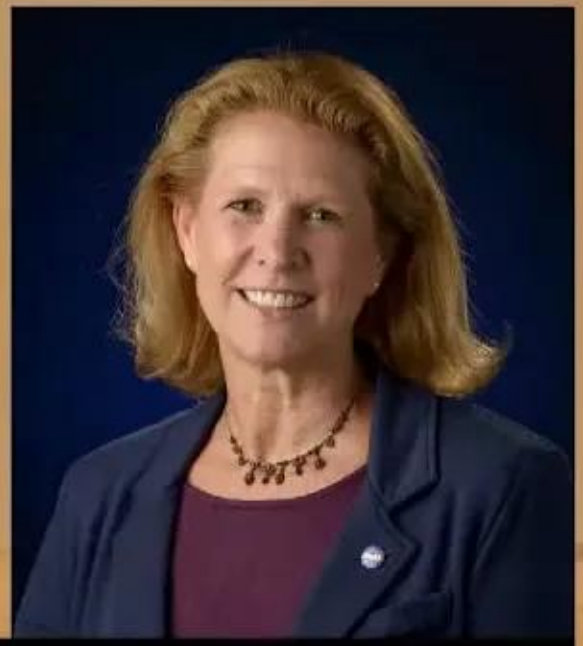

Lori Glaze
Director, NASA's Planetary Science Division

1
00:00:11,030 --> 00:00:09,110
[Music]

