:08:32,870 --> 00:08:30,160
many people i think initially is about

218
00:08:34,949 --> 00:08:32,880
something hard it is something beautiful

219
00:08:37,750 --> 00:08:34,959
it's together with exploration together

220
00:08:39,990 --> 00:08:37,760
with hope together with vision it is

221
00:08:42,230 --> 00:08:40,000
what actually allows us to achieve these

222
00:08:44,790 --> 00:08:42,240
amazing goals and this mission is full

223
00:08:46,710 --> 00:08:44,800
of perseverance it's perseverance uh

224
00:08:49,750 --> 00:08:46,720
early on even of

225
00:08:52,870 --> 00:08:49,760
com bringing this amazing idea to bear

226
00:08:55,110 --> 00:08:52,880
and designing this exciting rover

227
00:08:57,910 --> 00:08:55,120
together with international partners

228
00:08:59,750 --> 00:08:57,920
that persevered themselves developing uh

229
00:09:00,710 --> 00:08:59,760
these uh instruments and sending them

230
00:09:03,350 --> 00:09:00,720
over

231
00:09:05,110 --> 00:09:03,360
it is uh going through the adversity

232
00:09:08,790 --> 00:09:05,120
that we always encounter when it comes

233
00:09:10,949 --> 00:09:08,800
to complex uh uh you know exploration

234
00:09:12,949 --> 00:09:10,959
but also in this case over and above

235
00:09:16,150 --> 00:09:12,959
because of the tremendous difficulties

236
00:09:18,630 --> 00:09:16,160
in this sample return uh uh technology

237
00:09:20,150 --> 00:09:18,640
that was invented at jpl and their

238
00:09:22,470 --> 00:09:20,160

collaborators

239
00:09:23,910 --> 00:09:22,480
but then you talked about it

240
00:09:25,910 --> 00:09:23,920
life changed

241
00:09:28,070 --> 00:09:25,920
and on this role where we have the unity

242
00:09:30,550 --> 00:09:28,080
plaque uh recognizing the first

243
00:09:32,790 --> 00:09:30,560
responders that also had an important

244
00:09:35,269 --> 00:09:32,800
role and actually kept everybody safe

245
00:09:37,190 --> 00:09:35,279
not only the good people who worked

246
00:09:39,509 --> 00:09:37,200
at this rover and the launch vehicle but

247
00:09:42,310 --> 00:09:39,519
also their friends and family all over

248
00:09:44,949 --> 00:09:42,320
the united states and in fact all over

249
00:09:49,269 --> 00:09:44,959
the world in addition to that uh on this

250
00:09:52,070 --> 00:09:49,279
rower is a plaque with 11

251
00:09:54,790 --> 00:09:52,080
million uh names and i want to tell you

252
00:09:57,350 --> 00:09:54,800
my name is there uh as or my entire

253
00:09:59,990 --> 00:09:57,360
family and both of my parents who are no

254
00:10:02,150 --> 00:10:00,000
longer with us they too are part of that

255
00:10:03,670 --> 00:10:02,160
important uh exploration and i hope so

256
00:10:04,389 --> 00:10:03,680
many of the people are watching right

257
00:10:06,550 --> 00:10:04,399
now

258
00:10:08,230 --> 00:10:06,560
because we're going together

259
00:10:10,949 --> 00:10:08,240
as a world and i want to give you a

260
00:10:13,269 --> 00:10:10,959
glimpse of going together as a world

261
00:10:15,190 --> 00:10:13,279
uh from a little uh country over there

262
00:10:17,509 --> 00:10:15,200
in europe and i want to uh

263
00:10:19,269 --> 00:10:17,519

show the first image

264
00:10:21,110 --> 00:10:19,279
this is in the background there the

265
00:10:22,550 --> 00:10:21,120
matterhorn you've seen it from chocolate

266
00:10:24,870 --> 00:10:22,560
bars perhaps

267
00:10:27,910 --> 00:10:24,880
you know it's one of the most amazing

268
00:10:31,430 --> 00:10:27,920
mountains almost 15 000 feet high

269
00:10:35,670 --> 00:10:31,440
and what you see in the forefront is

270
00:10:38,470 --> 00:10:35,680
a light show actually uh really onto the

271
00:10:39,990 --> 00:10:38,480
onto the matterhorn with mars uh image

272
00:10:41,829 --> 00:10:40,000
as you see of course looking at these

273
00:10:44,230 --> 00:10:41,839
rocks as well this could be on another

274
00:10:47,190 --> 00:10:44,240
planet too well this is in switzerland

275
00:10:49,590 --> 00:10:47,200
it's actually at uh 9 000 feet high

276
00:10:51,509 --> 00:10:49,600
that's where the crew is right now but

277
00:10:54,389 --> 00:10:51,519
here's what's exciting right now every

278
00:10:56,550 --> 00:10:54,399
night until the 15th of august and next

279
00:10:58,949 --> 00:10:56,560
image please

280
00:11:02,069 --> 00:10:58,959
the crew is going to project images such

281
00:11:05,350 --> 00:11:02,079
as this one onto the matterhorn images

282
00:11:09,030 --> 00:11:05,360
of coming together as a world and

283
00:11:11,590 --> 00:11:09,040
persevering and exploring the uh our

284
00:11:14,550 --> 00:11:11,600
neighbor neighboring planet together but

285
00:11:17,190 --> 00:11:14,560
being explorers together and persevering

286
00:11:19,829 --> 00:11:17,200
and so for me that image is just

287
00:11:21,990 --> 00:11:19,839
really one of those uh demonstrations no

288
00:11:24,230 --> 00:11:22,000

this is not fake that's exactly what

289
00:11:26,389 --> 00:11:24,240
happened last night that's exactly what

290
00:11:28,310 --> 00:11:26,399
happened next night in switzerland and

291
00:11:30,949 --> 00:11:28,320
for the next few nights so i just really

292
00:11:32,790 --> 00:11:30,959
want to thanks cherry hofstetter uh the

293
00:11:35,829 --> 00:11:32,800
artist and the event designer who did

294
00:11:38,470 --> 00:11:35,839
that and uh of course daniel lookin uh

295
00:11:40,150 --> 00:11:38,480
who is uh who is uh the official in

296
00:11:42,790 --> 00:11:40,160
charge who enabled that there's a lot of

297
00:11:49,829 --> 00:11:42,800
people who have to agree to that moment

298
00:11:54,629 --> 00:11:51,750
yes that was swiss german and i do speak

299
00:11:56,870 --> 00:11:54,639
that language with that however uh i'm

300
00:11:59,350 --> 00:11:56,880
going to turn it over to matt uh you

301
00:12:01,590 --> 00:11:59,360
know and i just want to tell you um uh

302
00:12:04,310 --> 00:12:01,600
how much i appreciate matt and his work

303
00:12:06,150 --> 00:12:04,320
and and the work of his entire team matt

304
00:12:08,870 --> 00:12:06,160
and i got to know each other a lot

305
00:12:10,790 --> 00:12:08,880
because we too had to persevere together

306
00:12:12,790 --> 00:12:10,800
matt

307
00:12:15,430 --> 00:12:12,800
thank you thomas i'm not gonna speak

308
00:12:17,509 --> 00:12:15,440
german but i'm pretty excited uh this is

309
00:12:19,269 --> 00:12:17,519
the fifth mars rover mission i've had an

310
00:12:21,350 --> 00:12:19,279
opportunity to work on

311
00:12:22,389 --> 00:12:21,360
and uh i have to say this one's really

312
00:12:24,069 --> 00:12:22,399
special

313
00:12:25,829 --> 00:12:24,079

for for a lot of reasons some of which

314
00:12:27,670 --> 00:12:25,839
you've already heard about

315
00:12:29,430 --> 00:12:27,680
uh that we're doing transformative

316
00:12:31,509 --> 00:12:29,440
science really for the first time we're

317
00:12:32,550 --> 00:12:31,519
looking for signs of life on another

318
00:12:34,949 --> 00:12:32,560
planet

319
00:12:36,710 --> 00:12:34,959
and uh as as thomas mentioned for the

320
00:12:38,710 --> 00:12:36,720
first time we're gonna collect samples

321
00:12:41,670 --> 00:12:38,720
that'll be part of we hope the first

322
00:12:43,269 --> 00:12:41,680
sample return from another planet and

323
00:12:44,550 --> 00:12:43,279
there's a lot of other firsts along the

324
00:12:46,790 --> 00:12:44,560
way

325
00:12:48,470 --> 00:12:46,800
administrator mentioned our

326
00:12:49,430 --> 00:12:48,480
first powered

327
00:12:53,269 --> 00:12:49,440
aerial

328
00:12:55,190 --> 00:12:53,279
capability with the ingenuity helicopter

329
00:12:57,910 --> 00:12:55,200
we're making oxygen on the surface of

330
00:12:59,670 --> 00:12:57,920
mars for the first time for the first

331
00:13:02,389 --> 00:12:59,680
time we have an opportunity to use

332
00:13:04,629 --> 00:13:02,399
autonomous systems to

333
00:13:06,710 --> 00:13:04,639
avoid hazards on

334
00:13:08,550 --> 00:13:06,720
as we land in jezreel crater and that's

335
00:13:09,750 --> 00:13:08,560
a technology that will feed forward into

336
00:13:12,230 --> 00:13:09,760
future

337
00:13:15,110 --> 00:13:12,240
robotic systems and human exploration

338
00:13:16,870 --> 00:13:15,120

systems and that's exciting

339
00:13:19,030 --> 00:13:16,880
we're also carrying microphones for the

340
00:13:21,110 --> 00:13:19,040
first time we're going to hear

341
00:13:24,470 --> 00:13:21,120
the sounds of the spacecraft landing on

342
00:13:26,310 --> 00:13:24,480
another planet and the and the rover uh

343
00:13:29,590 --> 00:13:26,320
drilling in the rocks and and rolling

344
00:13:31,190 --> 00:13:29,600
over the surface of of mars and uh

345
00:13:33,030 --> 00:13:31,200
you know that that's pretty exciting

346
00:13:34,710 --> 00:13:33,040
i'll mention one more which is uh kind

347
00:13:36,230 --> 00:13:34,720
of near and dear to my heart for the

348
00:13:37,430 --> 00:13:36,240
first time

349
00:13:39,990 --> 00:13:37,440
we're going to have an opportunity to

350
00:13:42,949 --> 00:13:40,000
see another spacecraft see our

351
00:13:45,030 --> 00:13:42,959
spacecraft land on another planet

352
00:13:46,790 --> 00:13:45,040
we've got commercial ruggedized cameras

353
00:13:48,470 --> 00:13:46,800
that we've distributed essentially all

354
00:13:49,269 --> 00:13:48,480
over the spacecraft

355
00:13:55,990 --> 00:13:49,279
and

356
00:13:57,990 --> 00:13:56,000
activity from the inflation of the

357
00:13:58,870 --> 00:13:58,000
parachute to the touchdown of the rover

358
00:14:00,470 --> 00:13:58,880
and

359
00:14:01,590 --> 00:14:00,480
that's going to be some very exciting

360
00:14:05,670 --> 00:14:01,600
footage

361
00:14:07,110 --> 00:14:05,680
so uh so the whole whole mission is um

362
00:14:08,470 --> 00:14:07,120
very exciting for me if we bring up the

363
00:14:11,269 --> 00:14:08,480

first graphic

364
00:14:12,310 --> 00:14:11,279
just from a quick historical perspective

365
00:14:15,350 --> 00:14:12,320
we

366
00:14:17,110 --> 00:14:15,360
leverage

367
00:14:19,750 --> 00:14:17,120
the powerful

368
00:14:22,310 --> 00:14:19,760
sky sky crane delivery system that we

369
00:14:25,269 --> 00:14:22,320
developed to successfully land curiosity

370
00:14:26,550 --> 00:14:25,279
and gale crater in 2012

371
00:14:28,470 --> 00:14:26,560
we we started to look for that

372
00:14:30,790 --> 00:14:28,480
opportunity almost immediately after we

373
00:14:33,750 --> 00:14:30,800
launched curiosity in 2011 we got a new

374
00:14:34,949 --> 00:14:33,760
start on the project in 2012.