2
00:00:12,230 --> 00:00:11,040
welcome and thank you for standing by at

3
00:00:13,589 --> 00:00:12,240
this time all participants are in

4
00:00:15,430 --> 00:00:13,599
listening mode until the question and

5
00:00:16,710 --> 00:00:15,440
answer session takes conference

6
00:00:18,230 --> 00:00:16,720
at the time you may press star one on

7
00:00:19,429 --> 00:00:18,240
your phone to ask a question

8
00:00:21,269 --> 00:00:19,439
like the informal part of today's

9
00:00:22,870 --> 00:00:21,279
conference is being recorded the vmware

10
00:00:24,470 --> 00:00:22,880
objections you may disconnect at this

11
00:00:26,550 --> 00:00:24,480
time i would now like to turn to

12
00:00:28,710 --> 00:00:26,560
commerce or nasa jpl thank you he may

13
00:00:30,390 --> 00:00:28,720

begin

14
00:00:32,950 --> 00:00:30,400
welcome to today's insight

15
00:00:35,270 --> 00:00:32,960
teleconference i'm requier villanueva

16
00:00:38,229 --> 00:00:35,280
with the digital news and media office

17
00:00:40,229 --> 00:00:38,239
at nasa's jet propulsion laboratory and

18
00:00:42,229 --> 00:00:40,239
i will be moderating today

19
00:00:44,790 --> 00:00:42,239
insight team members from jpl in

20
00:00:46,229 --> 00:00:44,800
southern california and nasa leadership

21
00:00:48,310 --> 00:00:46,239
are here to discuss insight

22
00:00:50,869 --> 00:00:48,320
accomplishments share details on the

23
00:00:52,150 --> 00:00:50,879
spacecraft's power supply and preview

24
00:00:54,310 --> 00:00:52,160
what's to come

25
00:00:58,069 --> 00:00:54,320
for some background the insight lander

26
00:01:00,790 --> 00:00:58,079
arrived at mars on november 26 2018 and

27
00:01:03,430 --> 00:01:00,800
is now in its extended mission

28
00:01:05,830 --> 00:01:03,440
joining us on this teleconference are

29
00:01:08,310 --> 00:01:05,840
bruce bannert inside principal

30
00:01:11,350 --> 00:01:08,320
investigator at jpl

31
00:01:14,469 --> 00:01:11,360
katya zamora garcia insight deputy

32
00:01:17,749 --> 00:01:14,479
project manager also at jpl

33
00:01:20,630 --> 00:01:17,759
and lori glaze director of the planetary

34
00:01:22,149 --> 00:01:20,640
science division at nasa headquarters

35
00:01:24,630 --> 00:01:22,159
for anyone listening would like to

36
00:01:27,190 --> 00:01:24,640
submit a question you can do so by using

37
00:01:29,109 --> 00:01:27,200
the ask nasa

38
00:01:31,590 --> 00:01:29,119

for members of the media on the phone

39
00:01:34,149 --> 00:01:31,600
you can ask a question by pressing star

40
00:01:35,749 --> 00:01:34,159
1 and entering the queue

41
00:01:37,990 --> 00:01:35,759
to access the images that we are

42
00:01:42,149 --> 00:01:38,000
discussing during this teleconference

43
00:01:44,789 --> 00:01:43,350
insight

44
00:01:46,310 --> 00:01:44,799
update

45
00:01:48,630 --> 00:01:46,320
telecom

46
00:01:50,950 --> 00:01:48,640
i'll hand it over to inside principal

47
00:01:53,350 --> 00:01:50,960
investigator bruce bannert to provide

48
00:01:55,990 --> 00:01:53,360
the big picture on insights activities

49
00:01:58,950 --> 00:01:56,000
on mars and how the spacecraft is

50
00:02:02,149 --> 00:01:58,960
measuring up to its goals

51
00:02:04,310 --> 00:02:02,159
thanks raquel so as uh as raquel noted

52
00:02:07,190 --> 00:02:04,320
we've been very busy at mars for the

53
00:02:08,550 --> 00:02:07,200
last three and a half years we've been

54
00:02:11,350 --> 00:02:08,560
obtaining some

55
00:02:13,190 --> 00:02:11,360
unprecedented data on the deep interior

56
00:02:15,750 --> 00:02:13,200
of mars as well as its weather and

57
00:02:17,190 --> 00:02:15,760
magnetic field and we're here today to

58
00:02:18,550 --> 00:02:17,200
talk to you a little bit about some of

59
00:02:20,309 --> 00:02:18,560
the results that we've gotten out of

60
00:02:21,910 --> 00:02:20,319
that and talk about you know sort of

61
00:02:24,309 --> 00:02:21,920
where we're going in in the next few

62
00:02:26,150 --> 00:02:24,319
months as our power starts to dwindle

63
00:02:28,869 --> 00:02:26,160

but first before i get to that i'd like

64
00:02:30,550 --> 00:02:28,879
to share some of the latest

65
00:02:32,630 --> 00:02:30,560
results that we have uh if you could

66
00:02:35,670 --> 00:02:32,640
bring up b1 please

67
00:02:38,790 --> 00:02:35,680
even as our power is starting to dwindle

68
00:02:39,750 --> 00:02:38,800
we're still doing great science at mars

69
00:02:41,350 --> 00:02:39,760
the

70
00:02:44,150 --> 00:02:41,360
animation that

71
00:02:45,110 --> 00:02:44,160
that we're bringing up here shows the

72
00:02:47,430 --> 00:02:45,120
latest

73
00:02:48,309 --> 00:02:47,440
large marsquake that we obtained just

74
00:02:53,509 --> 00:02:48,319
about

75
00:02:55,830 --> 00:02:53,519
biggest event of the of the mission uh

76
00:02:57,589 --> 00:02:55,840
it's a magnitude 5 event the biggest

77
00:03:00,470 --> 00:02:57,599
thing that we've seen before that was

78
00:03:03,430 --> 00:03:00,480
the magnitude 4 which is almost 10 times

79
00:03:06,149 --> 00:03:03,440
smaller so even as we're starting to get

80
00:03:09,110 --> 00:03:06,159
close to the end of our mission mars is

81
00:03:13,110 --> 00:03:09,120
still giving us some really uh amazing

82
00:03:14,790 --> 00:03:13,120
things to uh to see and to to add to our

83
00:03:15,589 --> 00:03:14,800
data record

84
00:03:21,430 --> 00:03:15,599
um

85
00:03:23,750 --> 00:03:21,440
obtaining data mostly from its

86
00:03:26,710 --> 00:03:23,760
seismometer that's our sort of marquee

87
00:03:28,390 --> 00:03:26,720
instrument and if you bring up b2 it

88
00:03:30,149 --> 00:03:28,400

shows an image of the seismometer

89
00:03:32,949 --> 00:03:30,159
sitting on the surface which is taken

90
00:03:36,149 --> 00:03:32,959
from our instrument context camera on

91
00:03:38,550 --> 00:03:36,159
insight this is a really super sensitive

92
00:03:40,949 --> 00:03:38,560
seismometer which measures the motion of

93
00:03:43,589 --> 00:03:40,959
the ground vibrations of the ground at

94
00:03:46,949 --> 00:03:43,599
an incredibly precise level down to the

95
00:03:49,270 --> 00:03:46,959
sort of the the scale of a single atom's

96
00:03:51,030 --> 00:03:49,280
radius is the the sort of the size the

97
00:03:53,350 --> 00:03:51,040
vibrations that we can sense with this

98
00:03:54,869 --> 00:03:53,360
and those vibrations um come from lots

99
00:03:57,110 --> 00:03:54,879
of things they come from the wind

100
00:03:59,270 --> 00:03:57,120
blowing around our spacecraft but more

101
00:04:01,429 --> 00:03:59,280
importantly they come from

102
00:04:03,429 --> 00:04:01,439
seismic waves of

103
00:04:05,110 --> 00:04:03,439
vibrational waves which travel through

104
00:04:07,670 --> 00:04:05,120
the planet from

105
00:04:09,830 --> 00:04:07,680
sources elsewhere on the planet if you

106
00:04:12,630 --> 00:04:09,840
bring up b3

107
00:04:13,670 --> 00:04:12,640
b3 shows an infographic that shows some

108
00:04:17,749 --> 00:04:13,680
of the

109
00:04:19,670 --> 00:04:17,759
mission uh down in the bottom it shows

110
00:04:21,990 --> 00:04:19,680
some of the sources that uh

111
00:04:23,909 --> 00:04:22,000
that create these seismic waves uh

112
00:04:26,710 --> 00:04:23,919
either faults on the surface which are

113
00:04:30,629 --> 00:04:26,720

which are created by forces in the crust

114
00:04:32,790 --> 00:04:30,639
uh due to mostly thermal

115
00:04:33,830 --> 00:04:32,800
thermal anomalies in the in the interior

116
00:04:35,830 --> 00:04:33,840
and

117
00:04:38,710 --> 00:04:35,840
a mantle convection things like that

118
00:04:41,350 --> 00:04:38,720
also possibly by impacts

119
00:04:42,950 --> 00:04:41,360
and these sources create vibrations

120
00:04:45,270 --> 00:04:42,960
create waves that travel through the

121
00:04:47,189 --> 00:04:45,280
planet as they travel through the planet

122
00:04:49,189 --> 00:04:47,199
they are affected by the various

123
00:04:51,590 --> 00:04:49,199
materials that they uh

124
00:04:53,030 --> 00:04:51,600
pass through they're reflected off of

125
00:04:55,110 --> 00:04:53,040
boundaries they're refracted at

126
00:04:57,030 --> 00:04:55,120
boundaries lots of things happen these

127
00:04:59,909 --> 00:04:57,040
ways and the seismologists use

128
00:05:01,830 --> 00:04:59,919
techniques to decode the waves and and

129
00:05:03,670 --> 00:05:01,840
pull from them the information that they

130
00:05:06,230 --> 00:05:03,680
picked up as they go through the planet

131
00:05:08,150 --> 00:05:06,240
and we are able to

132
00:05:10,150 --> 00:05:08,160
basically we've been able to map out the

133
00:05:13,350 --> 00:05:10,160
inside of mars for the very first time

134
00:05:16,070 --> 00:05:13,360
in history we're able to get the size of

135
00:05:18,230 --> 00:05:16,080
the core we're able to deduce something

136
00:05:19,909 --> 00:05:18,240
about its density and therefore the

137
00:05:21,350 --> 00:05:19,919
composition of the core

138
00:05:23,430 --> 00:05:21,360

we've

139
00:05:24,710 --> 00:05:23,440
detected the bottom of the crust and

140
00:05:27,029 --> 00:05:24,720
we're able to

141
00:05:29,350 --> 00:05:27,039
to determine the thickness of the the

142
00:05:32,150 --> 00:05:29,360
martian crust and we've been able to

143
00:05:32,950 --> 00:05:32,160
probe the the mantle of the of of mars

144
00:05:37,830 --> 00:05:32,960
uh

145
00:05:40,390 --> 00:05:37,840
about its temperature structure and it's

146
00:05:43,189 --> 00:05:40,400
uh and it's a mineralogical structure

147
00:05:44,870 --> 00:05:43,199
and so these are the primary goals of

148
00:05:47,110 --> 00:05:44,880
insight the main goals of insight that

149
00:05:50,790 --> 00:05:47,120
we actually put forth when we proposed

150
00:05:53,189 --> 00:05:50,800
this mission uh almost 10 years ago and

151
00:05:55,590 --> 00:05:53,199
we've been able to uh meet all these

152
00:05:57,670 --> 00:05:55,600
goals and during the course of the of of

153
00:05:58,550 --> 00:05:57,680
our mission

154
00:06:00,390 --> 00:05:58,560
um

155
00:06:02,309 --> 00:06:00,400
this mission is

156
00:06:03,909 --> 00:06:02,319
is uh uh

157
00:06:06,390 --> 00:06:03,919
really you know near and dear to my

158
00:06:09,029 --> 00:06:06,400
heart it's been part of my life for even

159
00:06:11,430 --> 00:06:09,039
longer than 10 years i've been

160
00:06:13,590 --> 00:06:11,440
trying to get a seismometer on mars for

161
00:06:15,350 --> 00:06:13,600
most of my professional career

162
00:06:17,029 --> 00:06:15,360
and if you bring up

163
00:06:19,110 --> 00:06:17,039

image b4

164
00:06:21,110 --> 00:06:19,120
it shows a little bit of my personal

165
00:06:24,390 --> 00:06:21,120
connection so that insight was actually

166
00:06:26,309 --> 00:06:24,400
selected uh on my birthday so every time

167
00:06:29,110 --> 00:06:26,319
inside has a birthday i have a birthday

168
00:06:31,029 --> 00:06:29,120
too and uh this is a picture of the

169
00:06:33,430 --> 00:06:31,039
birthday cake that we

170
00:06:35,670 --> 00:06:33,440
my wife and i baked for inside's first

171
00:06:38,710 --> 00:06:35,680
birthday and because we're nerds we made

172
00:06:40,309 --> 00:06:38,720
a spherical birthday cake and

173
00:06:42,070 --> 00:06:40,319
if you look at the the structure of this

174
00:06:43,670 --> 00:06:42,080
cake the size of the corn the thickness

175
00:06:44,550 --> 00:06:43,680
of the crust are actually pretty close

176
00:06:47,110 --> 00:06:44,560
to what

177
00:06:49,670 --> 00:06:47,120
insight was able to determine

178
00:06:51,510 --> 00:06:49,680
many years later so i i think we had a

179
00:06:52,550 --> 00:06:51,520
pretty good idea of what was going on

180
00:06:54,469 --> 00:06:52,560
there

181
00:06:57,749 --> 00:06:54,479
so um

182
00:07:00,550 --> 00:06:57,759
so as uh katya will talk about uh in a

183
00:07:03,189 --> 00:07:00,560
minute uh insight's probably coming to

184
00:07:04,469 --> 00:07:03,199
the end end of its uh scientific life

185
00:07:06,790 --> 00:07:04,479
pretty soon

186
00:07:09,029 --> 00:07:06,800
but i think you know insight has a quite