375
00:14:38,069 --> 00:14:34,959
we had

376
00:14:39,910 --> 00:14:38,079
our instruments selected by mid-2014 and

377
00:14:41,750 --> 00:14:39,920
then we got down to work accommodating

378
00:14:43,110 --> 00:14:41,760
those mission those uh

379
00:14:44,470 --> 00:14:43,120
those

380
00:14:46,069 --> 00:14:44,480
instruments and

381
00:14:48,230 --> 00:14:46,079
experiments

382
00:14:50,470 --> 00:14:48,240
and started building uh still started

383
00:14:52,150 --> 00:14:50,480
building the vehicle along the way we

384
00:14:53,030 --> 00:14:52,160
had plenty of challenges

385
00:14:58,069 --> 00:14:53,040
we

386
00:15:00,069 --> 00:14:58,079
a new planetary parachute it's another

387
00:15:01,269 --> 00:15:00,079
first first time we've done that as an

388
00:15:03,829 --> 00:15:01,279

agency

389
00:15:05,829 --> 00:15:03,839
and 40 or 50 years it's not an easy

390
00:15:07,910 --> 00:15:05,839
thing to do requires a lot of

391
00:15:10,470 --> 00:15:07,920
a number of suborbital rocket flights

392
00:15:12,310 --> 00:15:10,480
out of wallops we we managed to get that

393
00:15:13,110 --> 00:15:12,320
done and and we got through a number of

394
00:15:16,310 --> 00:15:13,120
other

395
00:15:17,990 --> 00:15:16,320
uh challenges in our development as well

396
00:15:20,710 --> 00:15:18,000
uh kind of late in the game we were

397
00:15:23,670 --> 00:15:20,720
asked to accommodate uh this this little

398
00:15:26,069 --> 00:15:23,680
thing called uh the mars helicopter

399
00:15:27,910 --> 00:15:26,079
and as you can see it was well after

400
00:15:29,749 --> 00:15:27,920
most of the payloads were assigned to

401
00:15:31,110 --> 00:15:29,759
the project and so

402
00:15:34,150 --> 00:15:31,120
you know we had to do a little bit of a

403
00:15:35,990 --> 00:15:34,160
magic trick to get that one on the rover

404
00:15:38,870 --> 00:15:36,000
uh pulled a bit of a rabbit out of the

405
00:15:40,389 --> 00:15:38,880
hat but i guess it was fate because we

406
00:15:42,310 --> 00:15:40,399
managed to get it done

407
00:15:44,470 --> 00:15:42,320
and the helicopter team delivered their

408
00:15:46,949 --> 00:15:44,480
system and it's sitting up with the

409
00:15:48,230 --> 00:15:46,959
perseverance rover on top of our atlas 5

410
00:15:51,189 --> 00:15:48,240
rocket

411
00:15:52,790 --> 00:15:51,199
getting ready to go to mars with us so

412
00:15:54,629 --> 00:15:52,800
you all know the launch is coming up and

413
00:15:58,069 --> 00:15:54,639

of course there's about a six and a half

414
00:16:01,110 --> 00:15:58,079
month cruise uh to mars and will land

415
00:16:03,350 --> 00:16:01,120
the middle of february of 2021

416
00:16:06,389 --> 00:16:03,360
at jezreel crater

417
00:16:08,710 --> 00:16:06,399
so if you go to the next graphic please

418
00:16:11,430 --> 00:16:08,720
okay this is uh this is the important

419
00:16:12,870 --> 00:16:11,440
part this is where i talk about the team

420
00:16:14,870 --> 00:16:12,880
this is just a small fraction of the

421
00:16:16,949 --> 00:16:14,880
team believe it or not uh this is just

422
00:16:19,670 --> 00:16:16,959
the jpl team and it's just a fraction of

423
00:16:20,870 --> 00:16:19,680
the more than 2 000 people

424
00:16:22,870 --> 00:16:20,880
over the course of the mission

425
00:16:24,230 --> 00:16:22,880
development that worked on the project

426
00:16:26,069 --> 00:16:24,240
at jpl

427
00:16:28,550 --> 00:16:26,079
and of course our team didn't stop at

428
00:16:29,910 --> 00:16:28,560
jpl pretty much every nasa center

429
00:16:32,310 --> 00:16:29,920
participated

430
00:16:35,590 --> 00:16:32,320
in this project in one form or another

431
00:16:38,310 --> 00:16:35,600
it was really a cross-agency

432
00:16:40,069 --> 00:16:38,320
effort and and something we're extremely

433
00:16:42,870 --> 00:16:40,079
appreciative of all the support that we

434
00:16:44,949 --> 00:16:42,880
got and it didn't stop there thomas

435
00:16:47,749 --> 00:16:44,959
mentioned we have three instruments from

436
00:16:49,509 --> 00:16:47,759
europe one from france one from spain

437
00:16:52,230 --> 00:16:49,519
uh one from norway and of course of

438
00:16:55,030 --> 00:16:52,240

course we have a very large science team

439
00:16:57,350 --> 00:16:55,040
i think it's more than 250 scientists

440
00:16:59,829 --> 00:16:57,360
really from around the world which are

441
00:17:02,389 --> 00:16:59,839
participating in this in this project as

442
00:17:05,189 --> 00:17:03,990
if you bring up the next graphic i think

443
00:17:07,110 --> 00:17:05,199
we've got a picture here of the

444
00:17:08,470 --> 00:17:07,120
spacecraft as

445
00:17:10,309 --> 00:17:08,480
uh i like it because it gives you a

446
00:17:12,549 --> 00:17:10,319
sense of the complexity of this system

447
00:17:14,069 --> 00:17:12,559
you see the cruise stage up on top the

448
00:17:16,150 --> 00:17:14,079
rover is a little hard to see but you

449
00:17:17,750 --> 00:17:16,160
can see one of the wheels there and the

450
00:17:18,949 --> 00:17:17,760
helicopter is actually mounted

451
00:17:20,870 --> 00:17:18,959
underneath

452
00:17:23,510 --> 00:17:20,880
the body of the rover and they're both

453
00:17:25,429 --> 00:17:23,520
nestled up into the uh

454
00:17:27,669 --> 00:17:25,439
into the upper portion of the entry

455
00:17:30,390 --> 00:17:27,679
capsule and we're about to bring the

456
00:17:32,630 --> 00:17:30,400
heat shield up to encapsulate the entire

457
00:17:34,390 --> 00:17:32,640
spacecraft this is right before going

458
00:17:36,549 --> 00:17:34,400
into our integrated flow with the launch

459
00:17:38,070 --> 00:17:36,559
vehicle just a few weeks ago

460
00:17:40,710 --> 00:17:38,080
you know you can't build something this

461
00:17:42,470 --> 00:17:40,720
complex without a lot of help

462
00:17:44,789 --> 00:17:42,480
from our industry partners and they

463
00:17:45,669 --> 00:17:44,799

stepped up big time

464
00:17:48,150 --> 00:17:45,679
we

465
00:17:49,590 --> 00:17:48,160
built flight hardware in 44 out of the

466
00:17:50,789 --> 00:17:49,600
50 states

467
00:17:54,710 --> 00:17:50,799
in the country

468
00:17:56,549 --> 00:17:54,720
more than 550 different cities and towns

469
00:17:57,350 --> 00:17:56,559
and communities

470
00:18:00,070 --> 00:17:57,360
so

471
00:18:01,830 --> 00:18:00,080
no matter where you are in this country

472
00:18:03,270 --> 00:18:01,840
you don't have to go very far probably

473
00:18:04,789 --> 00:18:03,280
to find somebody that's been part of

474
00:18:07,110 --> 00:18:04,799
this mission

475
00:18:11,029 --> 00:18:07,120
and it's a it's a tremendous

476
00:18:15,029 --> 00:18:13,029
you know it's

477
00:18:16,950 --> 00:18:15,039
we work with

478
00:18:19,430 --> 00:18:16,960
cutting edge technology

479
00:18:21,510 --> 00:18:19,440
and when we do that we expect to be we

480
00:18:23,909 --> 00:18:21,520
expect to be challenged

481
00:18:26,310 --> 00:18:23,919
and as as thomas and the administrator

482
00:18:28,789 --> 00:18:26,320
have mentioned our our fundamental job

483
00:18:31,029 --> 00:18:28,799
is to explore new new places

484
00:18:32,470 --> 00:18:31,039
places we haven't been

485
00:18:34,470 --> 00:18:32,480
answer questions we don't know the

486
00:18:36,310 --> 00:18:34,480
answers to sometimes

487
00:18:38,150 --> 00:18:36,320
create questions that we we didn't even

488
00:18:40,070 --> 00:18:38,160

know we needed to ask

489
00:18:43,350 --> 00:18:40,080
and so you expect new issues and new

490
00:18:44,950 --> 00:18:43,360
problems i have to say along the way

491
00:18:46,789 --> 00:18:44,960
but but really

492
00:18:49,430 --> 00:18:46,799
nothing prepared us

493
00:18:51,029 --> 00:18:49,440
for what we had to deal with in in the

494
00:18:53,990 --> 00:18:51,039
middle of march

495
00:18:55,669 --> 00:18:54,000
as a pandemic struck not just our team

496
00:18:57,669 --> 00:18:55,679
but obviously

497
00:18:59,350 --> 00:18:57,679
communities across the country and and

498
00:19:01,190 --> 00:18:59,360
the world

499
00:19:03,190 --> 00:19:01,200
we really uh at that point of the

500
00:19:05,190 --> 00:19:03,200
mission we're in our final assembly

501
00:19:07,669 --> 00:19:05,200
activities it's critically important

502
00:19:10,710 --> 00:19:07,679
that the team

503
00:19:12,470 --> 00:19:10,720
do that assembly correctly that they do

504
00:19:14,549 --> 00:19:12,480
it without making mistakes or damaging

505
00:19:16,150 --> 00:19:14,559
the hardware there's really no safety

506
00:19:18,150 --> 00:19:16,160
net at that point

507
00:19:19,990 --> 00:19:18,160
we're working with a very limited

508
00:19:22,310 --> 00:19:20,000
schedule every

509
00:19:25,110 --> 00:19:22,320
every day every shift

510
00:19:26,470 --> 00:19:25,120
every hour is is something we're

511
00:19:28,310 --> 00:19:26,480
scrutinized to make sure we're going to

512
00:19:31,029 --> 00:19:28,320
stay on track because

513
00:19:32,710 --> 00:19:31,039

we got a 20-day planetary launch window

514
00:19:34,789 --> 00:19:32,720
and if we miss it we're we're going to

515
00:19:36,310 --> 00:19:34,799
push out by a couple years

516
00:19:38,789 --> 00:19:36,320
and so um

517
00:19:41,909 --> 00:19:38,799
you know just having the uh

518
00:19:43,909 --> 00:19:41,919
uh the coronavirus issue uh at that

519
00:19:45,430 --> 00:19:43,919
point in time was was very challenging

520
00:19:47,990 --> 00:19:45,440
for us

521
00:19:49,830 --> 00:19:48,000
um and of course no matter how many

522
00:19:52,230 --> 00:19:49,840
hardships we were facing there's a

523
00:19:54,310 --> 00:19:52,240
community set of

524
00:19:56,470 --> 00:19:54,320
community out there first responders

525
00:19:57,590 --> 00:19:56,480
nurses doctors and medical community

526
00:20:01,510 --> 00:19:57,600
that

527
00:20:05,750 --> 00:20:03,750
life and death situations

528
00:20:07,830 --> 00:20:05,760
at the same time and so

529
00:20:10,310 --> 00:20:07,840
i asked the team a couple months ago to

530
00:20:12,230 --> 00:20:10,320
do something to

531
00:20:13,830 --> 00:20:12,240
kind of represent um this this

532
00:20:15,909 --> 00:20:13,840
particular challenge that we all faced

533
00:20:17,830 --> 00:20:15,919
here in 2020 on this mission and i think

534
00:20:23,350 --> 00:20:17,840
if you bring up the next uh

535
00:20:28,070 --> 00:20:25,029
you can see um

536
00:20:29,190 --> 00:20:28,080
a technician on our assembly team

537
00:20:32,149 --> 00:20:29,200
installing

538
00:20:35,830 --> 00:20:32,159

a plate this is on the a little hard to

539
00:20:37,350 --> 00:20:35,840
tell but on the aft port side left side

540
00:20:39,990 --> 00:20:37,360
of the rover

541
00:20:41,830 --> 00:20:40,000
and we call the plate the

542
00:20:44,070 --> 00:20:41,840
perseverance

543
00:20:47,270 --> 00:20:44,080
covert 19 plate

544
00:20:50,470 --> 00:20:47,280
and there's a good good shot of it

545
00:20:52,789 --> 00:20:50,480
the you could see we have a

546
00:20:53,750 --> 00:20:52,799
representation of the earth on the top

547
00:20:56,630 --> 00:20:53,760
uh

548
00:20:58,390 --> 00:20:56,640
kind of to symbolize the the challenge

549
00:20:59,270 --> 00:20:58,400
that we faced

550
00:21:01,990 --> 00:20:59,280
you know

551
00:21:04,789 --> 00:21:02,000
globally as as the pandemic struck we

552
00:21:07,270 --> 00:21:04,799
have a representation of the spacecraft

553
00:21:08,390 --> 00:21:07,280
leaving the earth and heading to heading

554
00:21:10,149 --> 00:21:08,400
to mars

555
00:21:13,590 --> 00:21:10,159
and of course all of this is

556
00:21:16,149 --> 00:21:13,600
appropriately supported by the

557
00:21:18,470 --> 00:21:16,159
rod and serpent of the medical community

558
00:21:21,750 --> 00:21:18,480
you know during this period

559
00:21:23,830 --> 00:21:21,760
this this is a group of uh of

560
00:21:25,909 --> 00:21:23,840
people that really inspired i think our

561
00:21:27,110 --> 00:21:25,919
team to keep going

562
00:21:30,870 --> 00:21:27,120
and

563
00:21:32,230 --> 00:21:30,880

mission can help

564
00:21:34,630 --> 00:21:32,240
inspire the people that have had to go

565
00:21:37,510 --> 00:21:34,640
through this pandemic as well

566
00:21:42,870 --> 00:21:40,870
if we go to the next graphic please

567
00:21:45,029 --> 00:21:42,880
i mentioned the team you saw some

568
00:21:46,789 --> 00:21:45,039
pictures our team actually doesn't end

569
00:21:49,270 --> 00:21:46,799
with international contributions and

570
00:21:52,390 --> 00:21:49,280
industry partners and and other nasa

571
00:21:54,630 --> 00:21:52,400
centers we include we include all of you

572
00:21:57,270 --> 00:21:54,640
as well and this plate if you look at

573
00:21:59,909 --> 00:21:57,280
the top left corner of this plate you'll

574
00:22:02,230 --> 00:21:59,919
see three small

575
00:22:03,029 --> 00:22:02,240
micro fish chips which thomas referred

576
00:22:04,870 --> 00:22:03,039
to

577
00:22:06,230 --> 00:22:04,880
these are the places where his family's

578
00:22:08,549 --> 00:22:06,240
names and

579
00:22:10,789 --> 00:22:08,559
11 million other names

580
00:22:13,029 --> 00:22:10,799
are etched onto those micro fish chips

581
00:22:15,430 --> 00:22:13,039
we had only intended to fly one

582
00:22:18,070 --> 00:22:15,440
but we cut so much interest we couldn't

583
00:22:19,830 --> 00:22:18,080
fit it on one so we flew three and you

584
00:22:21,830 --> 00:22:19,840
see on the plate as well representation

585
00:22:23,029 --> 00:22:21,840
of the solar system with earth and mars

586
00:22:26,549 --> 00:22:23,039
and

587
00:22:28,149 --> 00:22:26,559
some hidden morse code i think in the

588
00:22:30,710 --> 00:22:28,159

rays of the sun which

589
00:22:34,630 --> 00:22:30,720
people quickly recognized uh spelled out

590
00:22:36,310 --> 00:22:34,640
explore as one which is what we uh what

591
00:22:37,990 --> 00:22:36,320
we intend to do

592
00:22:40,710 --> 00:22:38,000
you know we're going to launch

593
00:22:42,230 --> 00:22:40,720
the vehicle here in just a

594
00:22:44,630 --> 00:22:42,240
couple days

595
00:22:45,909 --> 00:22:44,640
and um

596
00:22:47,510 --> 00:22:45,919
we're looking forward to having

597
00:22:50,950 --> 00:22:47,520
everybody come along

598
00:22:53,990 --> 00:22:50,960
for the ride if you go to nasa.gov be my

599
00:22:56,870 --> 00:22:54,000
guest you'll find plenty of experiences

600
00:22:58,230 --> 00:22:56,880
there to to

601
00:23:01,350 --> 00:22:58,240
see the launch and to see some of the

602
00:23:02,830 --> 00:23:01,360
behind behind the scenes interviews

603
00:23:06,149 --> 00:23:02,840
also at

604
00:23:08,149 --> 00:23:06,159
mars.nasa.gov mars 2020

605
00:23:10,310 --> 00:23:08,159
there's if you click on the participate

606
00:23:12,630 --> 00:23:10,320
there's opportunities to get

607
00:23:15,350 --> 00:23:12,640
to some pretty cool uh social media

608
00:23:16,789 --> 00:23:15,360
filters there's uh there's a photo booth

609
00:23:19,590 --> 00:23:16,799
there and where you can take a picture

610
00:23:21,750 --> 00:23:19,600
with uh the mars perseverance rover

611
00:23:24,149 --> 00:23:21,760
uh some some competitions and some other

612
00:23:25,830 --> 00:23:24,159
things so we invite all of you to ride

613
00:23:28,149 --> 00:23:25,840

shotgun along with us starting on

614
00:23:29,110 --> 00:23:28,159
thursday and with that i'm going to hand

615
00:23:31,909 --> 00:23:29,120
it over

616
00:23:33,669 --> 00:23:31,919
to our launch director omar baez

617
00:23:36,549 --> 00:23:33,679
thank you matt

618
00:23:38,390 --> 00:23:36,559
and as everybody else here has has

619
00:23:40,710 --> 00:23:38,400
mentioned um

620
00:23:41,669 --> 00:23:40,720
our situation did change

621
00:23:43,590 --> 00:23:41,679
um

622
00:23:45,430 --> 00:23:43,600
i would have never thought

623
00:23:47,110 --> 00:23:45,440
that um

624
00:23:49,110 --> 00:23:47,120
a launch director would be working from

625
00:23:51,350 --> 00:23:49,120
home

626
00:23:53,510 --> 00:23:51,360
and i've done that for the last

627
00:23:54,789 --> 00:23:53,520
um

628
00:23:56,390 --> 00:23:54,799
five months

629
00:23:58,950 --> 00:23:56,400
and uh

630
00:24:00,789 --> 00:23:58,960
we used to have something called uh

631
00:24:02,149 --> 00:24:00,799
every other year here called take your

632
00:24:03,590 --> 00:24:02,159
kids to work

633
00:24:06,390 --> 00:24:03,600
well guess what

634
00:24:07,750 --> 00:24:06,400
every day was take your kids to work day

635
00:24:10,149 --> 00:24:07,760
and

636
00:24:11,750 --> 00:24:10,159
i bet you it's been an experience uh for

637
00:24:15,830 --> 00:24:11,760
the kids

638
00:24:17,029 --> 00:24:15,840

but it's humbling uh as a parent to see

639
00:24:20,230 --> 00:24:17,039
how

640
00:24:25,990 --> 00:24:23,269
from the range to our partners at jpl to

641
00:24:28,549 --> 00:24:26,000
our partners

642
00:24:31,029 --> 00:24:28,559
ula to our folks at headquarters how we

643
00:24:32,710 --> 00:24:31,039
all had to adjust

644
00:24:35,990 --> 00:24:32,720
to work in this environment and to

645
00:24:38,470 --> 00:24:36,000
collaborate electronically where

646
00:24:40,789 --> 00:24:38,480
before it was a face-to-face

647
00:24:42,950 --> 00:24:40,799
interaction versus you know seeing

648
00:24:45,590 --> 00:24:42,960
somebody's little picture on a

649
00:24:48,310 --> 00:24:45,600
computer screen and voice

650
00:24:50,630 --> 00:24:48,320
and uh even

651
00:24:52,549 --> 00:24:50,640
as simple as a launch readiness review

652
00:24:53,430 --> 00:24:52,559
which we had this morning

653
00:24:54,950 --> 00:24:53,440
uh

654
00:24:56,470 --> 00:24:54,960
where it would have been shoulder to

655
00:24:59,750 --> 00:24:56,480
shoulder that room would have been full

656
00:25:00,950 --> 00:24:59,760
and people standing up in the back

657
00:25:05,590 --> 00:25:00,960
sparse

658
00:25:08,070 --> 00:25:05,600
you had trouble hearing some people

659
00:25:10,230 --> 00:25:08,080
because you're wearing these masks so it

660
00:25:12,390 --> 00:25:10,240
there's a challenge

661
00:25:13,430 --> 00:25:12,400
and a penalty that goes with doing these

662
00:25:16,710 --> 00:25:13,440
things

663
00:25:19,190 --> 00:25:16,720

and i've seen the team react and

664
00:25:21,990 --> 00:25:19,200
overcome all of that and it

665
00:25:25,350 --> 00:25:22,000
makes me very proud

666
00:25:29,669 --> 00:25:27,750
a couple of days from launch

667
00:25:31,590 --> 00:25:29,679
we did complete the launch readiness

668
00:25:33,110 --> 00:25:31,600
review

669
00:25:36,230 --> 00:25:33,120
if i could

670
00:25:39,669 --> 00:25:36,240
have the folks roll a short video here

671
00:25:42,230 --> 00:25:39,679
i'll show you how we're going to get

672
00:25:44,950 --> 00:25:42,240
perseverance to the red planet and it

673
00:25:46,810 --> 00:25:44,960
starts with that right there that's the

674
00:25:48,230 --> 00:25:46,820
atlas 5

675
00:25:50,789 --> 00:25:48,240
[Music]

676
00:25:54,630 --> 00:25:50,799
with its rd180 motors

677
00:25:57,110 --> 00:25:54,640
being stacked into the mlp at the vif

678
00:25:59,590 --> 00:25:57,120
at complex 41.