187
00:07:11,589 --> 00:07:09,039
a legacy and if you look at the last

188
00:07:13,670 --> 00:07:11,599

image b5 that i have here this is a

189
00:07:16,309 --> 00:07:13,680
movie showing sunrise

190
00:07:19,430 --> 00:07:16,319
at mars from from insight that we took

191
00:07:21,510 --> 00:07:19,440
uh a a few months ago and i think that

192
00:07:23,670 --> 00:07:21,520
in a way this is really just the start

193
00:07:25,189 --> 00:07:23,680
of insights legacy the the data that

194
00:07:27,270 --> 00:07:25,199
we've taken over the last three and a

195
00:07:29,430 --> 00:07:27,280
half years and will still be taken in

196
00:07:31,830 --> 00:07:29,440
the next couple of months is all being

197
00:07:33,909 --> 00:07:31,840
you know archived on

198
00:07:36,230 --> 00:07:33,919
websites which are labeled available to

199
00:07:38,309 --> 00:07:36,240
the entire scientific community of the

200
00:07:40,790 --> 00:07:38,319
world and i think the data that we're

201
00:07:43,430 --> 00:07:40,800
taking with the insight seismometer its

202
00:07:45,430 --> 00:07:43,440
weather station its magnetometer and the

203
00:07:46,629 --> 00:07:45,440
precision tracking that we've done uh

204
00:07:48,950 --> 00:07:46,639
will be

205
00:07:51,430 --> 00:07:48,960
yielding with scientific results with uh

206
00:07:52,950 --> 00:07:51,440
new ways of analyzing this data for

207
00:07:54,550 --> 00:07:52,960
decades to come

208
00:07:57,990 --> 00:07:54,560
and with that i'd like to turn it over

209
00:08:00,629 --> 00:07:58,000
to katya de morgan to talk a little bit

210
00:08:02,150 --> 00:08:00,639
about what the situation is on mars with

211
00:08:04,390 --> 00:08:02,160
insight

212
00:08:06,230 --> 00:08:04,400
great thank you bruce um so the big

213
00:08:07,830 --> 00:08:06,240

question is right what what does our

214
00:08:10,790 --> 00:08:07,840
lander look like right now as far as

215
00:08:12,390 --> 00:08:10,800
power consumption if we bring up k1

216
00:08:17,029 --> 00:08:12,400
please

217
00:08:20,309 --> 00:08:18,629
you see on the left hand side here this

218
00:08:21,990 --> 00:08:20,319
is a selfie that was taken to the lander

219
00:08:23,749 --> 00:08:22,000
when we first landed back in november of

220
00:08:25,830 --> 00:08:23,759
2018. that was three and a half years

221
00:08:27,990 --> 00:08:25,840
ago you see the solar panels are nice

222
00:08:30,230 --> 00:08:28,000
and black that allows us to collect

223
00:08:32,469 --> 00:08:30,240
energy from the the sun there and you

224
00:08:35,029 --> 00:08:32,479
can see upon landing we're approximately

225
00:08:37,190 --> 00:08:35,039
about 5 000 watt hours per sole for

226
00:08:38,709 --> 00:08:37,200
available energy to do our operations

227
00:08:40,310 --> 00:08:38,719
now we use the term soul and that's

228
00:08:41,670 --> 00:08:40,320
really referring to a martian day and

229
00:08:43,350 --> 00:08:41,680
it's different than an earth day it's

230
00:08:45,430 --> 00:08:43,360
approximately 40 minutes longer so we do

231
00:08:48,070 --> 00:08:45,440
need to take that difference in time

232
00:08:49,670 --> 00:08:48,080
into our operations timeline so if you

233
00:08:51,509 --> 00:08:49,680
look at the right hand side today we're

234
00:08:53,750 --> 00:08:51,519
at about a tenth of that available power

235
00:08:55,910 --> 00:08:53,760
approximately about 500 watt hours per

236
00:08:57,750 --> 00:08:55,920
sole to do our operations our solar

237
00:08:59,269 --> 00:08:57,760
panels are now covered with some nice

238
00:09:01,269 --> 00:08:59,279

martian dust there you see it looks more

239
00:09:02,870 --> 00:09:01,279
of an orangish kind of color so that

240
00:09:05,110 --> 00:09:02,880
limits the amount of

241
00:09:06,870 --> 00:09:05,120
activities we can do that includes

242
00:09:10,230 --> 00:09:06,880
running the seismometer

243
00:09:13,190 --> 00:09:10,240
other instruments and moving our arm

244
00:09:14,550 --> 00:09:13,200
so if we bring up k2 it'll show a

245
00:09:16,070 --> 00:09:14,560
timeline

246
00:09:18,550 --> 00:09:16,080
of what we're going to be able to do for

247
00:09:19,670 --> 00:09:18,560
the remainder of 2022

248
00:09:23,430 --> 00:09:19,680
so

249
00:09:24,949 --> 00:09:23,440
during spring of 2022

250
00:09:26,389 --> 00:09:24,959
we are going to be running our

251
00:09:28,070 --> 00:09:26,399
seismometer

252
00:09:29,829 --> 00:09:28,080
continuously and that will happen for

253
00:09:32,949 --> 00:09:29,839
another few weeks

254
00:09:35,509 --> 00:09:32,959
we do have a couple of arm activities

255
00:09:36,870 --> 00:09:35,519
that we'd like to finalize

256
00:09:39,030 --> 00:09:36,880
those will be happening in the coming

257
00:09:40,710 --> 00:09:39,040
weeks as well and shortly thereafter

258
00:09:43,110 --> 00:09:40,720
we'll be placing the arm in a retirement

259
00:09:45,269 --> 00:09:43,120
post so if you look at the graphic below

260
00:09:46,949 --> 00:09:45,279
the arm is kind of in an l shape our

261
00:09:48,870 --> 00:09:46,959
retirement pose is kind of in an

262
00:09:51,430 --> 00:09:48,880
inverted v which allows the camera

263
00:09:53,590 --> 00:09:51,440

that's attached to the arm to be able to

264
00:09:56,310 --> 00:09:53,600
take images of the seismometer and the

265
00:09:57,110 --> 00:09:56,320
hp3 mole in front of the actual lander

266
00:09:59,269 --> 00:09:57,120
there

267
00:10:01,190 --> 00:09:59,279
so it takes a lot less energy to run the

268
00:10:02,150 --> 00:10:01,200
camera we'll be able to do that past

269
00:10:05,670 --> 00:10:02,160
spring

270
00:10:07,430 --> 00:10:05,680
now towards the end of summer of 22 um

271
00:10:09,030 --> 00:10:07,440
we anticipate our seismometer to be

272
00:10:10,710 --> 00:10:09,040
turned off not because we want to turn

273
00:10:13,269 --> 00:10:10,720
them off but unfortunately we don't have

274
00:10:15,590 --> 00:10:13,279
the energy to run it we will be running

275
00:10:17,190 --> 00:10:15,600
it in various durations from continuous

276
00:10:18,870 --> 00:10:17,200
to approximately maybe like 12 hours or

277
00:10:20,550 --> 00:10:18,880
six hours for salt

278
00:10:22,630 --> 00:10:20,560
but we do expect to end science

279
00:10:24,949 --> 00:10:22,640
operations at the end of summer

280
00:10:27,910 --> 00:10:24,959
and again uh at that time we'll have

281
00:10:31,110 --> 00:10:27,920
lower energy levels but we'll be able to

282
00:10:33,829 --> 00:10:31,120
monitor the lander power levels maybe

283
00:10:35,590 --> 00:10:33,839
once per saw or every other saw

284
00:10:37,750 --> 00:10:35,600
and again be able to maybe take a couple

285
00:10:39,990 --> 00:10:37,760
of images of the camera there

286
00:10:42,150 --> 00:10:40,000
at the end of the calendar year we do

287
00:10:43,990 --> 00:10:42,160
anticipate to conclude all of inside

288
00:10:45,509 --> 00:10:44,000

operations and again that's just due to

289
00:10:47,269 --> 00:10:45,519
the lack of energy

290
00:10:48,470 --> 00:10:47,279
so our operations team we have a really

291
00:10:50,230 --> 00:10:48,480
bright team

292
00:10:53,030 --> 00:10:50,240
working on the project and we were

293
00:10:54,710 --> 00:10:53,040
sitting there back in 2020 2021 thinking

294
00:10:56,230 --> 00:10:54,720
about what can we do with this energy

295
00:10:59,030 --> 00:10:56,240
situation because it was predicted to

296
00:11:00,630 --> 00:10:59,040
decline so we had a really clever idea

297
00:11:02,389 --> 00:11:00,640
of trying to figure out how we can

298
00:11:04,230 --> 00:11:02,399
actually clean these solar panels and

299
00:11:05,910 --> 00:11:04,240
one of the ideas was using the martian

300
00:11:06,870 --> 00:11:05,920
dirt to clean the dirt off the solar

301
00:11:07,670 --> 00:11:06,880
panels

302
00:11:09,509 --> 00:11:07,680
so

303
00:11:10,870 --> 00:11:09,519
the idea was proposed we all agreed

304
00:11:13,509 --> 00:11:10,880
let's try this i think this is going to

305
00:11:15,350 --> 00:11:13,519
work so if you bring up k3

306
00:11:18,630 --> 00:11:15,360
this is an animation

307
00:11:20,790 --> 00:11:18,640
that you will see where we use the arm

308
00:11:23,750 --> 00:11:20,800
to scoop the dirt

309
00:11:26,710 --> 00:11:23,760
transport it over the lander here and we

310
00:11:28,870 --> 00:11:26,720
slowly let the dirt fall onto the deck

311
00:11:31,030 --> 00:11:28,880
of a lander so that the

312
00:11:32,710 --> 00:11:31,040
dirt is carried over by the solar winds

313
00:11:34,310 --> 00:11:32,720

across the solar panels cleaning it now

314
00:11:36,710 --> 00:11:34,320
if you looked at the left hand corner of

315
00:11:39,509 --> 00:11:36,720
that animation originally started off

316
00:11:41,590 --> 00:11:39,519
orangish color and when the winds blew

317
00:11:43,509 --> 00:11:41,600
the dirt over it turned it into a more

318
00:11:45,110 --> 00:11:43,519
black color allowing us to collect more

319
00:11:46,630 --> 00:11:45,120
energy there so that was really good

320
00:11:48,230 --> 00:11:46,640
cleaning we've done this six times

321
00:11:50,230 --> 00:11:48,240
successfully

322
00:11:51,990 --> 00:11:50,240
doing this allowed us to

323
00:11:54,949 --> 00:11:52,000
continue to run our seismometer

324
00:11:56,470 --> 00:11:54,959
continuously for four to six weeks so

325
00:11:57,750 --> 00:11:56,480
luckily we've been able to do that so

326
00:11:59,829 --> 00:11:57,760
that we were able to catch that last

327
00:12:02,150 --> 00:11:59,839
mars quake in the last few weeks so

328
00:12:03,590 --> 00:12:02,160
that's really really exciting for us so

329
00:12:05,269 --> 00:12:03,600
you know it's an amazing team that we've

330
00:12:06,550 --> 00:12:05,279
worked on we've captured a lot of

331
00:12:08,310 --> 00:12:06,560
lessons learned based on all the

332
00:12:09,910 --> 00:12:08,320
challenges that we've endured on the

333
00:12:11,430 --> 00:12:09,920
martian environment and we're hoping

334
00:12:13,269 --> 00:12:11,440
that this will be carried into future

335
00:12:16,230 --> 00:12:13,279
missions i'm here to talk a little bit

336
00:12:18,389 --> 00:12:16,240
more about that is lori glaze

337
00:12:20,710 --> 00:12:18,399
great thank you katya

338
00:12:23,350 --> 00:12:20,720

yeah so the you know the insight mission

339
00:12:25,350 --> 00:12:23,360
has really just been an incredible

340
00:12:27,590 --> 00:12:25,360
mission for us it's given us a glimpse

341
00:12:31,030 --> 00:12:27,600
of mars that we couldn't get from any

342
00:12:32,629 --> 00:12:31,040
other spacecraft in our nasa mars fleet

343
00:12:34,550 --> 00:12:32,639
an interpretation of the insight data

344
00:12:37,190 --> 00:12:34,560
have really furthered our understanding

345
00:12:38,790 --> 00:12:37,200
of how rocky planets form throughout the

346
00:12:40,710 --> 00:12:38,800
universe and you know in addition to

347
00:12:43,990 --> 00:12:40,720
just at mars so if i can

348
00:12:45,509 --> 00:12:44,000
pull up uh the graphic l1 um i just

349
00:12:48,230 --> 00:12:45,519
wanted to remind folks that you know

350
00:12:50,949 --> 00:12:48,240
nasa's uh discovery program insight is

351
00:12:52,949 --> 00:12:50,959
part of that discovery program um and as

352
00:12:54,550 --> 00:12:52,959
i said i mean it's not just telling us

353
00:12:56,710 --> 00:12:54,560
information about mars but broadening

354
00:12:58,310 --> 00:12:56,720
our planetary science understanding and

355
00:13:00,629 --> 00:12:58,320
helping us think differently about other

356
00:13:02,710 --> 00:13:00,639
rocky planets across the solar system

357
00:13:04,710 --> 00:13:02,720
and beyond i think you know

358
00:13:06,790 --> 00:13:04,720
understanding mars and studying mars's

359
00:13:08,710 --> 00:13:06,800
interior structure answers key questions

360
00:13:10,310 --> 00:13:08,720
about the early formation of these rocky

361
00:13:12,550 --> 00:13:10,320
planets in our inner solar system

362
00:13:13,590 --> 00:13:12,560
including mercury venus earth earth's

363
00:13:15,750 --> 00:13:13,600

moon

364
00:13:17,190 --> 00:13:15,760
and mars and you know trying to

365
00:13:19,190 --> 00:13:17,200
understand what they were like more than

366
00:13:22,310 --> 00:13:19,200
four billion years ago as well as

367
00:13:24,470 --> 00:13:22,320
helping us understand rocky exoplanets

368
00:13:27,590 --> 00:13:24,480
and we're just so lucky to have this

369
00:13:29,750 --> 00:13:27,600
great nursery of rocky planets nearby

370
00:13:31,829 --> 00:13:29,760
that we can study and help inform how we

371
00:13:33,509 --> 00:13:31,839
interpret data for some of the distant

372
00:13:35,190 --> 00:13:33,519
exoplanets of thousands of distant

373
00:13:37,750 --> 00:13:35,200
exoplanets that we're discovering now

374
00:13:41,350 --> 00:13:37,760
hundreds of which are we believe

375
00:13:43,509 --> 00:13:41,360
terrestrial or rocky exoplanets

376
00:13:45,829 --> 00:13:43,519
so i wanted to say a few words about

377
00:13:47,750 --> 00:13:45,839
insight's power system um thinking about

378
00:13:50,310 --> 00:13:47,760
it from the mission

379
00:13:52,310 --> 00:13:50,320
development perspective for each mission

380
00:13:54,150 --> 00:13:52,320
you know we decide what power source is

381
00:13:55,269 --> 00:13:54,160
most appropriate based on its science

382
00:13:57,910 --> 00:13:55,279
goals

383
00:14:00,629 --> 00:13:57,920
discovery class mission like insight

384
00:14:03,189 --> 00:14:00,639
is very very focused and our goal really

385
00:14:05,829 --> 00:14:03,199
is to maximize the incredible science

386
00:14:07,430 --> 00:14:05,839
return that we can get from each mission

387
00:14:10,389 --> 00:14:07,440
the principal investigator is

388
00:14:12,069 --> 00:14:10,399

responsible for making that happen

389
00:14:14,550 --> 00:14:12,079
and one way to do that is to implement

390
00:14:17,670 --> 00:14:14,560
hardware that's flown before the use of

391
00:14:19,670 --> 00:14:17,680
such heritage we call heritage hardware

392
00:14:22,069 --> 00:14:19,680
allows the mission funding to be used to

393
00:14:24,389 --> 00:14:22,079
help us get the most science that we

394
00:14:26,389 --> 00:14:24,399
possibly can out of each mission and in

395
00:14:28,230 --> 00:14:26,399
the case of insight the mission is

396
00:14:30,310 --> 00:14:28,240
powered by those two solar panels that

397
00:14:32,470 --> 00:14:30,320
katie was showing you and those solar

398
00:14:34,790 --> 00:14:32,480
panels had worked previously

399
00:14:37,350 --> 00:14:34,800
successfully on the proven design of

400
00:14:38,310 --> 00:14:37,360
nasa's the mars phoenix lander which

401
00:14:40,710 --> 00:14:38,320
flew

402
00:14:42,710 --> 00:14:40,720
before insight

403
00:14:45,030 --> 00:14:42,720
and so those solar panels on inside were

404
00:14:46,710 --> 00:14:45,040
really only meant to provide power or

405
00:14:48,310 --> 00:14:46,720
designed to provide power for the

406
00:14:51,189 --> 00:14:48,320
primary mission but i feel like we've

407
00:14:54,230 --> 00:14:51,199
been so lucky to get an extra year and a

408
00:14:56,710 --> 00:14:54,240
half of bonus science during the

409
00:14:58,389 --> 00:14:56,720
insight extended mission

410
00:15:00,310 --> 00:14:58,399
and so just thinking about those three

411
00:15:02,470 --> 00:15:00,320
and a half years of primary and extended

412
00:15:05,590 --> 00:15:02,480
operations uh you know you heard bruce

413
00:15:07,030 --> 00:15:05,600

talking about some of the amazing uh

414
00:15:08,550 --> 00:15:07,040
science accomplishments that have been

415
00:15:10,310 --> 00:15:08,560
achieved by the mission i just thought i

416
00:15:12,230 --> 00:15:10,320
would mention you know a few of my

417
00:15:13,829 --> 00:15:12,240
favorite um you know first of all i

418
00:15:16,629 --> 00:15:13,839
think the ability

419
00:15:19,269 --> 00:15:16,639
to see into the interior of the planet

420
00:15:21,350 --> 00:15:19,279
this is something that we can try to do

421
00:15:23,910 --> 00:15:21,360
a little bit from orbit but to to

422
00:15:26,310 --> 00:15:23,920
overcome that constraint of only being

423
00:15:27,829 --> 00:15:26,320
able to see from from the outside really

424
00:15:30,150 --> 00:15:27,839
required

425
00:15:32,790 --> 00:15:30,160
this seismic instrument on the surface

426
00:15:33,749 --> 00:15:32,800
of mars as bruce said he's been dreaming

427
00:15:35,430 --> 00:15:33,759
of

428
00:15:37,670 --> 00:15:35,440
quite a long time

429
00:15:38,790 --> 00:15:37,680
you know secondly the ability of insight

430
00:15:40,470 --> 00:15:38,800
to determine

431
00:15:42,790 --> 00:15:40,480
the state of the core

432
00:15:44,870 --> 00:15:42,800
the the liquid state of the core

433
00:15:46,710 --> 00:15:44,880
from the precise measure of the wobble

434
00:15:48,629 --> 00:15:46,720
of the planet as it spins to me that is

435
00:15:50,710 --> 00:15:48,639
just almost mind-blowing just the level

436
00:15:52,389 --> 00:15:50,720
of precision that's required

437
00:15:54,710 --> 00:15:52,399
to get that measurement

438
00:15:57,509 --> 00:15:54,720

and then finally just using the the

439
00:15:58,949 --> 00:15:57,519
seismic data uh as a means to learn more

440
00:16:00,870 --> 00:15:58,959
about the density and structure of the

441
00:16:02,790 --> 00:16:00,880
crust to me it's just been so cool

442
00:16:04,310 --> 00:16:02,800
including you know that while the crust

443
00:16:06,389 --> 00:16:04,320
is perhaps thinner than expected that

444
00:16:08,629 --> 00:16:06,399
there may be two or even possibly three

445
00:16:11,269 --> 00:16:08,639
sub layers within the crust

446
00:16:14,790 --> 00:16:11,279
so finally i want to wrap up by thanking

447
00:16:17,509 --> 00:16:14,800
bruce and his incredibly dedicated team

448
00:16:19,350 --> 00:16:17,519
that met every challenge with innovation

449
00:16:20,870 --> 00:16:19,360
and creativity

450
00:16:22,550 --> 00:16:20,880
you know they've had many challenges

451
00:16:24,870 --> 00:16:22,560
mars didn't

452
00:16:27,749 --> 00:16:24,880
want to cooperate in some cases

453
00:16:29,829 --> 00:16:27,759
but this team was so creative over and

454
00:16:32,310 --> 00:16:29,839
over to come up with amazing ways to

455
00:16:34,629 --> 00:16:32,320
keep trying and not giving up on

456
00:16:36,470 --> 00:16:34,639
maximizing the science return

457
00:16:37,910 --> 00:16:36,480
and the incredible legacy as bruce does

458
00:16:39,990 --> 00:16:37,920
the legacy of this mission that's going

459
00:16:42,230 --> 00:16:40,000
to live on far beyond the lifetime of

460
00:16:44,069 --> 00:16:42,240
the spacecraft you know they've found uh

461
00:16:45,269 --> 00:16:44,079
creative ways to use the scoop you saw

462
00:16:47,430 --> 00:16:45,279
the the

463
00:16:48,949 --> 00:16:47,440

the video that uh that katie was showing

464
00:16:51,189 --> 00:16:48,959
showing picking up the dust with the

465
00:16:53,030 --> 00:16:51,199
scoop and rallying rattling the dust off

466
00:16:54,949 --> 00:16:53,040
of the arrays and a variety of other

467
00:16:56,389 --> 00:16:54,959
things as well so i have a tremendous

468
00:16:57,749 --> 00:16:56,399
amount of respect for bruce and his

469
00:17:00,629 --> 00:16:57,759
entire team

470
00:17:03,269 --> 00:17:00,639
so if you can pull up graphic l2

471
00:17:05,029 --> 00:17:03,279
i just want to again restate as bruce

472
00:17:06,470 --> 00:17:05,039
says the legacy that these measurements

473
00:17:09,029 --> 00:17:06,480
and discoveries of insight are going to

474
00:17:11,270 --> 00:17:09,039
hold for a very very long time they're

475
00:17:13,750 --> 00:17:11,280
unique and special and we've made

476
00:17:15,669 --> 00:17:13,760
incredible advance advances in

477
00:17:17,669 --> 00:17:15,679
understanding the interior of mars that

478
00:17:20,069 --> 00:17:17,679
are not likely to be improved for

479
00:17:22,309 --> 00:17:20,079
decades and so as you kind of look at

480
00:17:25,029 --> 00:17:22,319
the sunset as viewed from insight we

481
00:17:26,870 --> 00:17:25,039
will think forward to the sunset of the

482
00:17:28,710 --> 00:17:26,880
spacecraft but not the sunset of the

483
00:17:30,710 --> 00:17:28,720
science that's going to continue to come

484
00:17:35,590 --> 00:17:30,720
thank you

485
00:17:37,909 --> 00:17:35,600
speakers we are now ready to take media

486
00:17:40,150 --> 00:17:37,919
questions remember to press star one to

487
00:17:42,230 --> 00:17:40,160
get put in the queue and please direct

488
00:17:44,070 --> 00:17:42,240

your questions to one of the panelists

489
00:17:46,150 --> 00:17:44,080
we're also taking questions through the

490
00:17:48,070 --> 00:17:46,160
ask nasa

491
00:17:49,510 --> 00:17:48,080
if you are a member of the media asking

492
00:17:52,230 --> 00:17:49,520
questions and watching this

493
00:17:53,909 --> 00:17:52,240
teleconference on your computer please

494
00:17:56,310 --> 00:17:53,919
mute your computer speakers before

495
00:17:58,950 --> 00:17:56,320
asking your questions or else you will

496
00:18:01,110 --> 00:17:58,960
hear some feedback on the line

497
00:18:04,789 --> 00:18:01,120
up first is

498
00:18:07,350 --> 00:18:04,799
marcia dunn with the associated press

499
00:18:09,909 --> 00:18:07,360
yes hi can you hear me

500
00:18:11,750 --> 00:18:09,919
yes we can hear you oh good for dr

501
00:18:13,430 --> 00:18:11,760
banner i'm just wondering if you and

502
00:18:16,070 --> 00:18:13,440
your team are already in mourning there

503
00:18:19,029 --> 00:18:16,080
must be a sense of sadness about this

504
00:18:20,950 --> 00:18:19,039
and and when we think of

505
00:18:22,870 --> 00:18:20,960
mars landers we think of opportunity

506
00:18:24,870 --> 00:18:22,880
being taken out by this massive dust

507
00:18:27,350 --> 00:18:24,880
storm and i know that wasn't the case

508
00:18:29,110 --> 00:18:27,360
here was it just drips and drabs of dust

509
00:18:31,430 --> 00:18:29,120
over the years just

510
00:18:34,310 --> 00:18:31,440
finally taking its toll

511
00:18:35,909 --> 00:18:34,320
and and lastly for the uh for the german

512
00:18:37,430 --> 00:18:35,919
experiment the mole

513
00:18:39,029 --> 00:18:37,440

what's the bottom line on why that

514
00:18:43,190 --> 00:18:39,039
didn't work do you think was it just an

515
00:18:45,350 --> 00:18:43,200
unlucky place to land dirt wise thanks

516
00:18:47,270 --> 00:18:45,360
okay so first of all um there really

517
00:18:49,270 --> 00:18:47,280
hasn't been too much doom and gloom on

518
00:18:51,510 --> 00:18:49,280
the team we're really still focused on

519
00:18:53,669 --> 00:18:51,520
on operating the spacecraft it's it's

520
00:18:56,390 --> 00:18:53,679
it's a it's a busy it's a it's a

521
00:18:58,789 --> 00:18:56,400
full-time job keeping keeping this uh

522
00:19:00,150 --> 00:18:58,799
this spacecraft alive and operating and

523
00:19:02,230 --> 00:19:00,160
getting science

524
00:19:04,789 --> 00:19:02,240
on mars and we're still you know

525
00:19:06,390 --> 00:19:04,799
figuring out how to get the most uh most

526
00:19:07,909 --> 00:19:06,400
science out of it get the most data out

527
00:19:09,590 --> 00:19:07,919
of it and you know every day you know

528
00:19:10,630 --> 00:19:09,600
we're figuring out how to optimize

529
00:19:12,390 --> 00:19:10,640
things so

530
00:19:14,150 --> 00:19:12,400
we really haven't had time to really

531
00:19:16,630 --> 00:19:14,160
reflect on what's coming up and that

532
00:19:18,630 --> 00:19:16,640
that i think that'll probably come

533
00:19:21,110 --> 00:19:18,640
later this summer so

534
00:19:23,510 --> 00:19:21,120
you know tune back in later and ask us

535
00:19:26,390 --> 00:19:23,520
how sad we are and when we have time

536
00:19:29,590 --> 00:19:26,400
we'll tell you um in terms of let's see

537
00:19:32,230 --> 00:19:29,600
so the the in terms of the hp cube mole

538
00:19:34,710 --> 00:19:32,240

um the problem we had with that was that

539
00:19:35,990 --> 00:19:34,720
we ran into an unexpected kind of soil

540
00:19:38,549 --> 00:19:36,000
we we

541
00:19:40,710 --> 00:19:38,559
designed the mold to penetrate into