679
00:26:02,549 --> 00:25:59,600
um that's of

680
00:26:05,029 --> 00:26:02,559
srms going up we're flying four of them

681
00:26:07,269 --> 00:26:05,039
on this mission and that gives

682
00:26:09,669 --> 00:26:07,279
the atlas that extra oomph

683
00:26:10,789 --> 00:26:09,679
it needs to leave the earth's gravity

684
00:26:13,510 --> 00:26:10,799
well

685
00:26:15,590 --> 00:26:13,520
with perseverance and ingenuity there

686
00:26:19,190 --> 00:26:15,600
you see

687
00:26:21,990 --> 00:26:19,200
about the last time we got to see the

688
00:26:24,630 --> 00:26:22,000

rover and helicopter stack

689
00:26:25,909 --> 00:26:24,640
before it got encapsulated and we took

690
00:26:27,909 --> 00:26:25,919
that out to

691
00:26:30,950 --> 00:26:27,919
complex 41 on the

692
00:26:34,149 --> 00:26:32,230
and

693
00:26:36,830 --> 00:26:34,159
stacked it on top of the vehicle got it

694
00:26:41,750 --> 00:26:38,710
environmentally

695
00:26:43,350 --> 00:26:41,760
for planetary protection purposes

696
00:26:45,510 --> 00:26:43,360
we had to

697
00:26:48,789 --> 00:26:45,520
prepare that area to be able to ingress

698
00:26:50,230 --> 00:26:48,799
an egress and on the 24th

699
00:26:53,190 --> 00:26:50,240
of this month we

700
00:26:55,110 --> 00:26:53,200
inserted the rtg which is going to power

701
00:26:58,070 --> 00:26:55,120
the rover on

702
00:27:00,149 --> 00:26:58,080
mars for the next couple of years

703
00:27:04,070 --> 00:27:00,159
and

704
00:27:07,110 --> 00:27:04,080
that remains

705
00:27:08,470 --> 00:27:07,120
is i have three goes to go tomorrow at

706
00:27:10,549 --> 00:27:08,480
eight in morning

707
00:27:13,029 --> 00:27:10,559
i give the go for the vehicle to roll

708
00:27:18,230 --> 00:27:15,750
we take a day of rest after tomorrow to

709
00:27:21,190 --> 00:27:18,240
get synced up with having to come in at

710
00:27:23,669 --> 00:27:21,200
two or three in the morning give a a go

711
00:27:25,190 --> 00:27:23,679
to uh fuel the vehicle

712
00:27:28,230 --> 00:27:25,200
and once we're ready and the

713
00:27:29,909 --> 00:27:28,240

spacecraft's configured one more go and

714
00:27:32,310 --> 00:27:29,919
uh four minutes later

715
00:27:34,630 --> 00:27:32,320
we're going to be flying to mars

716
00:27:36,950 --> 00:27:34,640
and that makes my job really simple

717
00:27:38,149 --> 00:27:36,960
and over to tori to explain the rest of

718
00:27:39,029 --> 00:27:38,159
it

719
00:27:40,470 --> 00:27:39,039
all right

720
00:27:43,510 --> 00:27:40,480
thank you

721
00:27:46,070 --> 00:27:43,520
um i cannot tell you how thrilled we are

722
00:27:48,470 --> 00:27:46,080
to lift perseverance ula and its

723
00:27:51,830 --> 00:27:48,480
heritage rockets have taken every u.s

724
00:27:54,070 --> 00:27:51,840
mission to mars but this one is arguably

725
00:27:56,710 --> 00:27:54,080
the most sophisticated in some ways the

726
00:27:59,430 --> 00:27:56,720
most exciting of all of them

727
00:28:01,990 --> 00:27:59,440
so it will sit atop our mighty atlas in

728
00:28:03,990 --> 00:28:02,000
the 541 configuration

729
00:28:06,950 --> 00:28:04,000
i like to call that one the dominator

730
00:28:07,990 --> 00:28:06,960
because that is our second most powerful

731
00:28:09,029 --> 00:28:08,000
atlas

732
00:28:12,389 --> 00:28:09,039
so

733
00:28:14,230 --> 00:28:12,399
supplementing that core with its 860

734
00:28:17,190 --> 00:28:14,240
thousand pounds of thrust from the rd

735
00:28:20,149 --> 00:28:17,200
180 will be four massive solid rocket

736
00:28:22,549 --> 00:28:20,159
motors that you saw in omar's video each

737
00:28:24,149 --> 00:28:22,559
of them generating another 280 000

738
00:28:27,110 --> 00:28:24,159

pounds of thrust

739
00:28:29,990 --> 00:28:27,120
this rocket is going to leap off the pad

740
00:28:33,190 --> 00:28:30,000
with this relatively tiny payload so do

741
00:28:35,669 --> 00:28:33,200
not blink when they say ignition

742
00:28:36,950 --> 00:28:35,679
now i've got a mission profile video to

743
00:28:38,950 --> 00:28:36,960
show you they'll just kind of walk

744
00:28:41,669 --> 00:28:38,960
through what that flight will look like

745
00:28:42,710 --> 00:28:41,679
if you could run that please

746
00:28:43,669 --> 00:28:42,720
three

747
00:28:44,710 --> 00:28:43,679
two

748
00:28:48,630 --> 00:28:44,720
one

749
00:28:51,669 --> 00:28:48,640
main engine start zero and liftoff of

750
00:28:53,909 --> 00:28:51,679
the atlas v the atlas v rd 180 main

751
00:28:56,389 --> 00:28:53,919
engine and four solid rocket boosters

752
00:28:59,430 --> 00:28:56,399
ignite that generate more than 10.2

753
00:29:01,590 --> 00:28:59,440
million newtons or 2.3 million pounds of

754
00:29:05,669 --> 00:29:01,600
thrust to lift the rocket on its way

755
00:29:07,909 --> 00:29:05,679
towards a hyperbolic escape trajectory

756
00:29:09,750 --> 00:29:07,919
shortly after liftoff atlas begins a

757
00:29:11,669 --> 00:29:09,760
pitchover to attain the proper flight

758
00:29:13,430 --> 00:29:11,679
path while minimizing the dynamic

759
00:29:15,669 --> 00:29:13,440
pressure the vehicle experiences during

760
00:29:18,389 --> 00:29:15,679
flight

761
00:29:21,830 --> 00:29:18,399
the atlas v reaches mach 1 the speed of

762
00:29:24,149 --> 00:29:21,840
sound at 35 seconds

763
00:29:26,950 --> 00:29:24,159

following burnout the four srbs are

764
00:29:28,549 --> 00:29:26,960
jettisoned at one minute 49 seconds

765
00:29:30,870 --> 00:29:28,559
in the next two and a half minutes of

766
00:29:33,909 --> 00:29:30,880
first stage flight the atlas 5 will more

767
00:29:36,549 --> 00:29:33,919
than triple its velocity

768
00:29:39,110 --> 00:29:36,559
at 3 minutes 27 seconds the payload

769
00:29:41,669 --> 00:29:39,120
fairing is jettisoned

770
00:29:43,510 --> 00:29:41,679
at four minutes 22 seconds propellant

771
00:29:46,310 --> 00:29:43,520
levels deplete and the booster engine

772
00:29:49,510 --> 00:29:48,310
the atlas 5 is now traveling at more

773
00:29:53,990 --> 00:29:49,520
than 21

774
00:29:57,510 --> 00:29:54,000
680 kilometers or 13 470 miles per hour

775
00:29:58,909 --> 00:29:57,520
and located nearly 156 kilometers or 97

776
00:30:03,269 --> 00:29:58,919
miles in altitude

777
00:30:05,350 --> 00:30:03,279
497 kilometers or 309 miles downrange

778
00:30:07,430 --> 00:30:05,360
six seconds later the atlas centaur

779
00:30:09,909 --> 00:30:07,440
separation system activates to release

780
00:30:11,909 --> 00:30:09,919
the booster stage the vehicle now weighs

781
00:30:14,389 --> 00:30:11,919
a little more than five percent of what

782
00:30:16,549 --> 00:30:14,399
it did at liftoff

783
00:30:18,950 --> 00:30:16,559
ten seconds later the first burn of the

784
00:30:21,190 --> 00:30:18,960
centaur main engine begins burning

785
00:30:24,310 --> 00:30:21,200
liquid hydrogen and liquid oxygen the

786
00:30:25,909 --> 00:30:24,320
centaur is attaining orbital velocity

787
00:30:27,590 --> 00:30:25,919
at approximately eleven and a half

788
00:30:30,630 --> 00:30:27,600

minutes into flight cut off of the

789
00:30:32,950 --> 00:30:30,640
centaur main engine or mikko one occurs

790
00:30:34,789 --> 00:30:32,960
the mission now enters a 30-minute coast

791
00:30:37,269 --> 00:30:34,799
phase in preparation for the earth

792
00:30:41,909 --> 00:30:39,430
the centaur main engine is restarted in

793
00:30:44,310 --> 00:30:41,919
45 minutes this burn provides the

794
00:30:46,870 --> 00:30:44,320
required thrust for centaur to escape

795
00:30:49,190 --> 00:30:46,880
earth orbit

796
00:30:51,669 --> 00:30:49,200
approximately eight minutes later final

797
00:30:55,430 --> 00:30:51,679
cutoff of the centaur main engine occurs

798
00:30:59,509 --> 00:30:57,350
centaur will coast for nearly five

799
00:31:00,950 --> 00:30:59,519
minutes in preparation for spacecraft

800
00:31:03,750 --> 00:31:00,960
separation

801
00:31:05,269 --> 00:31:03,760
at about 57 and a half minutes centaur

802
00:31:07,430 --> 00:31:05,279
releases the spacecraft into a

803
00:31:11,110 --> 00:31:07,440
hyperbolic orbit traveling at more than

804
00:31:14,149 --> 00:31:11,120
41 000 kilometers or nearly 26 000 miles

805
00:31:16,310 --> 00:31:14,159
per hour on a seven-month cruise to mars

806
00:31:18,389 --> 00:31:16,320
where it will seek signs of ancient life

807
00:31:20,630 --> 00:31:18,399
on the red planet and collect rock and

808
00:31:27,269 --> 00:31:20,640
soil samples for possible return to

809
00:31:32,710 --> 00:31:30,230
so the vehicle is sitting atop its

810
00:31:34,789 --> 00:31:32,720
launch platform in our vertical assembly

811
00:31:35,590 --> 00:31:34,799
or vertical integration facility right

812
00:31:37,990 --> 00:31:35,600
now

813
00:31:41,430 --> 00:31:38,000

processing has been going very smoothly

814
00:31:43,110 --> 00:31:41,440
for the last several days so atlas is go

815
00:31:45,590 --> 00:31:43,120
centaur is go

816
00:31:48,149 --> 00:31:45,600
and we are literally chomping at the bit

817
00:31:52,230 --> 00:31:48,159
to take this nuclear-powered dune buggy

818
00:31:56,870 --> 00:31:54,310
fantastic thank you so much next week go

819
00:31:59,750 --> 00:31:56,880
to jessica williams of the 45th space

820
00:32:01,750 --> 00:31:59,760
wing weather officer

821
00:32:04,630 --> 00:32:01,760
overall the weather looks very favorable

822
00:32:06,710 --> 00:32:04,640
for launch thursday morning today we had

823
00:32:09,110 --> 00:32:06,720
a surface ridge of high pressure built

824
00:32:10,789 --> 00:32:09,120
into south florida and what this did for

825
00:32:13,350 --> 00:32:10,799
us is shift the weather pattern from

826
00:32:15,509 --> 00:32:13,360
last week so that we have southwest

827
00:32:17,750 --> 00:32:15,519
winds in the low levels in the mornings

828
00:32:19,909 --> 00:32:17,760
that's offshore winds and this pattern

829
00:32:22,870 --> 00:32:19,919
will persist through this weekend so

830
00:32:24,789 --> 00:32:22,880
through the 48 hour backup window so

831
00:32:26,310 --> 00:32:24,799
this gives us dry mornings with those

832
00:32:28,389 --> 00:32:26,320
offshore winds

833
00:32:30,070 --> 00:32:28,399
but it does give us chances for showers

834
00:32:31,430 --> 00:32:30,080
and thunderstorms in the afternoon and

835
00:32:36,950 --> 00:32:31,440
evening

836
00:32:42,470 --> 00:32:39,509
the chart for the launch day forecast

837
00:32:45,190 --> 00:32:42,480
we should have a 20 percent probability

838
00:32:47,350 --> 00:32:45,200

of violation for the cumulus cloud rule

839
00:32:49,750 --> 00:32:47,360
and the thick cloud layer rule

840
00:32:51,669 --> 00:32:49,760
and this is really just due to a weak

841
00:32:54,310 --> 00:32:51,679
boundary being off the coast of the

842
00:32:56,789 --> 00:32:54,320
southeast so we are expecting to see

843
00:32:59,430 --> 00:32:56,799
isolated to a few scattered showers just

844
00:33:01,350 --> 00:32:59,440
offshore from complex 41 but they will

845
00:33:03,990 --> 00:33:01,360
be moving very little or moving away

846
00:33:06,070 --> 00:33:04,000
from the pad we have that slight chance

847