542
00:19:41,909 --> 00:19:40,720
sandy unconsolidated soil the kind that

543
00:19:45,909 --> 00:19:41,919
we've seen

544
00:19:47,190 --> 00:19:45,919
at spirit opportunity before us and even

545
00:19:53,990 --> 00:19:47,200
at

546
00:19:56,150 --> 00:19:54,000
be landing on but it turned out the

547
00:19:58,630 --> 00:19:56,160
particular soil that was underneath

548
00:20:02,630 --> 00:19:58,640
insight when we landed had a

549
00:20:05,350 --> 00:20:02,640
consolidated uh layer of crusty soil at

550
00:20:07,350 --> 00:20:05,360
the very top and that crusty soil sort

551
00:20:10,390 --> 00:20:07,360
of disintegrated as the mold tried to

552
00:20:12,549 --> 00:20:10,400
penetrate and thus was not able to

553
00:20:14,149 --> 00:20:12,559
provide the the friction on the sides of

554
00:20:17,909 --> 00:20:14,159
the mold that we required to keep it

555
00:20:19,590 --> 00:20:17,919
from rebounding as it went down and so

556
00:20:22,149 --> 00:20:19,600
the the good news is we learned

557
00:20:23,909 --> 00:20:22,159
something new about the soil of mars uh

558
00:20:25,590 --> 00:20:23,919
the bad news is we weren't able to get

559
00:20:27,990 --> 00:20:25,600
down more than just

560
00:20:29,510 --> 00:20:28,000
to be able to bury the mole itself and

561
00:20:31,190 --> 00:20:29,520
we weren't able to get our heat flow

562
00:20:32,310 --> 00:20:31,200
measurement that that we had wanted to

563
00:20:34,710 --> 00:20:32,320

get

564
00:20:36,549 --> 00:20:34,720
we're still able to do a lot of uh

565
00:20:37,909 --> 00:20:36,559
science with the mole get uh some

566
00:20:40,149 --> 00:20:37,919
thermal measurements and physical

567
00:20:41,990 --> 00:20:40,159
measurements on the soil itself but you

568
00:20:43,830 --> 00:20:42,000
know getting not being able to get that

569
00:20:46,390 --> 00:20:43,840
heat flow measurement was probably the

570
00:20:48,549 --> 00:20:46,400
the biggest disappointment uh of of the

571
00:20:50,310 --> 00:20:48,559
mission

572
00:20:52,470 --> 00:20:50,320
and as far as the

573
00:20:54,630 --> 00:20:52,480
the problem with the dust that's not

574
00:20:56,710 --> 00:20:54,640
from one big storm but it's what just an

575
00:20:57,990 --> 00:20:56,720
accumulation over natural dusting over

576
00:21:00,470 --> 00:20:58,000
the years

577
00:21:02,630 --> 00:21:00,480
yeah it's an accumulation and we we had

578
00:21:04,549 --> 00:21:02,640
predicted sort of the rate of commut of

579
00:21:07,510 --> 00:21:04,559
accumulation based on previous missions

580
00:21:09,110 --> 00:21:07,520
and it was about what we expected um

581
00:21:10,630 --> 00:21:09,120
what we had hoped for was that every

582
00:21:12,789 --> 00:21:10,640
once in a while those the panels might

583
00:21:14,630 --> 00:21:12,799
get cleaned off by uh

584
00:21:16,390 --> 00:21:14,640
particularly high gusts of wind or

585
00:21:18,789 --> 00:21:16,400
perhaps dust devils

586
00:21:21,350 --> 00:21:18,799
has happened with spirit and opportunity

587
00:21:23,590 --> 00:21:21,360
but we're apparently in a place on mars

588
00:21:26,630 --> 00:21:23,600

that doesn't have as many dust devils as

589
00:21:29,270 --> 00:21:26,640
gooseberry crater or mariana planum

590
00:21:31,110 --> 00:21:29,280
so that just hasn't happened to us yet

591
00:21:33,110 --> 00:21:31,120
it could still happen there there are

592
00:21:35,990 --> 00:21:33,120
lots of dust devils around us we've

593
00:21:37,510 --> 00:21:36,000
actually been able to sense uh several

594
00:21:40,549 --> 00:21:37,520
thousand dust devils with our very

595
00:21:42,630 --> 00:21:40,559
sensitive uh pressure sensor that that

596
00:21:45,190 --> 00:21:42,640
sees the the dip in atmospheric pressure

597
00:21:47,750 --> 00:21:45,200
as they go by but none of them have

598
00:21:51,029 --> 00:21:47,760
quite hit us dead on yet enough to blow

599
00:21:53,669 --> 00:21:51,039
the dust off the panels so

600
00:21:55,350 --> 00:21:53,679
we're still watching for that um we're

601
00:21:56,950 --> 00:21:55,360
not too hopeful given that it's been

602
00:22:01,669 --> 00:21:56,960
three and a half years and we haven't

603
00:22:06,870 --> 00:22:03,510
thank you bruce up next we have

604
00:22:08,549 --> 00:22:06,880
elizabeth howell with space.com

605
00:22:10,710 --> 00:22:08,559
thanks everyone for the time today this

606
00:22:12,390 --> 00:22:10,720
is probably for katya you did provide a

607
00:22:14,149 --> 00:22:12,400
little bit of detail about what the ramp

608
00:22:15,350 --> 00:22:14,159
down plan is going to be for insight but

609
00:22:17,750 --> 00:22:15,360
i was wondering if you could kind of

610
00:22:19,190 --> 00:22:17,760
give both a sequence for the instruments

611
00:22:20,950 --> 00:22:19,200
and a sequence for the science

612
00:22:23,110 --> 00:22:20,960
especially after the seismometer is shut

613
00:22:24,149 --> 00:22:23,120

off

614
00:22:27,990 --> 00:22:24,159
so

615
00:22:31,350 --> 00:22:28,000
mentioned the next couple of weeks we'll

616
00:22:32,870 --> 00:22:31,360
be running it continuously um in about

617
00:22:34,630 --> 00:22:32,880
three weeks we're probably going to

618
00:22:36,630 --> 00:22:34,640
reach the threshold we don't have the

619
00:22:39,190 --> 00:22:36,640
energy to keep it on continuously so

620
00:22:41,430 --> 00:22:39,200
we'll uh be turning it on probably for a

621
00:22:43,430 --> 00:22:41,440
duration of maybe half a saw

622
00:22:45,190 --> 00:22:43,440
and then maybe every other every other

623
00:22:47,350 --> 00:22:45,200
saw depending on

624
00:22:49,510 --> 00:22:47,360
how much energy that's going to take

625
00:22:51,590 --> 00:22:49,520
and we'll keep doing that um until we

626
00:22:54,870 --> 00:22:51,600
just don't have an event enough energy

627
00:22:56,710 --> 00:22:54,880
to keep the seismometer on at all um

628
00:22:58,630 --> 00:22:56,720
let's see did you had a secondary

629
00:23:00,310 --> 00:22:58,640
question i'm sorry could you repeat that

630
00:23:01,830 --> 00:23:00,320
yes exactly i wanted to know about the

631
00:23:03,270 --> 00:23:01,840
instruments and also about the science

632
00:23:04,470 --> 00:23:03,280
thank you

633
00:23:05,990 --> 00:23:04,480
yeah so so the remainder of the

634
00:23:08,549 --> 00:23:06,000
instruments are priorities to keep the

635
00:23:11,110 --> 00:23:08,559
seismometer on so we will keep on the

636
00:23:13,110 --> 00:23:11,120
other instruments as long as possible

637
00:23:14,789 --> 00:23:13,120
but um once we

638
00:23:17,270 --> 00:23:14,799

no longer can keep them on which is

639
00:23:18,630 --> 00:23:17,280
probably anticipated um you know summer

640
00:23:21,270 --> 00:23:18,640
time period

641
00:23:23,750 --> 00:23:21,280
then unfortunately they will just be in

642
00:23:25,669 --> 00:23:23,760
you know permanent uh off state and um

643
00:23:27,830 --> 00:23:25,679
we'll be working with the uh instrument

644
00:23:29,110 --> 00:23:27,840
teams to do uh science close out at that

645
00:23:30,549 --> 00:23:29,120
point

646
00:23:32,789 --> 00:23:30,559
yeah i can talk a little bit to the

647
00:23:33,990 --> 00:23:32,799
science um you know we're the the

648
00:23:36,470 --> 00:23:34,000
science team

649
00:23:38,950 --> 00:23:36,480
is is has uh funding through the end of

650
00:23:42,230 --> 00:23:38,960
this fiscal year at least we actually

651
00:23:44,149 --> 00:23:42,240
have uh uh our budget set up to continue

652
00:23:46,950 --> 00:23:44,159
for about six months after

653
00:23:49,669 --> 00:23:46,960
the end of the of the mission to sort of

654
00:23:51,830 --> 00:23:49,679
finish taking all the data preparing it

655
00:23:54,149 --> 00:23:51,840
putting it in the archive and and

656
00:23:57,590 --> 00:23:54,159
getting our our final data products you

657
00:23:59,350 --> 00:23:57,600
know our final uh mars quake catalog and

658
00:24:00,950 --> 00:23:59,360
our final mars models and things like

659
00:24:03,510 --> 00:24:00,960
that so the scientists are going to be

660
00:24:07,190 --> 00:24:03,520
very busy even for another uh probably

661
00:24:09,430 --> 00:24:07,200
half year after um after the the the

662
00:24:11,269 --> 00:24:09,440
spacecraft itself is is no longer

663
00:24:13,029 --> 00:24:11,279

operating but that's just the beginning

664
00:24:14,950 --> 00:24:13,039
because that data as i said is going to

665
00:24:15,990 --> 00:24:14,960
be available to the entire scientific

666
00:24:18,789 --> 00:24:16,000
community

667
00:24:21,269 --> 00:24:18,799
even now we're putting our data into the

668
00:24:24,390 --> 00:24:21,279
publicly available archive every three

669
00:24:27,750 --> 00:24:24,400
months and so um our data is is going

670
00:24:30,549 --> 00:24:27,760
into uh the uh the scientific community

671
00:24:32,390 --> 00:24:30,559
uh with a fairly short you know delay we

672
00:24:34,470 --> 00:24:32,400
only take about as i said about three

673
00:24:36,789 --> 00:24:34,480
months to make sure that you know we've

674
00:24:38,549 --> 00:24:36,799
taken out all the the data errors and

675
00:24:40,710 --> 00:24:38,559
then prepared it in the right formats

676
00:24:42,390 --> 00:24:40,720
and things like that so that data is

677
00:24:44,390 --> 00:24:42,400
going to be out there and

678
00:24:46,950 --> 00:24:44,400
scientists all over the country and all

679
00:24:48,950 --> 00:24:46,960
over the world can can be using that

680
00:24:50,710 --> 00:24:48,960
data without

681
00:24:53,750 --> 00:24:50,720
without any hesitation you know from

682
00:25:00,390 --> 00:24:56,310
okay thank you up next we have marina

683
00:25:02,390 --> 00:25:00,400
coren with the atlantic

684
00:25:04,630 --> 00:25:02,400
hi this question is for bruce or for

685
00:25:06,390 --> 00:25:04,640
katya do you have a specific date or

686
00:25:07,990 --> 00:25:06,400
even a week that you're targeting for

687
00:25:11,190 --> 00:25:08,000
the end of operations just something

688
00:25:12,710 --> 00:25:11,200

more specific than the end of the summer

689
00:25:14,230 --> 00:25:12,720
and then i know you said you predicted

690
00:25:15,990 --> 00:25:14,240
the amount of dust accumulation that

691
00:25:18,070 --> 00:25:16,000
you'd see on the solar panels and so you

692
00:25:19,990 --> 00:25:18,080
kind of knew what to expect but does

693
00:25:21,750 --> 00:25:20,000
anyone on the team wish at the end of

694
00:25:23,590 --> 00:25:21,760
the day that insight left earth with

695
00:25:25,430 --> 00:25:23,600
hardware specifically designed to keep

696
00:25:29,510 --> 00:25:25,440
those clean and to give the spacecraft a

697
00:25:31,669 --> 00:25:29,520
longer lifespan thanks

698
00:25:33,350 --> 00:25:31,679
well for the last question really well

699
00:25:35,190 --> 00:25:33,360
there's a lot of things that i wish were

700
00:25:36,950 --> 00:25:35,200
on the spacecraft and something to clean

701
00:25:39,510 --> 00:25:36,960
off the solar panels it's pretty tight

702
00:25:41,350 --> 00:25:39,520
on my list but

703
00:25:44,789 --> 00:25:41,360
whenever you put together a mission like

704
00:25:46,950 --> 00:25:44,799
this everything is a compromise um it's

705
00:25:49,909 --> 00:25:46,960
just like you know buying a car i would

706
00:25:52,630 --> 00:25:49,919
love to have a top-end audi or something

707
00:25:55,669 --> 00:25:52,640
like that but my my budget's more in the

708
00:25:58,710 --> 00:25:55,679
volkswagen range so you know i

709
00:26:00,630 --> 00:25:58,720
we we put on the uh the the pieces of

710
00:26:02,710 --> 00:26:00,640
the spacecraft that would do the job

711
00:26:05,110 --> 00:26:02,720
that we needed to do and we tried to

712
00:26:06,789 --> 00:26:05,120
figure out how to optimize that and you

713
00:26:08,870 --> 00:26:06,799

know if we put more money into the solar

714
00:26:11,190 --> 00:26:08,880
array we would have less to uh put into

715
00:26:13,990 --> 00:26:11,200
the science instruments and so we tried

716
00:26:16,630 --> 00:26:14,000
to find the right balance and uh

717
00:26:18,310 --> 00:26:16,640
whereas i would i would