00:33:07,830 --> 00:33:06,080
of violating for the cumulus cloud rule

848
00:33:10,870 --> 00:33:07,840
and there's also expected to be some

849
00:33:12,950 --> 00:33:10,880
mid-level clouds scattered to broken

850
00:33:15,509 --> 00:33:12,960
associated with this weak boundary off

851
00:33:17,509 --> 00:33:15,519
the coast so we could see just a brief

852
00:33:19,830 --> 00:33:17,519
period of violating the thick cloud

853
00:33:22,710 --> 00:33:19,840
layer rule but again overall it's only

854
00:33:25,350 --> 00:33:22,720
at a 20 percent violation for the

855
00:33:28,630 --> 00:33:25,360
overall two hour window

856
00:33:31,190 --> 00:33:28,640
so if we look at our 24 hour backup

857
00:33:33,269 --> 00:33:31,200
chart again we have offshore winds from

858
00:33:36,070 --> 00:33:33,279
the southwest in the morning 8 to 10

859
00:33:38,149 --> 00:33:36,080
knots we have a 10 percent probability

860
00:33:39,909 --> 00:33:38,159
of violating for the cumulus cloud rule

861
00:33:42,950 --> 00:33:39,919
as that weak boundary off the coast of

862
00:33:45,029 --> 00:33:42,960
the southeast starts to diminish and the

863
00:33:47,350 --> 00:33:45,039

chances for any cumulus clouds in the

864
00:33:51,029 --> 00:33:47,360
flight path over the water just off the

865
00:33:53,269 --> 00:33:51,039
coast reduce from the day before

866
00:33:55,269 --> 00:33:53,279
and if we look at our 48 hour backup

867
00:33:57,190 --> 00:33:55,279
window for saturday morning

868
00:33:59,669 --> 00:33:57,200
the weather still looks favorable with

869
00:34:01,909 --> 00:33:59,679
offshore winds from the southwest or

870
00:34:04,870 --> 00:34:01,919
south from the west really they pick up

871
00:34:08,230 --> 00:34:04,880
a little bit 12 knots with sustained

872
00:34:11,030 --> 00:34:08,240
gusts to 16 knots at 230 feet

873
00:34:13,190 --> 00:34:11,040
however the upper level wind flow does

874
00:34:15,430 --> 00:34:13,200
change and become more from the east and

875
00:34:17,349 --> 00:34:15,440
stronger so if we do see any

876
00:34:18,950 --> 00:34:17,359
showers or thunderstorms over the gulf

877
00:34:20,790 --> 00:34:18,960
stream which is pretty typical for this

878
00:34:22,790 --> 00:34:20,800
time of year in the morning

879
00:34:24,710 --> 00:34:22,800
and if they do produce any anvil clouds

880
00:34:27,190 --> 00:34:24,720
there's just a very slight possibility

881
00:34:28,950 --> 00:34:27,200
of those anvils reaching close to the

882
00:34:31,270 --> 00:34:28,960
coast so that is why we have that 20

883
00:34:33,589 --> 00:34:31,280
percent probability of violation for the

884
00:34:36,310 --> 00:34:33,599
attached and detached anvil cloud rules

885
00:34:38,470 --> 00:34:36,320
for the 48-hour backup day on saturday

886
00:34:40,869 --> 00:34:38,480
morning so again overall we're in a very

887
00:34:42,710 --> 00:34:40,879
favorable weather pattern for a morning

888
00:34:45,510 --> 00:34:42,720

launch time frame for thursday through

889
00:34:49,829 --> 00:34:47,589
thank you so much jessica now where you

890
00:34:52,310 --> 00:34:49,839
start taking questions from reporters

891
00:34:54,310 --> 00:34:52,320
and social media for reporters please

892
00:34:56,629 --> 00:34:54,320
remember to press star one to ask your

893
00:34:59,589 --> 00:34:56,639
questions and those online you can use

894
00:35:01,990 --> 00:34:59,599
the hashtag countdown to mars our first

895
00:35:03,910 --> 00:35:02,000
question comes from marsha dunn of ap

896
00:35:06,950 --> 00:35:03,920
marsha

897
00:35:09,589 --> 00:35:06,960
hi can you hear me yes

898
00:35:12,630 --> 00:35:09,599
hello yes we can hear you marsha

899
00:35:14,829 --> 00:35:12,640
yes great um i cannot remember so much

900
00:35:17,349 --> 00:35:14,839
company on the way to mars as there is

901
00:35:19,910 --> 00:35:17,359
happening uh this year

902
00:35:22,390 --> 00:35:19,920
and i was wondering um if either mr

903
00:35:25,910 --> 00:35:22,400
weinstein or um

904
00:35:28,230 --> 00:35:25,920
dr zurbukin could comment on china and

905
00:35:29,990 --> 00:35:28,240
uh on their way to mars

906
00:35:31,430 --> 00:35:30,000
and how whether there's any sense of

907
00:35:33,910 --> 00:35:31,440
competition

908
00:35:36,310 --> 00:35:33,920
um and is the pressure on now that the

909
00:35:40,550 --> 00:35:36,320
world has two good lunches off and you

910
00:35:46,790 --> 00:35:43,109
sure i'll start um a couple of things

911
00:35:49,109 --> 00:35:46,800
number one uh we welcome more nations uh

912
00:35:51,030 --> 00:35:49,119
taking trips to mars and studying and

913
00:35:53,190 --> 00:35:51,040

delivering the science and sharing the

914
00:35:54,870 --> 00:35:53,200
science with the world that's what

915
00:35:57,190 --> 00:35:54,880
science is all about and of course it's

916
00:35:59,109 --> 00:35:57,200
a very uniting kind of thing

917
00:36:01,190 --> 00:35:59,119
i honestly don't see this as a

918
00:36:03,670 --> 00:36:01,200
competition at all

919
00:36:06,390 --> 00:36:03,680
this is our ninth time to go to mars and

920
00:36:08,310 --> 00:36:06,400
land softly and do robotic experiments

921
00:36:10,390 --> 00:36:08,320
and discovery

922
00:36:13,190 --> 00:36:10,400
and so we've been doing this now for

923
00:36:16,069 --> 00:36:13,200
decades successfully

924
00:36:19,349 --> 00:36:16,079
and of course this mission is by far the

925
00:36:20,950 --> 00:36:19,359
most sophisticated mission ever so

926
00:36:22,550 --> 00:36:20,960
i don't see it as a competition but

927
00:36:24,710 --> 00:36:22,560
certainly we welcome

928
00:36:26,870 --> 00:36:24,720
more explorers to deliver more science

929
00:36:28,310 --> 00:36:26,880
than ever before and we look forward to

930
00:36:31,430 --> 00:36:28,320
seeing what it is that they're able to

931
00:36:38,710 --> 00:36:33,270
thanks

932
00:36:44,790 --> 00:36:40,470
so he's site now

933
00:36:50,150 --> 00:36:46,950
and um i think my question is from matt

934
00:36:52,470 --> 00:36:50,160
wallace uh you mentioned you worked on

935
00:36:53,990 --> 00:36:52,480
numerous rovers before and you listed

936
00:36:55,990 --> 00:36:54,000
all the firsts on this mission i'm

937
00:36:58,550 --> 00:36:56,000
curious if you could compare

938
00:37:01,030 --> 00:36:58,560

the complexity and risks associated with

939
00:37:02,310 --> 00:37:01,040
this mission with curiosity and previous

940
00:37:03,670 --> 00:37:02,320
missions you know everyone was kind of

941
00:37:05,670 --> 00:37:03,680
keyed up for

942
00:37:07,270 --> 00:37:05,680
curiosity's landing back in 2012 with

943
00:37:09,109 --> 00:37:07,280
the seven minutes of terror the sky

944
00:37:11,430 --> 00:37:09,119
crane was brand new

945
00:37:13,270 --> 00:37:11,440
just interested given your experience

946
00:37:14,630 --> 00:37:13,280
base and your assessment of the risks

947
00:37:16,790 --> 00:37:14,640
and complexity

948
00:37:20,310 --> 00:37:16,800
of this mission overall compared to

949
00:37:24,790 --> 00:37:23,030
sure yeah from a complexity perspective

950
00:37:26,710 --> 00:37:24,800
it's clearly a more sophisticated

951
00:37:29,430 --> 00:37:26,720
vehicle as i said we're we're carrying

952
00:37:31,270 --> 00:37:29,440
about 50 percent more surface payload

953
00:37:33,589 --> 00:37:31,280
than curiosity did

954
00:37:35,270 --> 00:37:33,599
and that was by far the most complex

955
00:37:38,150 --> 00:37:35,280
thing we had ever done up until that

956
00:37:40,150 --> 00:37:38,160
time so we're taking this a step further

957
00:37:42,310 --> 00:37:40,160
and and really the sampling system that

958
00:37:44,870 --> 00:37:42,320
we have on this vehicle

959
00:37:46,790 --> 00:37:44,880
because we are collecting um

960
00:37:49,109 --> 00:37:46,800
rocks and soil samples that we

961
00:37:51,349 --> 00:37:49,119
ultimately want to bring back to

962
00:37:53,829 --> 00:37:51,359
to the earth and and look for really

963
00:37:55,190 --> 00:37:53,839

trace chemical signatures from billions

964
00:37:56,310 --> 00:37:55,200
of years ago

965
00:37:58,390 --> 00:37:56,320
you know

966
00:38:00,470 --> 00:37:58,400
very faint signatures

967
00:38:01,990 --> 00:38:00,480
the system that we use to collect those

968
00:38:03,589 --> 00:38:02,000
samples has to be

969
00:38:04,870 --> 00:38:03,599
immensely clean

970
00:38:07,030 --> 00:38:04,880
and so

971
00:38:08,870 --> 00:38:07,040
we had to sterilize it and we had to

972
00:38:10,630 --> 00:38:08,880
clean it from an organics and chemical

973
00:38:12,870 --> 00:38:10,640
perspective and we had to keep it that

974
00:38:15,670 --> 00:38:12,880
way from all the rest of the systems

975
00:38:17,589 --> 00:38:15,680
that that we had to use to get the

976
00:38:20,150 --> 00:38:17,599
the system to mars and so

977
00:38:24,630 --> 00:38:20,160
that was from a complexity perspective

978
00:38:27,990 --> 00:38:24,640
um it was really uh another step

979
00:38:29,030 --> 00:38:28,000
beyond what we did on on curiosity

980
00:38:31,510 --> 00:38:29,040
um

981
00:38:33,030 --> 00:38:31,520
you know from a risk perspective i think

982
00:38:35,349 --> 00:38:33,040
one of the

983
00:38:36,950 --> 00:38:35,359
still the highest risk portion of all

984
00:38:39,190 --> 00:38:36,960
these missions

985
00:38:40,470 --> 00:38:39,200
is is a landing process

986
00:38:42,310 --> 00:38:40,480
you know you mentioned at the seven

987
00:38:44,710 --> 00:38:42,320
minutes of terror there's really nothing

988
00:38:47,349 --> 00:38:44,720

we can do we hit the

989
00:38:49,270 --> 00:38:47,359
we call it do edl do entry descent

990
00:38:51,030 --> 00:38:49,280
landing we literally send a command to

991
00:38:53,670 --> 00:38:51,040
the spacecraft

992
00:38:55,829 --> 00:38:53,680
that's that says that and uh and then

993
00:38:57,430 --> 00:38:55,839
for the you know the spacecraft on its

994
00:38:58,630 --> 00:38:57,440
own has to get

995
00:39:00,710 --> 00:38:58,640
from uh

996
00:39:02,710 --> 00:39:00,720
out uh you know outside the planet

997
00:39:05,030 --> 00:39:02,720
moving at 12 000 miles an hour all the

998
00:39:07,589 --> 00:39:05,040
way down safely to the surface

999
00:39:09,990 --> 00:39:07,599
without any human interaction and and uh

1000
00:39:11,270 --> 00:39:10,000
it's basically a controlled disassembly

1001
00:39:13,910 --> 00:39:11,280
the whole way

1002
00:39:16,310 --> 00:39:13,920
uh it's by far the most complex or the

1003
00:39:19,910 --> 00:39:18,390
the highest risk portion phase of the

1004
00:39:22,630 --> 00:39:19,920
mission still

1005
00:39:24,550 --> 00:39:22,640
and we have the good fortune on 2020 to

1006
00:39:27,349 --> 00:39:24,560
have leveraged

1007
00:39:28,710 --> 00:39:27,359
the the system that we designed on on

1008
00:39:29,670 --> 00:39:28,720
curiosity

1009
00:39:31,589 --> 00:39:29,680
and so

1010
00:39:33,589 --> 00:39:31,599
not only do we have all the testing

1011
00:39:35,990 --> 00:39:33,599
behind us on this system that we did

1012
00:39:37,990 --> 00:39:36,000
before we launched and landed curiosity

1013