718
00:26:19,909 --> 00:26:18,320
love to go to nasa and have them say

719
00:26:22,390 --> 00:26:19,919
yeah you have an unlimited budget do

720
00:26:24,950 --> 00:26:22,400
whatever you want um but

721
00:26:30,470 --> 00:26:24,960
that would probably add a lot to the

722
00:26:34,710 --> 00:26:31,510
thank you

723
00:26:36,470 --> 00:26:34,720
for the end of operations

724
00:26:37,510 --> 00:26:36,480
oh would you mind repeating that again

725
00:26:40,149 --> 00:26:37,520
please

726
00:26:41,909 --> 00:26:40,159
oh sorry um yeah i'm just uh curious if

727
00:26:43,669 --> 00:26:41,919
you have a specific date or even just

728
00:26:45,029 --> 00:26:43,679
like a week at the end of the summer

729
00:26:47,110 --> 00:26:45,039
where you're targeting the end of

730
00:26:49,590 --> 00:26:47,120
operation

731
00:26:50,830 --> 00:26:49,600
um based on our current energy level i'm

732
00:26:53,110 --> 00:26:50,840
going to

733
00:26:56,630 --> 00:26:53,120
approximate mid

734
00:26:58,710 --> 00:26:56,640
july maybe early july but again i mean

735
00:27:00,950 --> 00:26:58,720
summer is really what we're we're able

736
00:27:03,029 --> 00:27:00,960
to project

737
00:27:04,710 --> 00:27:03,039
yeah and and really we're in a an

738
00:27:06,549 --> 00:27:04,720

operating regime that we've never been

739
00:27:08,390 --> 00:27:06,559
in before and so you know

740
00:27:11,269 --> 00:27:08,400
as power goes down

741
00:27:13,510 --> 00:27:11,279
um we're not actually sure exactly how

742
00:27:15,510 --> 00:27:13,520
well the the spacecraft will perform i

743
00:27:18,710 --> 00:27:15,520
mean it's it's exceeded our our

744
00:27:21,350 --> 00:27:18,720
expectations uh just about at every turn

745
00:27:23,190 --> 00:27:21,360
on mars and so it may actually last

746
00:27:25,029 --> 00:27:23,200
longer than that

747
00:27:26,789 --> 00:27:25,039
the other thing is that the weather is

748
00:27:28,870 --> 00:27:26,799
actually pretty unpredictable this time

749
00:27:30,549 --> 00:27:28,880
of year we could have a little bit more

750
00:27:32,870 --> 00:27:30,559
dustiness we could actually have a dust

751
00:27:35,669 --> 00:27:32,880
storm that could shut things down a lot

752
00:27:37,909 --> 00:27:35,679
sooner than we expect or it may not be

753
00:27:40,149 --> 00:27:37,919
quite as dusty this year as is average

754
00:27:42,389 --> 00:27:40,159
which is allowed to go longer and so

755
00:27:44,870 --> 00:27:42,399
there's uh an uncertainty in the the

756
00:27:47,029 --> 00:27:44,880
weather at mars there's an uncertainty

757
00:27:48,870 --> 00:27:47,039
in just you know how well the the

758
00:27:51,190 --> 00:27:48,880
spacecraft will operate when it really

759
00:27:52,710 --> 00:27:51,200
gets down to the the sort of the

760
00:27:54,710 --> 00:27:52,720
the the

761
00:27:57,669 --> 00:27:54,720
drips and droughts of the of of its

762
00:27:59,590 --> 00:27:57,679
battery life um so there's really too

763
00:28:02,630 --> 00:27:59,600

many uncertainties here to pin it down

764
00:28:04,230 --> 00:28:02,640
any better than that um we're hoping for

765
00:28:05,750 --> 00:28:04,240
for more and

766
00:28:07,669 --> 00:28:05,760
we're working to get it as much as we

767
00:28:09,350 --> 00:28:07,679
can but we'll just have to see what what

768
00:28:13,430 --> 00:28:09,360
mars and insight

769
00:28:17,909 --> 00:28:15,110
marina thank you i think those were both

770
00:28:23,510 --> 00:28:21,830
up next we have bill harwood with cbs

771
00:28:26,149 --> 00:28:23,520
yeah hey it's uh it's bill harwood at

772
00:28:28,149 --> 00:28:26,159
the cape um a question for katya if i

773
00:28:30,630 --> 00:28:28,159
could is there a way to compare the

774
00:28:32,470 --> 00:28:30,640
energy required to run the seismometer

775
00:28:34,149 --> 00:28:32,480
with something that might be familiar to

776
00:28:35,510 --> 00:28:34,159
people in their homes i mean

777
00:28:38,310 --> 00:28:35,520
you know is it like a hair dryer

778
00:28:39,750 --> 00:28:38,320
requirement or a big light bulb or

779
00:28:41,830 --> 00:28:39,760
any is there i don't know what it

780
00:28:44,549 --> 00:28:41,840
actually consumes to get a sense of how

781
00:28:46,950 --> 00:28:44,559
much power you need to operate it thanks

782
00:28:49,190 --> 00:28:46,960
yeah so we actually uh did consult with

783
00:28:51,029 --> 00:28:49,200
our eps experts on that to give people a

784
00:28:54,230 --> 00:28:51,039
more like what is it really like here on

785
00:28:56,070 --> 00:28:54,240
earth so we kind of use an electric oven

786
00:28:58,310 --> 00:28:56,080
um as kind of a

787
00:28:59,830 --> 00:28:58,320
a marker to give people understanding so

788
00:29:01,909 --> 00:28:59,840

when we first landed it was about an

789
00:29:04,470 --> 00:29:01,919
hour 40 minutes or so where you can run

790
00:29:07,909 --> 00:29:04,480
electric oven nowadays we could probably

791
00:29:09,590 --> 00:29:07,919
run that approximately 10 minutes max so

792
00:29:12,070 --> 00:29:09,600
that'll give you a good understanding of

793
00:29:16,389 --> 00:29:12,080
how much energy has decreased

794
00:29:22,470 --> 00:29:18,789
and now we're going to take a social

795
00:29:24,789 --> 00:29:22,480
media question io on youtube is asking

796
00:29:28,230 --> 00:29:24,799
will seismometers similar to insight be

797
00:29:29,430 --> 00:29:28,240
placed on other moon planets in the

798
00:29:32,549 --> 00:29:29,440
future

799
00:29:34,789 --> 00:29:32,559
uh lori would you like to take that one

800
00:29:36,070 --> 00:29:34,799
i would love to take that one yeah i

801
00:29:38,230 --> 00:29:36,080
think you know

802
00:29:39,830 --> 00:29:38,240
seismic measurements are so fundamental

803
00:29:41,990 --> 00:29:39,840
to understanding the interior

804
00:29:44,950 --> 00:29:42,000
particularly of these

805
00:29:47,269 --> 00:29:44,960
rocky bodies or other kind of solid body

806
00:29:49,830 --> 00:29:47,279
planets so we would love to put science

807
00:29:52,470 --> 00:29:49,840
monitors on a bunch of different places

808
00:29:53,269 --> 00:29:52,480
you know for example within

809
00:30:02,789 --> 00:29:53,279
the

810
00:30:05,110 --> 00:30:02,799
a recommendation to establish a seismic

811
00:30:06,630 --> 00:30:05,120
network on earth's moon

812
00:30:07,590 --> 00:30:06,640
that's been something that we've wanted

813
00:30:09,029 --> 00:30:07,600

to do

814
00:30:11,430 --> 00:30:09,039
for a long time you know there were

815
00:30:13,510 --> 00:30:11,440
seismometers that the apollo astronauts

816
00:30:15,110 --> 00:30:13,520
placed there but they had limited

817
00:30:17,669 --> 00:30:15,120
operational timelines we'd really like

818
00:30:19,909 --> 00:30:17,679
to set up a complete network on the moon

819
00:30:21,590 --> 00:30:19,919
to really understand

820
00:30:23,350 --> 00:30:21,600
what's going on there

821
00:30:25,269 --> 00:30:23,360
there's also been a lot of discussion

822
00:30:26,549 --> 00:30:25,279
about about other places in the solar

823
00:30:29,029 --> 00:30:26,559
system that would benefit from

824
00:30:30,549 --> 00:30:29,039
seismometers for example venus is

825
00:30:32,710 --> 00:30:30,559
another place that would benefit from

826
00:30:34,310 --> 00:30:32,720
having seismometers understanding better

827
00:30:36,310 --> 00:30:34,320
understanding the interior there of

828
00:30:37,990 --> 00:30:36,320
course there's unique challenges in that

829
00:30:40,310 --> 00:30:38,000
environment

830
00:30:42,630 --> 00:30:40,320
that that might make that challenging

831
00:30:45,590 --> 00:30:42,640
but again as you said i think there's a

832
00:30:47,909 --> 00:30:45,600
lot of scope for for doing similar types

833
00:30:51,990 --> 00:30:47,919
of experiments on other other

834
00:30:57,430 --> 00:30:54,630
thanks for your answer lori and we have

835
00:31:01,430 --> 00:30:57,440
one coming in from the username the

836
00:31:03,029 --> 00:31:01,440
awesome nintendo fan on youtube asks

837
00:31:05,269 --> 00:31:03,039
how are their earthquakes

838
00:31:08,789 --> 00:31:05,279

we should actually say marsquakes if

839
00:31:10,950 --> 00:31:08,799
there aren't any plate tectonics there

840
00:31:13,509 --> 00:31:10,960
bruce would you like to take that

841
00:31:15,750 --> 00:31:13,519
yeah that's a really great question and

842
00:31:18,470 --> 00:31:15,760
of course you know on the earth most of

843
00:31:20,389 --> 00:31:18,480
the seismic activity comes from the the

844
00:31:23,029 --> 00:31:20,399
various different tectonic plates moving

845
00:31:24,470 --> 00:31:23,039
past each other and the rocks grinding

846
00:31:25,430 --> 00:31:24,480
against each other and sticking and

847
00:31:27,990 --> 00:31:25,440
slipping

848
00:31:29,990 --> 00:31:28,000
but that's not all the uh quake activity

849
00:31:32,470 --> 00:31:30,000
on the earth there's also quakes that

850
00:31:34,070 --> 00:31:32,480
happen in the middle of place there's

851
00:31:37,029 --> 00:31:34,080
quakes that happen in the united states

852
00:31:38,149 --> 00:31:37,039
in colorado in oklahoma

853
00:31:40,070 --> 00:31:38,159
even in

854
00:31:42,230 --> 00:31:40,080
north carolina and

855
00:31:43,509 --> 00:31:42,240
missouri so there are plates that happen

856
00:31:45,990 --> 00:31:43,519
in the middle of the place and those

857
00:31:48,070 --> 00:31:46,000
quakes happen because of forces in the

858
00:31:50,389 --> 00:31:48,080
crust and those forces can come from

859
00:31:52,230 --> 00:31:50,399
various different sources

860
00:31:53,190 --> 00:31:52,240
on the earth most of the forces come

861
00:31:55,509 --> 00:31:53,200
from

862
00:31:57,350 --> 00:31:55,519
the convection in the earth's mantle

863
00:31:59,590 --> 00:31:57,360

which brings heat up and drives the

864
00:32:02,230 --> 00:31:59,600
plate tectonics but the heat that comes

865
00:32:04,230 --> 00:32:02,240
up in the mantle can can dissipate

866
00:32:05,830 --> 00:32:04,240
itself in other ways it can

867
00:32:08,310 --> 00:32:05,840
heat up the bottom of the crust which

868
00:32:10,230 --> 00:32:08,320
can cause the crust to to rise up and

869
00:32:11,430 --> 00:32:10,240
that can cause cracking in the crust

870
00:32:14,710 --> 00:32:11,440
that can cause

871
00:32:18,149 --> 00:32:14,720
the crust be pulled apart in some places

872
00:32:20,310 --> 00:32:18,159
as the planet cools overall and shrinks

873
00:32:22,549 --> 00:32:20,320
um it can cause compressive forces to

874
00:32:24,789 --> 00:32:22,559
build up in the crust which can cause uh

875
00:32:27,509 --> 00:32:24,799
the failure of rocks the crack cracking

876
00:32:30,950 --> 00:32:27,519
and motion of rocks and so there's a lot

877
00:32:32,789 --> 00:32:30,960
of uh what we call tectonic forces not

878
00:32:35,110 --> 00:32:32,799
just plate tectonic forces but other

879
00:32:37,110 --> 00:32:35,120
kinds of tectonic forces that can build

880
00:32:38,710 --> 00:32:37,120
up in the crust of a planet besides with

881
00:32:41,269 --> 00:32:38,720
plate tectonics and we believe that's

882
00:32:43,750 --> 00:32:41,279
what's happening on mars and in fact we

883
00:32:45,830 --> 00:32:43,760
made a prediction as to uh how active

884
00:32:48,950 --> 00:32:45,840
mars would be how many mars plates we

885
00:32:51,029 --> 00:32:48,960
would see just based on how how uh

886
00:32:53,269 --> 00:32:51,039
quickly or how slowly mars is cooling

887
00:32:55,190 --> 00:32:53,279
off and our predictions are pretty much

888
00:32:56,470 --> 00:32:55,200

uh pretty much on the market so

889
00:32:58,389 --> 00:32:56,480
certainly within the

890
00:33:00,789 --> 00:32:58,399
fairly large air balance that we put on

891
00:33:02,549 --> 00:33:00,799
it and so there's a lot of stuff that

892
00:33:04,310 --> 00:33:02,559
can go on in a planet besides plate

893
00:33:07,430 --> 00:33:04,320
tectonics that can cause

894
00:33:10,789 --> 00:33:09,430
thank you and now we're heading back to

895
00:33:15,990 --> 00:33:10,799
the caller line

896
00:33:18,310 --> 00:33:16,000