00:39:40,230 --> 00:39:38,000

we have the curiosity flight itself and

1014
00:39:42,390 --> 00:39:40,240
all the telemetry that came back

1015
00:39:43,510 --> 00:39:42,400
and it performed extremely well during

1016
00:39:45,430 --> 00:39:43,520
that mission

1017
00:39:48,069 --> 00:39:45,440
uh and then we did a whole lot

1018
00:39:50,230 --> 00:39:48,079
additional testing you know to to launch

1019
00:39:53,030 --> 00:39:50,240
to launch this spacecraft

1020
00:39:55,349 --> 00:39:53,040
still no guarantees uh you know our

1021
00:39:57,829 --> 00:39:55,359
hearts will still be beating hard

1022
00:40:00,150 --> 00:39:57,839
when we get to that point of the mission

1023
00:40:02,310 --> 00:40:00,160
but i do think um

1024
00:40:04,630 --> 00:40:02,320
it's an advantage that we have and this

1025
00:40:10,470 --> 00:40:04,640
is not a first-time landing system as we

1026
00:40:14,069 --> 00:40:12,230
navigation of course if we landed with

1027
00:40:16,550 --> 00:40:14,079
the curiosity system as it is we

1028
00:40:18,710 --> 00:40:16,560
couldn't go to where we're going right

1029
00:40:20,630 --> 00:40:18,720
that's right yeah i mentioned briefly uh

1030
00:40:23,430 --> 00:40:20,640
before that for the first time we're

1031
00:40:25,270 --> 00:40:23,440
going to use a hazard avoidance system

1032
00:40:28,309 --> 00:40:25,280
autonomous hazard avoidance system we

1033
00:40:30,390 --> 00:40:28,319
call it terrain relative navigation

1034
00:40:32,150 --> 00:40:30,400
and it allows us to go to jezreel crater

1035
00:40:33,910 --> 00:40:32,160
which is a very interesting scientific

1036
00:40:36,069 --> 00:40:33,920
sites because it's got

1037
00:40:38,390 --> 00:40:36,079
a lot of rocks and escarpments and sand

1038
00:40:40,069 --> 00:40:38,400

dunes and a lot of variation in the

1039
00:40:42,390 --> 00:40:40,079
terrain and all those things are

1040
00:40:44,790 --> 00:40:42,400
wonderful for scientists who are looking

1041
00:40:46,950 --> 00:40:44,800
for stratigraphy and other things

1042
00:40:48,150 --> 00:40:46,960
but they all represent landing hazards

1043
00:40:52,309 --> 00:40:48,160
for us

1044
00:40:54,790 --> 00:40:52,319
and so to get to a scientifically

1045
00:40:57,349 --> 00:40:54,800
valuable site like jezreel we had to

1046
00:41:00,950 --> 00:40:57,359
develop a new uh a new hazard avoidance

1047
00:41:01,750 --> 00:41:00,960
system and uh and and we are flying that

1048
00:41:06,870 --> 00:41:01,760
it's

1049
00:41:09,270 --> 00:41:06,880
uses orbital imagery that we have from

1050
00:41:11,670 --> 00:41:09,280
our other spacecraft

1051
00:41:14,230 --> 00:41:11,680
we identify hazards on the surface we

1052
00:41:16,550 --> 00:41:14,240
mark those hazards on a map we load that

1053
00:41:17,910 --> 00:41:16,560
map on the onto the spacecraft and as

1054
00:41:19,589 --> 00:41:17,920
we're coming down

1055
00:41:20,870 --> 00:41:19,599
getting close to the planet we take a

1056
00:41:23,190 --> 00:41:20,880
picture

1057
00:41:25,510 --> 00:41:23,200
we find ourselves

1058
00:41:26,390 --> 00:41:25,520
in the hazard map that we've got on

1059
00:41:28,870 --> 00:41:26,400
board

1060
00:41:31,349 --> 00:41:28,880
and then we divert away from the most

1061
00:41:33,510 --> 00:41:31,359
significant hazards to the spacecraft

1062
00:41:35,670 --> 00:41:33,520
and so it does significantly improve our

1063
00:41:36,630 --> 00:41:35,680

probability of landing in a in a safe

1064
00:41:39,109 --> 00:41:36,640
way

1065
00:41:41,190 --> 00:41:39,119
particularly in rough terrain at jezrow

1066
00:41:42,790 --> 00:41:41,200
this is a system that we've we've tested

1067
00:41:44,470 --> 00:41:42,800
extensively

1068
00:41:45,990 --> 00:41:44,480
thomas in particular

1069
00:41:47,270 --> 00:41:46,000
wanted to make sure

1070
00:41:51,990 --> 00:41:47,280
that

1071
00:41:54,950 --> 00:41:52,000
we had all of the necessary checks and

1072
00:41:55,829 --> 00:41:54,960
balances and and uh rigorous reviews in

1073
00:41:58,550 --> 00:41:55,839
place

1074
00:42:00,470 --> 00:41:58,560
uh for this system uh before we uh

1075
00:42:03,190 --> 00:42:00,480
before we selected jezreel for as a

1076
00:42:04,870 --> 00:42:03,200
final destination but we we have

1077
00:42:06,470 --> 00:42:04,880
exercises system

1078
00:42:08,150 --> 00:42:06,480
out in the desert with simulated

1079
00:42:10,790 --> 00:42:08,160
landings we have simulation we have

1080
00:42:12,870 --> 00:42:10,800
computer simulations and it just works

1081
00:42:14,309 --> 00:42:12,880
extremely well it's very powerful and

1082
00:42:16,550 --> 00:42:14,319
robust system and we have a lot of

1083
00:42:17,510 --> 00:42:16,560
confidence in it

1084
00:42:19,270 --> 00:42:17,520
thank you

1085
00:42:24,630 --> 00:42:19,280
our next question comes from jackie

1086
00:42:31,030 --> 00:42:26,710
yes hello and maybe this question i

1087
00:42:33,430 --> 00:42:31,040
think is for matt um adding the audio um

1088
00:42:34,790 --> 00:42:33,440

is a a an interesting extra on this

1089
00:42:37,270 --> 00:42:34,800
mission and i wondered what is the

1090
00:42:40,069 --> 00:42:37,280
scientific significance of adding this

1091
00:42:42,150 --> 00:42:40,079
extra sensory dimension to the mission

1092
00:42:44,309 --> 00:42:42,160
and at what point in the entry descent

1093
00:42:47,030 --> 00:42:44,319
landing sequence does it kick in thank

1094
00:42:51,349 --> 00:42:48,950
so we'll turn on the microphone pretty

1095
00:42:54,150 --> 00:42:51,359
early in the process before we deploy

1096
00:42:55,589 --> 00:42:54,160
the parachute and and we should be able

1097
00:42:56,829 --> 00:42:55,599
to hear

1098
00:42:58,390 --> 00:42:56,839
some of the

1099
00:43:01,430 --> 00:42:58,400
spacecraft

1100
00:43:03,030 --> 00:43:01,440
pyrotechnic events and separation events

1101
00:43:05,349 --> 00:43:03,040
perhaps the

1102
00:43:07,109 --> 00:43:05,359
you know the atmosphere

1103
00:43:10,790 --> 00:43:07,119
at some level

1104
00:43:12,710 --> 00:43:10,800
interacting with the spacecraft itself

1105
00:43:14,870 --> 00:43:12,720
so we turn it on pretty early in the

1106
00:43:17,750 --> 00:43:14,880
entry descent and landing system

1107
00:43:20,470 --> 00:43:17,760
uh the microphone we expect to survive

1108
00:43:21,430 --> 00:43:20,480
landing and to also be usable uh on the

1109
00:43:23,270 --> 00:43:21,440
surface

1110
00:43:26,870 --> 00:43:23,280
it's a we have two microphones actually

1111
00:43:29,190 --> 00:43:26,880
i'm talking about a a general a general

1112
00:43:30,950 --> 00:43:29,200
engineering microphone now and and we do

1113
00:43:34,150 --> 00:43:30,960

think that that microphone

1114
00:43:35,990 --> 00:43:34,160
will be able to hear our uh big rotary

1115
00:43:38,790 --> 00:43:36,000
percussive drill out on the end of the

1116
00:43:39,589 --> 00:43:38,800
robot arm as it jackhammers its way into

1117
00:43:42,309 --> 00:43:39,599
uh

1118
00:43:44,550 --> 00:43:42,319
into rocks as well as

1119
00:43:45,910 --> 00:43:44,560
the wheels crunching over the surface of

1120
00:43:47,510 --> 00:43:45,920
mars

1121
00:43:48,710 --> 00:43:47,520
we think we'll be able to hear those

1122
00:43:50,790 --> 00:43:48,720
things

1123
00:43:53,109 --> 00:43:50,800
from an engineering

1124
00:43:55,430 --> 00:43:53,119
diagnostic perspective we're not quite

1125
00:43:57,109 --> 00:43:55,440
sure you know how it will help us that's

1126
00:43:59,030 --> 00:43:57,119
something we're going to have to

1127
00:44:01,190 --> 00:43:59,040
understand i think as we get some

1128
00:44:03,270 --> 00:44:01,200
experience with it there is a second

1129
00:44:05,829 --> 00:44:03,280
microphone it's mounted on the top of

1130
00:44:07,190 --> 00:44:05,839
the mast and it's associated with one of

1131
00:44:08,950 --> 00:44:07,200
our instruments

1132
00:44:11,190 --> 00:44:08,960
an instrument is

1133
00:44:12,069 --> 00:44:11,200
called super cam

1134
00:44:14,550 --> 00:44:12,079
and

1135
00:44:16,710 --> 00:44:14,560
it's a laser breakdown spectrometer

1136
00:44:18,230 --> 00:44:16,720
essentially it fires a laser and as the

1137
00:44:20,790 --> 00:44:18,240
laser goes out it creates a little

1138
00:44:23,270 --> 00:44:20,800

plasma cloud with the rocks and the dust

1139
00:44:25,829 --> 00:44:23,280
that interact interacts with

1140
00:44:28,150 --> 00:44:25,839
and uh and you when we when we fire this

1141
00:44:30,309 --> 00:44:28,160
in our test pads uh or in atlo you can

1142
00:44:32,630 --> 00:44:30,319
hear a pop you know you can hear the zap

1143
00:44:35,190 --> 00:44:32,640
almost and uh the science community is

1144
00:44:38,150 --> 00:44:35,200
hoping with that targeted microphone up

1145
00:44:40,230 --> 00:44:38,160
on the top of the uh the top of the mast

1146
00:44:41,990 --> 00:44:40,240
that they will learn something about the

1147
00:44:43,589 --> 00:44:42,000
um

1148
00:44:46,309 --> 00:44:43,599
about the composition

1149
00:44:48,470 --> 00:44:46,319
of the um of the things that the the

1150
00:44:50,069 --> 00:44:48,480
laser is interacting with

1151
00:44:51,510 --> 00:44:50,079
in particular but it's a little bit of

1152
00:44:52,950 --> 00:44:51,520
an experiment you know we haven't done

1153
00:44:54,630 --> 00:44:52,960
this before it's the first time we've

1154
00:44:56,950 --> 00:44:54,640
taken this uh

1155
00:44:59,270 --> 00:44:56,960
this human sense to mars and uh and

1156
00:45:01,510 --> 00:44:59,280
exercised it so we're gonna find out i

1157
00:45:03,349 --> 00:45:01,520
think we're gonna learn as we go

1158
00:45:06,150 --> 00:45:03,359
thank you sure

1159
00:45:10,069 --> 00:45:06,160
thank you jackie our next question is

1160
00:45:12,150 --> 00:45:10,079
comes from irene klotz of aviation week

1161
00:45:13,430 --> 00:45:12,160
thanks very much um i think this is all

1162
00:45:17,109 --> 00:45:13,440
good for matt

1163
00:45:20,150 --> 00:45:17,119

have the repositioning of the nafta 3

1164
00:45:21,990 --> 00:45:20,160
mars orbiters already begun to be able

1165
00:45:25,430 --> 00:45:22,000
to

1166
00:45:30,230 --> 00:45:25,440
provide i guess as real-time columns as

1167
00:45:33,510 --> 00:45:31,829
i'm not quite sure i heard the entire

1168
00:45:35,430 --> 00:45:33,520
question but i think it's related to the

1169
00:45:37,349 --> 00:45:35,440
the nasa orbiters and their their

1170
00:45:38,309 --> 00:45:37,359
support role for entry descent and

1171
00:45:40,390 --> 00:45:38,319
landing

1172
00:45:42,950 --> 00:45:40,400
uh communications is that

1173
00:45:45,030 --> 00:45:42,960
yeah if that repositioning if any has

1174
00:45:48,309 --> 00:45:45,040
already started or when you expect to do

1175
00:45:50,630 --> 00:45:48,319
that and which orbiters will be used

1176
00:45:53,109 --> 00:45:50,640
so we're primarily going to use the mars

1177
00:45:54,470 --> 00:45:53,119
reconnaissance orbiter mro

1178
00:45:55,670 --> 00:45:54,480
for entry descent and landing

1179
00:45:56,870 --> 00:45:55,680
communications

1180
00:45:59,270 --> 00:45:56,880
[Music]

1181
00:46:01,670 --> 00:45:59,280
and it has a minor amount of

1182
00:46:03,750 --> 00:46:01,680
repositioning as you mentioned uh that

1183
00:46:06,150 --> 00:46:03,760
that'll be required uh so that it's

1184
00:46:09,190 --> 00:46:06,160
exactly overhead when we land at jezebel

1185
00:46:11,430 --> 00:46:09,200
crater and uh i do not believe that that

1186
00:46:12,710 --> 00:46:11,440
repositioning has has quite started yet

1187
00:46:13,990 --> 00:46:12,720
but

1188
00:46:19,270 --> 00:46:14,000

we've got plenty of time to get that

1189
00:46:22,790 --> 00:46:20,870
thank you we're going to take some

1190
00:46:25,829 --> 00:46:22,800
questions from social media

1191
00:46:27,349 --> 00:46:25,839
our first one comes from jk um

1192
00:46:29,750 --> 00:46:27,359
trenzynski

1193
00:46:32,069 --> 00:46:29,760
um

1194
00:46:39,990 --> 00:46:32,079
what sort of data would perseverance

1195
00:46:44,710 --> 00:46:42,150
variants gather on the mars surface well

1196
00:46:47,349 --> 00:46:44,720
we've talked a lot i think about the um

1197
00:46:48,309 --> 00:46:47,359
the the science mission uh of the

1198
00:46:51,030 --> 00:46:48,319
project

1199
00:46:54,150 --> 00:46:51,040
and uh um you know uh thomas did you

1200
00:46:56,069 --> 00:46:54,160
want to go ahead and say a few words

1201
00:46:57,589 --> 00:46:56,079
amazing question that's why we're going

1202
00:46:59,109 --> 00:46:57,599
there i think the other thing i want to

1203
00:47:01,510 --> 00:46:59,119
say there's an uh

1204
00:47:03,510 --> 00:47:01,520
a show right after this really focused

1205
00:47:05,430 --> 00:47:03,520
on science with all details but you know

1206
00:47:07,109 --> 00:47:05,440
if you look back from you know

1207
00:47:09,030 --> 00:47:07,119
look at the data that we're going to i

1208
00:47:11,430 --> 00:47:09,040
got or we you talked about

1209
00:47:12,950 --> 00:47:11,440
the weather instrument kind of the the

1210
00:47:14,950 --> 00:47:12,960
meta that is standing there and there's

1211
00:47:17,829 --> 00:47:14,960
really a weather station uh or right

1212
00:47:20,150 --> 00:47:17,839
there in uh chess road crater uh you go

1213
00:47:22,069 --> 00:47:20,160

look at the cameras there's uh uh

1214
00:47:24,230 --> 00:47:22,079
numerous cameras today you talked about

1215
00:47:25,990 --> 00:47:24,240
super cam there's a there's another

1216
00:47:27,910 --> 00:47:26,000
camera that is uh you know it from a

1217
00:47:29,910 --> 00:47:27,920
point of view of field of view and

1218
00:47:31,030 --> 00:47:29,920
resolution really quite unprecedented

1219
00:47:33,030 --> 00:47:31,040
then you have

1220
00:47:33,910 --> 00:47:33,040
uh the instruments that are looking at

1221
00:47:38,630 --> 00:47:33,920
uh

1222
00:47:41,589 --> 00:47:38,640
remotely some of them by looking at

1223
00:47:44,309 --> 00:47:41,599
samples and uh really actually equipping

1224
00:47:46,390 --> 00:47:44,319
us to gather the right samples to

1225
00:47:47,190 --> 00:47:46,400
actually gather them and put them into

1226
00:47:49,270 --> 00:47:47,200
these

1227
00:47:51,589 --> 00:47:49,280
very clean sample tubes to bring back

1228
00:47:53,750 --> 00:47:51,599
you know everything i would argue is set

1229
00:47:55,430 --> 00:47:53,760
up for that to really get is that the

1230
00:47:57,990 --> 00:47:55,440
ultimate data do you want to gather are

1231
00:48:01,109 --> 00:47:58,000
these samples i mean for us those are

1232
00:48:03,270 --> 00:48:01,119
the most precious uh samples uh that uh

1233
00:48:05,349 --> 00:48:03,280
we believe we've had as humans in terms

1234
00:48:07,190 --> 00:48:05,359
of uh samples of nature

1235
00:48:09,030 --> 00:48:07,200
of really answering this important

1236
00:48:11,670 --> 00:48:09,040
question of astrobiology the other

1237
00:48:13,270 --> 00:48:11,680
administrator talked about that is the

1238
00:48:15,829 --> 00:48:13,280

ultimate uh

1239
00:48:17,990 --> 00:48:15,839
you know data not only the sample itself

1240
00:48:20,549 --> 00:48:18,000
but the context in which this sample is

1241
00:48:22,870 --> 00:48:20,559
collected we learned from geology here

1242
00:48:25,829 --> 00:48:22,880
we learned from the important analysis

1243
00:48:28,470 --> 00:48:25,839
uh in every environment uh that that in

1244
00:48:30,230 --> 00:48:28,480
fact that context is very important for

1245
00:48:32,150 --> 00:48:30,240
the interpretation thereof but i just

1246
00:48:33,270 --> 00:48:32,160
want to block the session later what did

1247
00:48:35,430 --> 00:48:33,280
i miss man

1248
00:48:37,030 --> 00:48:35,440
no i think you hit most of it as as

1249
00:48:38,470 --> 00:48:37,040
thomas said we have very powerful

1250
00:48:41,430 --> 00:48:38,480
spectrometers out on the end of the

1251
00:48:43,750 --> 00:48:41,440
robot arm we'll be able to look at the

1252
00:48:45,910 --> 00:48:43,760
at the rock at a spatial resolution of

1253
00:48:47,030 --> 00:48:45,920
100 microns which is tiny and really

1254
00:48:48,710 --> 00:48:47,040
understand

1255
00:48:51,670 --> 00:48:48,720
from spot to spot you know how the

1256
00:48:53,670 --> 00:48:51,680
chemical composition of the rock changes

1257
00:48:55,589 --> 00:48:53,680
we've got spectrometers up on the top of

1258
00:48:57,829 --> 00:48:55,599
the the mast which i mentioned the

1259
00:49:01,030 --> 00:48:57,839
supercam we've got zoom cameras up there

1260
00:49:03,670 --> 00:49:01,040
as well we've got the weather station

1261
00:49:05,270 --> 00:49:03,680
we also have a subsurface radar sounder

1262
00:49:07,430 --> 00:49:05,280
for the first time on the surface of

1263
00:49:09,829 --> 00:49:07,440

mars which will help us understand

1264
00:49:11,190 --> 00:49:09,839
contextually the geography of the

1265
00:49:13,190 --> 00:49:11,200
landing site

1266
00:49:15,670 --> 00:49:13,200
that's the norwegian provided

1267
00:49:18,230 --> 00:49:15,680
radar which i mentioned before

1268
00:49:20,470 --> 00:49:18,240
so um so we have a very very powerful

1269
00:49:23,030 --> 00:49:20,480
suite of instruments that will help us

1270
00:49:25,829 --> 00:49:23,040
do exactly what thomas said which is

1271
00:49:27,510 --> 00:49:25,839
find the right samples to collect

1272
00:49:28,470 --> 00:49:27,520
you know we can't bring back a lot you

1273
00:49:31,349 --> 00:49:28,480
know

1274
00:49:32,950 --> 00:49:31,359
a lot of material when when we bring

1275
00:49:34,549 --> 00:49:32,960
these samples back and so we want to

1276
00:49:35,829 --> 00:49:34,559
make sure we've gone to the right site

1277
00:49:37,910 --> 00:49:35,839
we want to make sure we've picked the

1278
00:49:40,069 --> 00:49:37,920
right targets and we want to make sure

1279
00:49:42,630 --> 00:49:40,079
we understand the context and the

1280
00:49:45,270 --> 00:49:42,640
chemistry of those targets when we bring

1281
00:49:47,589 --> 00:49:45,280
them back

1282
00:49:49,030 --> 00:49:47,599
so when you talk about what is the data

1283
00:49:50,069 --> 00:49:49,040
that's coming back

1284
00:49:52,950 --> 00:49:50,079
um you know

1285
00:49:55,349 --> 00:49:52,960
you mentioned spec uh spectroscopy the

1286
00:49:58,470 --> 00:49:55,359
idea that you can shoot energy into a

1287
00:50:00,630 --> 00:49:58,480
material think of radio waves

1288
00:50:03,270 --> 00:50:00,640

or in this case you know it could be

1289
00:50:04,870 --> 00:50:03,280
light waves or infrared waves and then

1290
00:50:06,710 --> 00:50:04,880
certain wavelengths

1291
00:50:09,190 --> 00:50:06,720
bounce back and other wavelengths are

1292
00:50:11,030 --> 00:50:09,200
absorbed and based on that we can make

1293
00:50:12,630 --> 00:50:11,040
determinations as to

1294
00:50:15,190 --> 00:50:12,640
the chemical composition of the

1295
00:50:16,470 --> 00:50:15,200
materials and here on earth what we have

1296
00:50:19,270 --> 00:50:16,480
been studying

1297
00:50:20,790 --> 00:50:19,280
is the chemical composition of materials

1298
00:50:22,150 --> 00:50:20,800
where we know

1299
00:50:24,549 --> 00:50:22,160
those chemicals that chemical

1300
00:50:27,430 --> 00:50:24,559
composition was a result

1301
00:50:28,950 --> 00:50:27,440
of ancient life here on earth so we're

1302
00:50:31,670 --> 00:50:28,960
taking what we've learned from our own

1303
00:50:33,990 --> 00:50:31,680
planet and we're applying it to another

1304
00:50:35,349 --> 00:50:34,000
planet to make determinations as to

1305
00:50:37,750 --> 00:50:35,359
whether or not

1306
00:50:39,910 --> 00:50:37,760
there was maybe at one time

1307
00:50:43,510 --> 00:50:39,920
biology might you know we're talking

1308
00:50:44,549 --> 00:50:43,520
about microbial kind of organisms on on

1309
00:50:45,910 --> 00:50:44,559
mars

1310
00:50:48,950 --> 00:50:45,920
and and then once we make that

1311
00:50:50,630 --> 00:50:48,960
determination we know kidding cash a

1312
00:50:52,710 --> 00:50:50,640
sample if we think it's a high

1313
00:50:54,470 --> 00:50:52,720

probability that there could have been

1314
00:50:57,829 --> 00:50:54,480
life in that place

1315
00:51:01,109 --> 00:50:57,839
we we cash a sample so that one day four

1316
00:51:03,349 --> 00:51:01,119
years from now or i should say uh 2026

1317
00:51:04,710 --> 00:51:03,359
six years from now we can bring it back

1318
00:51:07,190 --> 00:51:04,720
uh to earth

1319
00:51:09,109 --> 00:51:07,200
um and and study it and and actually

1320
00:51:10,230 --> 00:51:09,119
make a note no kidding determination

1321
00:51:13,349 --> 00:51:10,240
whether or not

1322
00:51:15,829 --> 00:51:13,359
humans um or i should say earth is the

1323
00:51:17,750 --> 00:51:15,839
only place uh in our own solar system

1324
00:51:19,990 --> 00:51:17,760
that that has the capability of hosting

1325
00:51:21,510 --> 00:51:20,000
life and uh that's that's i think one of

1326
00:51:23,430 --> 00:51:21,520
the most exciting things about this

1327
00:51:26,069 --> 00:51:23,440
mission so thank you bettina and thank

1328
00:51:27,670 --> 00:51:26,079
you all um in many ways you've answered

1329
00:51:29,349 --> 00:51:27,680
our next question from social media

1330
00:51:32,309 --> 00:51:29,359
ralph bennett asks

1331
00:51:34,870 --> 00:51:32,319
why do we need another rover there what

1332
00:51:37,109 --> 00:51:34,880
more can we learn from mars

1333
00:51:39,270 --> 00:51:37,119
well there's a lot i'll let you guys i

1334
00:51:41,510 --> 00:51:39,280
think it's precisely that you know

1335
00:51:42,630 --> 00:51:41,520
what's really interesting is like every

1336
00:51:44,950 --> 00:51:42,640
time

1337
00:51:45,910 --> 00:51:44,960
we build a rover and you send it we send

1338
00:51:48,390 --> 00:51:45,920

it there

1339
00:51:50,630 --> 00:51:48,400
with it go a number of questions that we

1340
00:51:52,790 --> 00:51:50,640
have for example spirit and opportunity

1341
00:51:55,190 --> 00:51:52,800
you talked about it matt earlier or

1342