up next is ramen skiba from wired

897
00:33:21,029 --> 00:33:18,320
hi thank you um i have a question i

898
00:33:23,190 --> 00:33:21,039
think it's probably best for lori i was

899
00:33:25,750 --> 00:33:23,200
wondering if this

900
00:33:27,110 --> 00:33:25,760
you know what insight has has uh you

901
00:33:29,669 --> 00:33:27,120
know what you've learned for future

902
00:33:32,549 --> 00:33:29,679
missions like uh if there's um you know

903
00:33:34,789 --> 00:33:32,559
like for solar panel designs or uh like

904
00:33:36,789 --> 00:33:34,799
that making them tiltable or i don't

905
00:33:38,630 --> 00:33:36,799
know shakeable or have like windshield

906
00:33:40,549 --> 00:33:38,640
wipers on them or anything like that or

907
00:33:43,430 --> 00:33:40,559
anything else that about how uh insight

908
00:33:45,029 --> 00:33:43,440
is informing future uh missions

909
00:33:46,630 --> 00:33:45,039
yeah it's a really great question i

910
00:33:49,110 --> 00:33:46,640
think that's an area that will probably

911
00:33:50,470 --> 00:33:49,120
get some focus um and uh you know some

912
00:33:51,830 --> 00:33:50,480
development over the coming years you

913
00:33:54,630 --> 00:33:51,840

know again

914
00:33:56,149 --> 00:33:54,640
after uh the experience with opportunity

915
00:33:58,310 --> 00:33:56,159
and then now with insight as well we

916
00:34:00,630 --> 00:33:58,320
know that uh systems that have solar

917
00:34:02,549 --> 00:34:00,640
panels are you know that this is a you

918
00:34:04,630 --> 00:34:02,559
know a challenge for these that you know

919
00:34:05,990 --> 00:34:04,640
that dusty environment

920
00:34:07,990 --> 00:34:06,000
so i'm sure that there will be a lot of

921
00:34:09,669 --> 00:34:08,000
technology developments coming up on

922
00:34:11,669 --> 00:34:09,679
clever ways and thinking of ways that

923
00:34:14,149 --> 00:34:11,679
that we can uh you know try and keep

924
00:34:15,109 --> 00:34:14,159
those solar panels um as cleared as we

925
00:34:19,990 --> 00:34:15,119
can

926
00:34:22,069 --> 00:34:20,000
about the seasons in which we are are

927
00:34:25,030 --> 00:34:22,079
sending our spacecraft and you know for

928
00:34:26,790 --> 00:34:25,040
example um in in planning for example

929
00:34:29,669 --> 00:34:26,800
for them our sample return mission we're

930
00:34:31,349 --> 00:34:29,679
thinking about um trying to send the the

931
00:34:33,589 --> 00:34:31,359
landers in a season where that's less

932
00:34:35,430 --> 00:34:33,599
dusty so that we have you know higher

933
00:34:41,109 --> 00:34:35,440
expectations of being able to get the

934
00:34:46,710 --> 00:34:43,030
thank you and then up next we have

935
00:34:48,710 --> 00:34:46,720
alexandria white with nature

936
00:34:50,869 --> 00:34:48,720
hi my question is for bruce i want to

937
00:34:51,990 --> 00:34:50,879
ask a bit more about this magnitude 5. i

938
00:34:54,230 --> 00:34:52,000

know that you're still working on

939
00:34:55,829 --> 00:34:54,240
analysis of it but can you talk a little

940
00:34:58,310 --> 00:34:55,839
bit more about kind of the quality of

941
00:35:00,710 --> 00:34:58,320
data like when in the day did it happen

942
00:35:01,990 --> 00:35:00,720
do you know it's a 5.0 do you have any

943
00:35:04,550 --> 00:35:02,000
hints that you're going to be able to

944
00:35:05,829 --> 00:35:04,560
get location at some point what might

945
00:35:08,550 --> 00:35:05,839
you be able to learn about that

946
00:35:13,790 --> 00:35:08,560
magnitude 5

947
00:35:17,990 --> 00:35:13,800
uh what we call a

948
00:35:19,589 --> 00:35:18,000
s1222a if that's our our name for it um

949
00:35:20,710 --> 00:35:19,599
it is so

950
00:35:23,030 --> 00:35:20,720
far in

951
00:35:24,790 --> 00:35:23,040
a way bigger and and more clear than

952
00:35:26,790 --> 00:35:24,800
anything else that we've seen

953
00:35:29,109 --> 00:35:26,800
it actually happened early in the

954
00:35:31,990 --> 00:35:29,119
martian morning during a relatively

955
00:35:34,870 --> 00:35:32,000
noisy part of the of the of the day um

956
00:35:37,990 --> 00:35:34,880
but it was it was such a large signal

957
00:35:40,550 --> 00:35:38,000
that the noise in the as you saw in that

958
00:35:43,190 --> 00:35:40,560
first animation the noise was just like

959
00:35:45,910 --> 00:35:43,200
a single line and in fact the largest

960
00:35:48,550 --> 00:35:45,920
quake that we saw uh before that would

961
00:35:50,630 --> 00:35:48,560
just have barely been a blip and so um

962
00:35:52,150 --> 00:35:50,640
the the background noise on mars really

963
00:35:54,390 --> 00:35:52,160

didn't matter to this quake at all it

964
00:35:56,310 --> 00:35:54,400
was it was the the signal was so large

965
00:35:58,710 --> 00:35:56,320
that it just completely swamped whatever

966
00:36:00,470 --> 00:35:58,720
whatever background noise we have

967
00:36:03,829 --> 00:36:00,480
we have a very clear

968
00:36:06,310 --> 00:36:03,839
p wave arrival very clear s wave arrival

969
00:36:07,430 --> 00:36:06,320
we have good polarization so we are

970
00:36:10,550 --> 00:36:07,440
we're getting a really good

971
00:36:12,790 --> 00:36:10,560
determination on the location

972
00:36:14,870 --> 00:36:12,800
we can actually you see with our eyes

973
00:36:17,190 --> 00:36:14,880
you can see surface waves uh in in the

974
00:36:20,150 --> 00:36:17,200
spectrum uh which is um something that

975
00:36:21,349 --> 00:36:20,160
we've been struggling to find uh in

976
00:36:23,589 --> 00:36:21,359
previous quakes through the whole

977
00:36:25,270 --> 00:36:23,599
mission and so um they're really coming

978
00:36:27,910 --> 00:36:25,280
booming out in this and will be able to

979
00:36:29,430 --> 00:36:27,920
do analysis on that um this quake is

980
00:36:31,510 --> 00:36:29,440
actually big enough that we think it's

981
00:36:33,670 --> 00:36:31,520
it's right on the threshold where we may

982
00:36:36,230 --> 00:36:33,680
actually be able to see uh the free

983
00:36:38,310 --> 00:36:36,240
oscillations the normal modes of mars

984
00:36:39,829 --> 00:36:38,320
excited which is something that happens

985
00:36:41,910 --> 00:36:39,839
with the larger quake that actually sets

986
00:36:44,470 --> 00:36:41,920
the whole planet ringing and we can look

987
00:36:47,270 --> 00:36:44,480
at the the resonances of the planet to

988
00:36:50,069 --> 00:36:47,280

say something about its structure and so

989
00:36:52,630 --> 00:36:50,079
um this quake is really uh going to be a

990
00:36:54,790 --> 00:36:52,640
treasure trove of scientific information

991
00:36:56,230 --> 00:36:54,800
when we get our teeth into it

992
00:36:57,829 --> 00:36:56,240
so where does it come from what is the

993
00:37:02,470 --> 00:36:57,839
location

994
00:37:04,710 --> 00:37:02,480
where we have gotten a lot of

995
00:37:06,710 --> 00:37:04,720
earthquakes before but it's not actually

996
00:37:08,870 --> 00:37:06,720
in servers fosse which is

997
00:37:10,950 --> 00:37:08,880
which is interesting and we don't really

998
00:37:12,310 --> 00:37:10,960
understand that yet like i said we've

999
00:37:14,310 --> 00:37:12,320
only been looking at this for less than

1000
00:37:16,470 --> 00:37:14,320
two weeks now but we're pretty sure that

1001
00:37:19,510 --> 00:37:16,480
it's not on the default system in

1002
00:37:21,670 --> 00:37:19,520
cerberus fosse so where it's actually uh

1003
00:37:22,550 --> 00:37:21,680
the the origin of it

1004
00:37:26,710 --> 00:37:22,560
is

1005
00:37:28,790 --> 00:37:26,720
still analyzing it but it's in that

1006
00:37:32,150 --> 00:37:28,800
general part of the planet

1007
00:37:37,589 --> 00:37:34,230
and up next on the phone lines is

1008
00:37:39,270 --> 00:37:37,599
kenneth ching went to new york time

1009
00:37:40,870 --> 00:37:39,280
all right thank you i had two questions

1010
00:37:41,829 --> 00:37:40,880
one is for bruce

1011
00:37:43,750 --> 00:37:41,839
um

1012
00:37:45,430 --> 00:37:43,760
what did you lose by not having them all

1013
00:37:46,790 --> 00:37:45,440

fully deployed

1014
00:37:49,190 --> 00:37:46,800
what science questions were you hoping

1015
00:37:51,910 --> 00:37:49,200
to answer that are still unanswered

1016
00:37:53,670 --> 00:37:51,920
and then for katya um

1017
00:37:55,990 --> 00:37:53,680
is there any chance that it could come

1018
00:37:57,829 --> 00:37:56,000
back to life after the end of mission

1019
00:37:58,950 --> 00:37:57,839
and if so would anyone be listening for

1020
00:38:01,589 --> 00:37:58,960
it

1021
00:38:04,790 --> 00:38:01,599
thank you okay so the the the science

1022
00:38:07,349 --> 00:38:04,800
goal we had uh the the hp cubed

1023
00:38:09,990 --> 00:38:07,359
instrument was to to actually measure

1024
00:38:12,310 --> 00:38:10,000
the uh heat flow coming out of out of

1025
00:38:14,150 --> 00:38:12,320
mars we're going to measure the thermal

1026
00:38:15,750 --> 00:38:14,160
gradient and the thermal conductivity to

1027
00:38:18,069 --> 00:38:15,760
get the amount of heat that mars is

1028
00:38:20,870 --> 00:38:18,079
losing and that would tell us something

1029
00:38:23,510 --> 00:38:20,880
about uh both the interior temperatures

1030
00:38:27,589 --> 00:38:23,520
on mars and the the

1031
00:38:30,230 --> 00:38:27,599
um sort of the degree of uh of uh energy

1032
00:38:31,910 --> 00:38:30,240
that's driving uh the internal geology

1033
00:38:34,069 --> 00:38:31,920
of mars today and that's that's

1034
00:38:36,069 --> 00:38:34,079
something that it was complementary to

1035
00:38:38,069 --> 00:38:36,079
the the structural information we're

1036
00:38:40,069 --> 00:38:38,079
getting from seismology seismology tells

1037
00:38:42,230 --> 00:38:40,079
us sort of what the

1038
00:38:44,150 --> 00:38:42,240

building blocks of the planet are today

1039
00:38:46,630 --> 00:38:44,160
and the hp cube was going to tell us

1040
00:38:48,310 --> 00:38:46,640
something about the dynamics of it

1041
00:38:50,710 --> 00:38:48,320
we can get some of that information from

1042
00:38:52,870 --> 00:38:50,720
seismology we're actually able to put

1043
00:38:55,829 --> 00:38:52,880
constraints on the

1044
00:38:57,430 --> 00:38:55,839
on the thermal profile in the mantle we

1045
00:38:59,109 --> 00:38:57,440
can put some constraints on the

1046
00:39:01,510 --> 00:38:59,119
temperatures in the core

1047
00:39:03,190 --> 00:39:01,520
the hp cube was going to help us to uh

1048
00:39:05,829 --> 00:39:03,200
to to nail that down a little bit more

1049
00:39:07,990 --> 00:39:05,839
precisely and so um that was that's

1050
00:39:10,870 --> 00:39:08,000
that's what we lost uh when we proposed

1051
00:39:12,870 --> 00:39:10,880
the mission the hp cubed was uh proposed

1052
00:39:14,870 --> 00:39:12,880
as a secondary instrument um we knew

1053
00:39:17,670 --> 00:39:14,880
that there were challenges involved in

1054
00:39:21,030 --> 00:39:17,680
it uh we knew that the the the mole was

1055
00:39:23,430 --> 00:39:21,040
uh was a sort of a cutting edge type of

1056
00:39:25,190 --> 00:39:23,440
uh instrument apparatus uh that we

1057
00:39:28,390 --> 00:39:25,200
couldn't guarantee was going to work on

1058
00:39:30,230 --> 00:39:28,400
mars and so when we proposed it um it

1059
00:39:31,910 --> 00:39:30,240
was part of the so-called baseline

1060
00:39:32,790 --> 00:39:31,920
mission but not the threshold mission

1061
00:39:35,190 --> 00:39:32,800
and

1062
00:39:38,150 --> 00:39:35,200
insight was actually selected on the the

1063
00:39:40,069 --> 00:39:38,160

threshold uh science goals which all had

1064
00:39:42,870 --> 00:39:40,079
to do with either seismology or the

1065
00:39:43,910 --> 00:39:42,880
precision tracking and so we were able

1066
00:39:46,630 --> 00:39:43,920
to

1067
00:39:48,230 --> 00:39:46,640
basically have a

1068
00:39:50,710 --> 00:39:48,240
technically fully successful mission

1069
00:39:52,630 --> 00:39:50,720
without the hp cube we've got the most

1070
00:39:55,430 --> 00:39:52,640
important science goals with the

1071
00:39:57,990 --> 00:39:55,440
seismology and the precision tracking

1072