00:51:56,309 --> 00:51:55,200
questions about water the history of

1343
00:51:58,230 --> 00:51:56,319
water

1344
00:52:00,150 --> 00:51:58,240
at the surface of mars so the entire

1345
00:52:03,270 --> 00:52:00,160
instrument complement was laid out for

1346
00:52:05,510 --> 00:52:03,280
that curiosity was about really trying

1347
00:52:08,630 --> 00:52:05,520
to understand uh the composition and

1348
00:52:10,549 --> 00:52:08,640
order any organics right many questions

1349
00:52:12,069 --> 00:52:10,559
that were open and you know and really

1350
00:52:14,710 --> 00:52:12,079
what we're learning from curiosity and

1351
00:52:17,589 --> 00:52:14,720
there's surprises even today that the

1352
00:52:20,230 --> 00:52:17,599
level of complexity and some of these

1353
00:52:22,390 --> 00:52:20,240
uh organics is much higher now it turns

1354
00:52:24,470 --> 00:52:22,400
out the more complex means the more

1355
00:52:26,470 --> 00:52:24,480
complex the more life kind of the more

1356
00:52:28,470 --> 00:52:26,480
the likelihood to life so that's why

1357
00:52:31,670 --> 00:52:28,480
that's such an important characteristics

1358
00:52:33,190 --> 00:52:31,680
and so so now what what uh perseverance

1359
00:52:35,190 --> 00:52:33,200
is is really

1360
00:52:36,950 --> 00:52:35,200
i would argue the first and we've said

1361
00:52:38,790 --> 00:52:36,960
it uh the administrator said it earlier

1362
00:52:41,510 --> 00:52:38,800
the first mission that really had at its

1363
00:52:43,030 --> 00:52:41,520

core the question about life

1364
00:52:44,790 --> 00:52:43,040
astrobiology

1365
00:52:47,829 --> 00:52:44,800
and therefore the instruments are very

1366
00:52:49,430 --> 00:52:47,839
different um for that and it's it's i

1367
00:52:51,829 --> 00:52:49,440
would argue

1368
00:52:54,150 --> 00:52:51,839
very hard to imagine coming up with that

1369
00:52:55,430 --> 00:52:54,160
instrument complement and that location

1370
00:52:57,750 --> 00:52:55,440
without

1371
00:52:59,910 --> 00:52:57,760
the other insights that we got from

1372
00:53:02,390 --> 00:52:59,920
these other uh missions before the ones

1373
00:53:04,069 --> 00:53:02,400
i mentioned as well as uh uh others and

1374
00:53:05,910 --> 00:53:04,079
so for us uh

1375
00:53:08,549 --> 00:53:05,920
it's a very different i mean it's you

1376
00:53:11,190 --> 00:53:08,559
know in science when you peel back a

1377
00:53:13,349 --> 00:53:11,200
layer it's not like an onion with a the

1378
00:53:15,349 --> 00:53:13,359
layer that comes from below it looks

1379
00:53:16,470 --> 00:53:15,359
like the layer above it's a very

1380
00:53:18,390 --> 00:53:16,480
different

1381
00:53:20,549 --> 00:53:18,400
set of questions that are there and you

1382
00:53:23,829 --> 00:53:20,559
know we're peeling back that on in and

1383
00:53:25,910 --> 00:53:23,839
frankly going after a question that

1384
00:53:28,150 --> 00:53:25,920
humans over millennia have asked and

1385
00:53:30,069 --> 00:53:28,160
we're answering for the first time with

1386
00:53:32,630 --> 00:53:30,079
the tools of science potentially the

1387
00:53:34,710 --> 00:53:32,640
best way we can i mean for for me that's

1388
00:53:37,190 --> 00:53:34,720

what it's about i mean that's i mean

1389
00:53:39,910 --> 00:53:37,200
that question it's an old question like

1390
00:53:42,549 --> 00:53:39,920
you go read old philosophers of the past

1391
00:53:44,630 --> 00:53:42,559
the greeks wherever the culture is the

1392
00:53:46,390 --> 00:53:44,640
people have asked those questions we're

1393
00:53:47,829 --> 00:53:46,400
we're starting to address it with the

1394
00:53:49,829 --> 00:53:47,839
instruments that are there that's the

1395
00:53:51,829 --> 00:53:49,839
amazing part of it

1396
00:53:53,750 --> 00:53:51,839
very exciting we're going to go to

1397
00:53:56,549 --> 00:53:53,760
another question from our reporters on

1398
00:53:58,790 --> 00:53:56,559
the line mike wahl of space.com

1399
00:54:00,549 --> 00:53:58,800
mike

1400
00:54:02,630 --> 00:54:00,559
thank you all um

1401
00:54:05,270 --> 00:54:02,640
this one's probably again for

1402
00:54:06,790 --> 00:54:05,280
for yeah for matt um like you mentioned

1403
00:54:08,549 --> 00:54:06,800
you had to pull off sort of like a magic

1404
00:54:10,069 --> 00:54:08,559
trick with ingenuity to sort of make it

1405
00:54:12,630 --> 00:54:10,079
fit could you go into a little more

1406
00:54:14,950 --> 00:54:12,640
detail about what you needed to do and

1407
00:54:17,990 --> 00:54:14,960
what what the exact challenges were sort

1408
00:54:19,109 --> 00:54:18,000
of posed by by that additional payload

1409
00:54:20,710 --> 00:54:19,119
thank you

1410
00:54:21,990 --> 00:54:20,720
can i start this one if it's all right

1411
00:54:24,630 --> 00:54:22,000
bettina

1412
00:54:26,630 --> 00:54:24,640
so this is probably my fault matt and i

1413
00:54:29,030 --> 00:54:26,640

and i and i apologize

1414
00:54:32,150 --> 00:54:29,040
uh thomas derbuchen brought this into

1415
00:54:34,470 --> 00:54:32,160
the into the administrator's suite uh in

1416
00:54:35,750 --> 00:54:34,480
my early days uh as being the nasa

1417
00:54:37,990 --> 00:54:35,760
administrator

1418
00:54:40,710 --> 00:54:38,000
and he had this you know this you know

1419
00:54:43,190 --> 00:54:40,720
hey what if we were to do this and

1420
00:54:45,109 --> 00:54:43,200
um i i loved it

1421
00:54:46,710 --> 00:54:45,119
and i told thomas whatever you can do to

1422
00:54:49,510 --> 00:54:46,720
make that happen i'm all for it and of

1423
00:54:52,309 --> 00:54:49,520
course thomas uh brought that to you and

1424
00:54:53,030 --> 00:54:52,319
so i know it was uh not easy to get done

1425
00:54:56,470 --> 00:54:53,040
but

1426
00:54:58,309 --> 00:54:56,480
i will tell you i i sent a tweet about

1427
00:54:59,910 --> 00:54:58,319
it wasn't called ingenuity at the time

1428
00:55:02,309 --> 00:54:59,920
it was just called the mars helicopter

1429
00:55:04,789 --> 00:55:02,319
but i sent a tweet about it on like a

1430
00:55:06,150 --> 00:55:04,799
friday afternoon at 5 pm

1431
00:55:07,910 --> 00:55:06,160
and i didn't have a lot of twitter

1432
00:55:10,230 --> 00:55:07,920
followers at the time and i sent a tweet

1433
00:55:12,150 --> 00:55:10,240
and it was like within within an hour or

1434
00:55:13,190 --> 00:55:12,160
two there's 5 000 retweets i mean it

1435
00:55:14,710 --> 00:55:13,200
just kind of

1436
00:55:17,510 --> 00:55:14,720
caught fire and everybody and then all

1437
00:55:19,510 --> 00:55:17,520
the media started covering it was a very

1438
00:55:21,910 --> 00:55:19,520

exciting moment so anyway i know it was

1439
00:55:23,910 --> 00:55:21,920
difficult want you to know how much i

1440
00:55:26,789 --> 00:55:23,920
appreciate all the work that you've done

1441
00:55:28,870 --> 00:55:26,799
so go ahead i i i'll say i remember an

1442
00:55:29,990 --> 00:55:28,880
all hands meeting where we were right

1443
00:55:32,710 --> 00:55:30,000
after we were asked to try to

1444
00:55:34,870 --> 00:55:32,720
accommodate the the helicopter and you

1445
00:55:36,789 --> 00:55:34,880
know some of the managers were kind of

1446
00:55:38,870 --> 00:55:36,799
scratching their heads and and wondering

1447
00:55:41,190 --> 00:55:38,880
how we were going to do this and i asked

1448
00:55:43,430 --> 00:55:41,200
for a show of hands from our own team

1449
00:55:44,789 --> 00:55:43,440
who would like to see the helicopter on

1450
00:55:47,030 --> 00:55:44,799
on this mission and pretty much every

1451
00:55:48,950 --> 00:55:47,040
hand went up so you know

1452
00:55:51,990 --> 00:55:48,960
even the people that had to figure it

1453
00:55:52,789 --> 00:55:52,000
out were excited by uh by the project

1454
00:55:57,349 --> 00:55:52,799
and

1455
00:55:59,190 --> 00:55:57,359
unusual payload you know it's uh it's

1456
00:56:01,430 --> 00:55:59,200
very lightweight you know

1457
00:56:03,829 --> 00:56:01,440
because it has to fly in this

1458
00:56:05,910 --> 00:56:03,839
very low density air it's got these big

1459
00:56:07,910 --> 00:56:05,920
stiff carbon fiber

1460
00:56:09,990 --> 00:56:07,920
blades that sit out that have to be

1461
00:56:12,549 --> 00:56:10,000
protected from the debris that we kick

1462
00:56:14,470 --> 00:56:12,559
up for instance during entry descent and

1463
00:56:17,109 --> 00:56:14,480

landing

1464
00:56:19,990 --> 00:56:17,119
it's got legs that that have to fold up

1465
00:56:21,190 --> 00:56:20,000
and then have to be deployed out um

1466
00:56:23,030 --> 00:56:21,200
and uh

1467
00:56:24,630 --> 00:56:23,040
you know and we had to we you know

1468
00:56:26,390 --> 00:56:24,640
essentially the rover was full the

1469
00:56:28,150 --> 00:56:26,400
inside of the vehicle which is where we

1470
00:56:29,910 --> 00:56:28,160
have most of our

1471
00:56:31,910 --> 00:56:29,920
electronic systems

1472
00:56:33,670 --> 00:56:31,920
so that we can keep them warm

1473
00:56:34,950 --> 00:56:33,680
that was full the top of the vehicle was

1474
00:56:39,030 --> 00:56:34,960
pretty much

1475
00:56:41,430 --> 00:56:39,040
uh overpopulated already and so uh and

1476
00:56:44,069 --> 00:56:41,440
we had to we had to come up with a way

1477
00:56:45,910 --> 00:56:44,079
of uh accommodating it and ultimately we

1478
00:56:47,589 --> 00:56:45,920
decided to put it up under the belly of

1479
00:56:49,750 --> 00:56:47,599
the the vehicle

1480
00:56:51,510 --> 00:56:49,760
it turns out that the belly pan is is a

1481
00:56:54,150 --> 00:56:51,520
pretty separable thing we kind of take

1482
00:56:55,589 --> 00:56:54,160
that belly pan off and we can give it to

1483
00:56:57,349 --> 00:56:55,599
the team that was developing the

1484
00:56:59,190 --> 00:56:57,359
accommodation engineering systems for

1485
00:57:01,829 --> 00:56:59,200
the helicopter and they

1486
00:57:04,710 --> 00:57:01,839
and they used some of our existing um

1487
00:57:06,789 --> 00:57:04,720
actuators motors and things like that we

1488
00:57:08,870 --> 00:57:06,799

sort of hunted around for available uh

1489
00:57:10,630 --> 00:57:08,880
spare flight hardware

1490
00:57:13,510 --> 00:57:10,640
to figure out how we could do it and get

1491
00:57:14,309 --> 00:57:13,520
it on the vehicle in a way that

1492
00:57:16,549 --> 00:57:14,319
one

1493
00:57:17,750 --> 00:57:16,559
kept the helicopter safe

1494
00:57:20,309 --> 00:57:17,760
and two

1495
00:57:22,549 --> 00:57:20,319
allowed us to

1496
00:57:24,710 --> 00:57:22,559
deploy it off of the vehicle in a way

1497
00:57:25,750 --> 00:57:24,720
that it wouldn't represent a risk or a

1498
00:57:28,230 --> 00:57:25,760
threat

1499
00:57:30,470 --> 00:57:28,240
to the rest of the mission we called it

1500
00:57:32,309 --> 00:57:30,480
the objective essentially was do no harm

1501
00:57:35,270 --> 00:57:32,319
to the primary mission because this was

1502
00:57:38,069 --> 00:57:35,280
an extra technology experiment

1503
00:57:39,910 --> 00:57:38,079
and and beyond that our team was

1504
00:57:41,510 --> 00:57:39,920
over subscribed you know just with

1505
00:57:44,150 --> 00:57:41,520
engineering challenges ourselves with

1506
00:57:46,789 --> 00:57:44,160
the sampling system and the instruments

1507
00:57:48,549 --> 00:57:46,799
and so we made a we made a phone call

1508
00:57:50,870 --> 00:57:48,559
and one of our system contractors

1509
00:57:52,390 --> 00:57:50,880
lockheed martin in denver stepped up to

1510
00:57:54,630 --> 00:57:52,400
the plate

1511
00:57:57,030 --> 00:57:54,640
we provided them a basic design and some

1512
00:57:59,109 --> 00:57:57,040
hardware and some engineering support

1513
00:58:00,630 --> 00:57:59,119

and we were able to figure out how to

1514
00:58:01,589 --> 00:58:00,640
how to accommodate it underneath the

1515
00:58:02,630 --> 00:58:01,599
vehicle

1516
00:58:05,430 --> 00:58:02,640
and then we went through a lot of

1517
00:58:07,430 --> 00:58:05,440
testing to make sure in fact that

1518
00:58:09,190 --> 00:58:07,440
that it would deploy that it was still

1519
00:58:11,030 --> 00:58:09,200
appropriately and it would deploy safely

1520
00:58:12,549 --> 00:58:11,040
on the surface of mars and then of

1521
00:58:14,630 --> 00:58:12,559
course we still had to figure out how to

1522
00:58:16,150 --> 00:58:14,640
operate it once we got it there

1523
00:58:17,030 --> 00:58:16,160
and i think we we're working through

1524
00:58:21,430 --> 00:58:17,040
those

1525
00:58:23,190 --> 00:58:21,440
so we'll be ready to go when it's time

1526
00:58:25,750 --> 00:58:23,200
to fly the helicopter on mars but it

1527
00:58:27,829 --> 00:58:25,760
wasn't easy

1528
00:58:29,990 --> 00:58:27,839
fantastic we're going to take our last

1529
00:58:32,150 --> 00:58:30,000
question from leo enright of irish

1530
00:58:34,950 --> 00:58:32,160
television leo

1531
00:58:37,750 --> 00:58:34,960
thanks bettina and indeed thanks to mike

1532
00:58:40,150 --> 00:58:37,760
wall mike matt wallace and

1533
00:58:42,549 --> 00:58:40,160
uh and to dr zabrukan for their

1534
00:58:44,950 --> 00:58:42,559
wonderful uh contributions but my

1535
00:58:45,829 --> 00:58:44,960
question is for the administrator

1536
00:58:50,950 --> 00:58:45,839
um

1537
00:58:53,030 --> 00:58:50,960
mars 2020 is basically mars 2026

1538
00:58:55,270 --> 00:58:53,040

um and i'm going to ask a political

1539
00:58:57,670 --> 00:58:55,280
question which i think i can ask because

1540
00:58:59,910 --> 00:58:57,680
i'm an ocean away so nobody is going to

1541
00:59:00,710 --> 00:58:59,920
think i've got an agenda

1542
00:59:02,630 --> 00:59:00,720
um

1543
00:59:05,990 --> 00:59:02,640
a lot of your international partners

1544
00:59:07,990 --> 00:59:06,000
will be wondering will you be willing to

1545
00:59:10,549 --> 00:59:08,000
continue to serve

1546
00:59:13,109 --> 00:59:10,559
as nasa administrator

1547
00:59:17,510 --> 00:59:13,119
no matter who gets elected in november

1548
00:59:22,549 --> 00:59:20,630
look uh you know my job right now is is

1549
00:59:24,630 --> 00:59:22,559
to do these stunning achievements on

1550
00:59:26,870 --> 00:59:24,640
behalf of the united states of america

1551
00:59:28,069 --> 00:59:26,880
and uh look i appreciate the question

1552
00:59:29,829 --> 00:59:28,079
but um

1553
00:59:30,870 --> 00:59:29,839
look i serve at the pleasure of the

1554
00:59:32,630 --> 00:59:30,880
president

1555
00:59:33,829 --> 00:59:32,640
i serve at the pleasure of the current

1556
00:59:35,589 --> 00:59:33,839
president and

1557
00:59:37,910 --> 00:59:35,599
i think it's important that the next

1558
00:59:39,430 --> 00:59:37,920
president have the per has the the nasa

1559
00:59:40,230 --> 00:59:39,440
administrator that

1560
00:59:46,390 --> 00:59:40,240
um

1561
00:59:47,829 --> 00:59:46,400
united states works the nasa

1562
00:59:49,829 --> 00:59:47,839
administrator is selected by the

1563
00:59:51,750 --> 00:59:49,839

president i think it's important

1564
00:59:53,750 --> 00:59:51,760
you have to have that relationship look

1565
00:59:55,910 --> 00:59:53,760
at look at what we're doing right now

1566
00:59:57,589 --> 00:59:55,920
we've got the artemis program which we

1567
00:59:59,349 --> 00:59:57,599
which we have reestablished that we're

1568
01:00:01,510 --> 00:59:59,359
going to the moon sustainably that we're

1569
01:00:03,589 --> 01:00:01,520
going with a purpose to get to mars

1570
01:00:05,670 --> 01:00:03,599
and because of that

1571
01:00:07,510 --> 01:00:05,680
we we've had we've had really big budget

1572
01:00:09,829 --> 01:00:07,520
requests the president of the united

1573
01:00:12,710 --> 01:00:09,839
states has put on the table the biggest

1574
01:00:14,870 --> 01:00:12,720
budget that nasa has ever had in nominal

1575
01:00:17,430 --> 01:00:14,880
dollars ever now of course in real

1576
01:00:19,030 --> 01:00:17,440
dollars apollo was was bigger

1577
01:00:20,150 --> 01:00:19,040
but we're heading the right direction

1578
01:00:21,910 --> 01:00:20,160
and um

1579
01:00:23,190 --> 01:00:21,920
that's because the the president of the

1580
01:00:24,870 --> 01:00:23,200
united states

1581
01:00:25,910 --> 01:00:24,880
trust the nasa administrator and i would

1582
01:00:28,150 --> 01:00:25,920
recommend

1583
01:00:30,309 --> 01:00:28,160
to whoever the president is at any point

1584
01:00:32,309 --> 01:00:30,319
in time pick a nasa administrator that

1585
01:00:36,069 --> 01:00:32,319
you trust to get the job done period end

1586
01:00:37,750 --> 01:00:36,079
of story um and look um i've had the

1587
01:00:39,270 --> 01:00:37,760
time of my life in this job i'm not

1588
01:00:40,309 --> 01:00:39,280

going to lie it's the greatest job i've

1589
01:00:41,910 --> 01:00:40,319
ever had

1590
01:00:44,150 --> 01:00:41,920
but i think there's a time when it's

1591
01:00:45,829 --> 01:00:44,160
it's somebody else's turn and i am i am

1592
01:00:47,990 --> 01:00:45,839
under no illusions that i'm the only one

1593
01:00:50,549 --> 01:00:48,000
capable of doing this job so

1594
01:00:52,309 --> 01:00:50,559
um there's a lot of people that um would

1595
01:00:54,710 --> 01:00:52,319
be even better than me and and we'll

1596
01:00:56,789 --> 01:00:54,720
leave it at that so um thank you thank

1597
01:00:58,950 --> 01:00:56,799
you for the question

1598
01:01:00,630 --> 01:00:58,960
thank you leo um with that we're going

1599
01:01:02,390 --> 01:01:00,640
to end our questions we're going to turn

1600
01:01:03,829 --> 01:01:02,400
it over to final remarks from nasa

1601
01:01:05,910 --> 01:01:03,839
administrator

1602
01:01:08,390 --> 01:01:05,920
well thank you bettina and thank you

1603
01:01:11,430 --> 01:01:08,400
for the panel uh participating in this

1604
01:01:13,510 --> 01:01:11,440
today what uh what an exciting time

1605
01:01:16,630 --> 01:01:13,520
um and i know we we just had this

1606
01:01:19,270 --> 01:01:16,640
conversation about ingenuity um and the

1607
01:01:21,109 --> 01:01:19,280
helicopter that's gonna fly on mars i

1608
01:01:23,030 --> 01:01:21,119
wanna i wanna kind of put it in

1609
01:01:25,270 --> 01:01:23,040
perspective for a moment

1610
01:01:28,630 --> 01:01:25,280
imagine looking

1611
01:01:31,510 --> 01:01:28,640
from perseverance out at a helicopter

1612
01:01:33,990 --> 01:01:31,520
that is flying around perseverance

1613
01:01:35,829 --> 01:01:34,000

and the helicopter is looking back at

1614
01:01:38,390 --> 01:01:35,839
perseverance getting us images of

1615
01:01:40,230 --> 01:01:38,400
perseverance what perseverance is doing

1616
01:01:42,870 --> 01:01:40,240
we're going to be able to see with our

1617
01:01:46,630 --> 01:01:42,880
own eyes with motion pictures these kind

1618
01:01:48,150 --> 01:01:46,640
of activities happening on another world

1619
01:01:49,990 --> 01:01:48,160
and and i just can't tell you how

1620
01:01:52,390 --> 01:01:50,000
excited i am about

1621
01:01:54,710 --> 01:01:52,400
ingenuity and of course perseverance the

1622
01:01:56,710 --> 01:01:54,720
first astrobiology mission we shouldn't

1623
01:01:59,190 --> 01:01:56,720
forget we're proving out that we can

1624
01:02:01,029 --> 01:01:59,200
turn the carbon dioxide atmosphere of

1625
01:02:02,870 --> 01:02:01,039
mars into pure oxygen for life support

1626
01:02:05,510 --> 01:02:02,880
because the president has given us

1627
01:02:08,230 --> 01:02:05,520
agenda an agenda to plant an american

1628
01:02:10,549 --> 01:02:08,240
flag on mars and of course to go with

1629
01:02:13,190 --> 01:02:10,559
our international partners and our

1630
01:02:15,190 --> 01:02:13,200
commercial partners all of which is in

1631
01:02:17,990 --> 01:02:15,200
uh president trump's space policy

1632
01:02:20,150 --> 01:02:18,000
directive one so we have this big agenda

1633
01:02:22,870 --> 01:02:20,160
this is a precursor mission but it's

1634
01:02:24,549 --> 01:02:22,880
also a scientific mission

1635
01:02:26,950 --> 01:02:24,559
in its own right

1636
01:02:28,710 --> 01:02:26,960
and there's so much more to discover

1637
01:02:30,150 --> 01:02:28,720
and we're so looking forward to it so i

1638
01:02:32,069 --> 01:02:30,160

just want to say thank you to everybody

1639
01:02:34,069 --> 01:02:32,079
for paying attention

1640
01:02:35,829 --> 01:02:34,079
if you know if you want to follow us if

1641
01:02:38,710 --> 01:02:35,839
you want to participate with us

1642
01:02:40,230 --> 01:02:38,720
virtually from thursday forward

1643
01:02:41,750 --> 01:02:40,240
nasa.gov

1644
01:02:43,750 --> 01:02:41,760
i would encourage everybody to go to

1645
01:02:45,029 --> 01:02:43,760
nasa.gov and

1646
01:02:47,430 --> 01:02:45,039
and this is all about the next

1647
01:02:50,230 --> 01:02:47,440
generation we want to inspire people so

1648
01:02:52,069 --> 01:02:50,240
have your kids or your grandkids tune in

1649
01:02:53,829 --> 01:02:52,079
this is a great moment for not just the

1650
01:02:56,150 --> 01:02:53,839
united states of america but also for

1651
01:02:58,390 --> 01:02:56,160
the world

1652
01:03:00,390 --> 01:02:58,400
thank you so much jim and thank you so

1653
01:03:02,870 --> 01:03:00,400
much for joining our conversation the

1654
01:03:05,750 --> 01:03:02,880
next briefing will be the mars 2020

1655
01:03:07,910 --> 01:03:05,760
science briefing today at 3 p.m and then

1656
01:03:10,710 --> 01:03:07,920
we mentioned launch coverage begins on

1657
01:03:13,430 --> 01:03:10,720
thursday at 7 00 a.m and the launch is

1658
01:03:15,750 --> 01:03:13,440
at 7 50. you can continue to talk about

1659
01:03:18,230 --> 01:03:15,760
the greatness of this mars perseverance

1660
01:03:20,470 --> 01:03:18,240
over mars 2020 and mars ingenuity by

1661
01:03:23,750 --> 01:03:20,480
joining us at twitter and facebook at

1662
01:03:26,150 --> 01:03:23,760
mars perseverance and uh

1663
01:03:28,150 --> 01:03:26,160

countdown to mars thank you so much for