00:40:02,550 --> 00:39:58,000
but it was definitely a a big scientific

1073
00:40:06,309 --> 00:40:04,950
and up next on the phone lines is oh

1074
00:40:07,670 --> 00:40:06,319
ducati yeah

1075
00:40:09,349 --> 00:40:07,680
so yeah to answer your secondary

1076
00:40:10,470 --> 00:40:09,359
question is can can the lander be

1077
00:40:11,990 --> 00:40:10,480
operable again

1078
00:40:14,069 --> 00:40:12,000
at some point so

1079
00:40:15,990 --> 00:40:14,079
as bruce mentioned the martian

1080
00:40:17,750 --> 00:40:16,000
environment is very uncertain we don't

1081
00:40:19,910 --> 00:40:17,760
know what's going to happen however if

1082
00:40:22,069 --> 00:40:19,920
we were to have a natural cleaning and

1083
00:40:23,829 --> 00:40:22,079
the solar panels were able to

1084
00:40:25,589 --> 00:40:23,839
actually be cleaned off and we're able

1085
00:40:27,589 --> 00:40:25,599
to get enough energy our lander may be

1086
00:40:29,510 --> 00:40:27,599
able to communicate back down to earth

1087
00:40:30,550 --> 00:40:29,520
so we'll be doing what we call open loop

1088
00:40:33,910 --> 00:40:30,560

recording

1089
00:40:35,670 --> 00:40:33,920
um after uh the lander is no longer able

1090
00:40:37,589 --> 00:40:35,680
to communicate with us in the event that

1091
00:40:39,030 --> 00:40:37,599
there is a cleaning like i mentioned

1092
00:40:41,430 --> 00:40:39,040
it's a natural clean that needs to occur

1093
00:40:44,630 --> 00:40:41,440
on mars to be able to do that but we'll

1094
00:40:46,790 --> 00:40:44,640
be listening um and once we get a few

1095
00:40:49,910 --> 00:40:46,800
beeps if that happens again if there's a

1096
00:40:51,990 --> 00:40:49,920
natural cleaning then we will evaluate

1097
00:40:53,829 --> 00:40:52,000
whether there's enough energy to uh have

1098
00:40:55,750 --> 00:40:53,839
the lander operate again so that that's

1099
00:40:58,309 --> 00:40:55,760
to be determined we're hopeful that

1100
00:40:59,750 --> 00:40:58,319
would be awesome

1101
00:41:02,790 --> 00:40:59,760
thanks just trying to get through

1102
00:41:04,069 --> 00:41:02,800
everyone in this collar line now we have

1103
00:41:07,430 --> 00:41:04,079
a jonathan

1104
00:41:09,349 --> 00:41:07,440
o'callaghan up next

1105
00:41:13,109 --> 00:41:09,359
hi thank you um yeah a couple of

1106
00:41:14,870 --> 00:41:13,119
questions uh for katya and or bruce i'm

1107
00:41:17,190 --> 00:41:14,880
just a little unclear on what will take

1108
00:41:19,190 --> 00:41:17,200
place between the end of summer and the

1109
00:41:20,630 --> 00:41:19,200
end of the year could you just spell out

1110
00:41:21,990 --> 00:41:20,640
what the lander will be doing

1111
00:41:24,150 --> 00:41:22,000
specifically isn't going to be taking

1112
00:41:26,470 --> 00:41:24,160
pictures or anything like that

1113
00:41:28,069 --> 00:41:26,480

um are there any options of

1114
00:41:30,150 --> 00:41:28,079
uh rather than running the seismometer

1115
00:41:31,829 --> 00:41:30,160
continuously um running it

1116
00:41:33,910 --> 00:41:31,839
intermittently for example at night when

1117
00:41:35,589 --> 00:41:33,920
noise levels are low to prolong the time

1118
00:41:37,510 --> 00:41:35,599
it's active on the surface

1119
00:41:39,510 --> 00:41:37,520
and just one more going back to lori

1120
00:41:41,430 --> 00:41:39,520
glaze um

1121
00:41:42,550 --> 00:41:41,440
could you just spell out a few more

1122
00:41:44,470 --> 00:41:42,560
other worlds that you think you might

1123
00:41:46,069 --> 00:41:44,480
want to use seismometers on aside from

1124
00:41:47,829 --> 00:41:46,079
the moon and venus are there things

1125
00:41:51,109 --> 00:41:47,839
being considered like europa or any

1126
00:41:52,710 --> 00:41:51,119
other destinations thank you

1127
00:41:55,589 --> 00:41:52,720
so i can touch on the first part of your

1128
00:41:57,270 --> 00:41:55,599
questions there so yes during summer

1129
00:41:59,910 --> 00:41:57,280
as i mentioned our primary objective is

1130
00:42:02,069 --> 00:41:59,920
to run the seismometer on continuously

1131
00:42:05,190 --> 00:42:02,079
we are also going to be able to take

1132
00:42:05,910 --> 00:42:05,200
some um camera images of

1133
00:42:10,069 --> 00:42:05,920
the

1134
00:42:12,150 --> 00:42:10,079
seismometer and hp3 that takes a lot

1135
00:42:13,109 --> 00:42:12,160
less energy to do so but in addition to

1136
00:42:15,750 --> 00:42:13,119
running

1137
00:42:17,349 --> 00:42:15,760
the the camera and the seismometer all

1138
00:42:20,230 --> 00:42:17,359

the way to the very end we're not going

1139
00:42:22,309 --> 00:42:20,240
to be able to do very many other

1140
00:42:24,390 --> 00:42:22,319
science operations and at that point

1141
00:42:26,630 --> 00:42:24,400
it'll be just telecommunications with

1142
00:42:30,790 --> 00:42:26,640
the lander through end of calendar of

1143
00:42:34,150 --> 00:42:32,550
yeah and and to your second question

1144
00:42:36,309 --> 00:42:34,160
this is lori um thinking about

1145
00:42:38,150 --> 00:42:36,319
seismometers um i forgot to mention

1146
00:42:41,190 --> 00:42:38,160
earlier of course dragonfly is carrying

1147
00:42:43,109 --> 00:42:41,200
a seismometer going to uh to titan

1148
00:42:44,390 --> 00:42:43,119
so that will be i think a fantastic

1149
00:42:46,150 --> 00:42:44,400
addition there

1150
00:42:47,510 --> 00:42:46,160
of course titan is a very uh or the

1151
00:42:49,109 --> 00:42:47,520
dragonfly mission is a very different

1152
00:42:50,550 --> 00:42:49,119
type of operation where it's moving

1153
00:42:52,710 --> 00:42:50,560
around but still

1154
00:42:55,670 --> 00:42:52,720
being able to uh to have an opportunity

1155
00:42:57,510 --> 00:42:55,680
to to detect titan quakes will be will

1156
00:42:59,829 --> 00:42:57,520
be very valuable

1157
00:43:02,550 --> 00:42:59,839
and you know right now

1158
00:43:04,309 --> 00:43:02,560
there is not any specific plan for a

1159
00:43:05,670 --> 00:43:04,319
lander on europa but certainly something

1160
00:43:07,109 --> 00:43:05,680
like that i think would be incredibly

1161
00:43:09,270 --> 00:43:07,119
valuable again

1162
00:43:11,349 --> 00:43:09,280
any place where we can land

1163
00:43:13,430 --> 00:43:11,359

on one of these solid body

1164
00:43:15,270 --> 00:43:13,440
surfaces and get a sense of what's going

1165
00:43:17,430 --> 00:43:15,280
on in their interiors would be extremely

1166
00:43:21,030 --> 00:43:17,440
valuable

1167
00:43:22,870 --> 00:43:21,040
yeah i'd just like to just uh

1168
00:43:25,109 --> 00:43:22,880
interject that i i feel like you know

1169
00:43:27,910 --> 00:43:25,119
inside one of the insights legacies is

1170
00:43:30,630 --> 00:43:27,920
to really prove the the the technique of

1171
00:43:32,710 --> 00:43:30,640
seismology for planetary science um the

1172
00:43:34,630 --> 00:43:32,720
last uh seismometer that was sent to

1173
00:43:37,109 --> 00:43:34,640
another planet was on viking back in the

1174
00:43:39,670 --> 00:43:37,119
mid 70s and that seismometer was not

1175
00:43:41,589 --> 00:43:39,680
successful and i think that kind of

1176
00:43:44,390 --> 00:43:41,599
passed the paul over uh plenary

1177
00:43:46,630 --> 00:43:44,400
seismology for for almost 40 years uh

1178
00:43:49,109 --> 00:43:46,640
and seismology is a difficult experiment

1179
00:43:51,030 --> 00:43:49,119
to do in space um it's a difficult

1180
00:43:52,710 --> 00:43:51,040
instrument to build but i think you know

1181
00:43:54,950 --> 00:43:52,720
insight has sort of you know finally

1182
00:43:57,190 --> 00:43:54,960
cleared the air and shown seismology for

1183
00:44:01,829 --> 00:43:57,200
the the incredibly

1184
00:44:06,829 --> 00:44:04,150
thank you updates on the phone lines is

1185
00:44:12,309 --> 00:44:09,990
ferreira oh hi um this is a question i

1186
00:44:13,510 --> 00:44:12,319
guess for bruce or katya um

1187
00:44:16,470 --> 00:44:13,520
i you mentioned that there's

1188
00:44:18,390 --> 00:44:16,480

unprecedented data uh also on weather

1189
00:44:20,150 --> 00:44:18,400
and magnetic fields and planetary

1190
00:44:22,550 --> 00:44:20,160
rotation from insight in addition to the

1191
00:44:24,390 --> 00:44:22,560
seismological stuff so could you kind of

1192
00:44:26,390 --> 00:44:24,400
give an overview of that of those other

1193
00:44:29,109 --> 00:44:26,400
instruments

1194
00:44:32,470 --> 00:44:29,119
yeah i can take that so

1195
00:44:34,230 --> 00:44:32,480
insights had had three primary

1196
00:44:36,309 --> 00:44:34,240
experiments that it was proposed to do

1197
00:44:38,230 --> 00:44:36,319
one was the seismometer which was the

1198
00:44:40,710 --> 00:44:38,240
prime the main one and we've already

1199
00:44:42,870 --> 00:44:40,720
talked about the heat flow experiment

1200
00:44:45,990 --> 00:44:42,880
and then rise which is this radio

1201
00:44:47,750 --> 00:44:46,000
science experiment was put on board to

1202
00:44:49,670 --> 00:44:47,760
measure the the details of the

1203
00:44:53,109 --> 00:44:49,680
rotational dynamics of mars actually

1204
00:44:56,230 --> 00:44:53,119
look at the the the motion of mars

1205
00:44:59,270 --> 00:44:56,240
rotation poles north pole um that's been

1206
00:45:01,190 --> 00:44:59,280
an extremely uh

1207
00:45:03,829 --> 00:45:01,200
successful experiment as well

1208
00:45:05,670 --> 00:45:03,839
we've already published an update to the

1209
00:45:07,990 --> 00:45:05,680
moment of inertia of mars

1210
00:45:10,470 --> 00:45:08,000
which gives some constraints on on the

1211
00:45:13,109 --> 00:45:10,480
the size of the core but the real goal

1212
00:45:15,270 --> 00:45:13,119
of this uh experiment was to try to

1213
00:45:16,309 --> 00:45:15,280

measure uh the mutations of mars and

1214
00:45:18,550 --> 00:45:16,319
we're still

1215
00:45:20,470 --> 00:45:18,560
analyzing that data we have uh some

1216
00:45:22,309 --> 00:45:20,480
papers that are that have been uh

1217
00:45:24,230 --> 00:45:22,319
submitted which are still being peer

1218
00:45:27,190 --> 00:45:24,240
reviewed so you know i can't talk about

1219
00:45:29,270 --> 00:45:27,200
the the results yet but um we've that

1220
00:45:31,750 --> 00:45:29,280
we've gotten the data that we had set

1221
00:45:33,750 --> 00:45:31,760
out to get and uh uh you know we believe

1222
00:45:36,630 --> 00:45:33,760
that that we're seeing the signal from

1223
00:45:38,710 --> 00:45:36,640
the uh the core of mars and and i think

1224
00:45:40,470 --> 00:45:38,720
we'll find that that experiment will

1225
00:45:42,550 --> 00:45:40,480
give us some some additional constraints

1226
00:45:44,309 --> 00:45:42,560
on the the the size and the the

1227
00:45:46,230 --> 00:45:44,319
composition of the core

1228
00:45:48,309 --> 00:45:46,240
the weather station the magnetometer

1229
00:45:50,710 --> 00:45:48,319
were in the interesting position of of

1230
00:45:53,750 --> 00:45:50,720
not being uh proposed as instruments but

1231
00:45:56,309 --> 00:45:53,760
they were put on just as sensors to

1232
00:45:58,390 --> 00:45:56,319
detect noise uh that would be affecting

1233
00:46:00,870 --> 00:45:58,400
the seismometer so originally we didn't

1234
00:46:03,109 --> 00:46:00,880
have any science goals any formal

1235
00:46:05,750 --> 00:46:03,119
science goals associated with those

1236
00:46:07,910 --> 00:46:05,760
those instruments those sensors

1237
00:46:10,230 --> 00:46:07,920
they were they were there to see if we

1238
00:46:12,390 --> 00:46:10,240

saw magnetic uh

1239
00:46:13,910 --> 00:46:12,400
oscillations uh that we could we could

1240
00:46:17,030 --> 00:46:13,920
tell whether those were interfering with

1241
00:46:19,270 --> 00:46:17,040
the seismometers operation or when there

1242
00:46:21,750 --> 00:46:19,280
was wind uh pressure variations and so

1243
00:46:23,190 --> 00:46:21,760
forth we could be able to detect those

1244
00:46:25,670 --> 00:46:23,200
on our pressure sensor and our wind

1245
00:46:28,069 --> 00:46:25,680
sensors and be able to discount those

1246
00:46:29,589 --> 00:46:28,079
kinds of signals on the seismometer but

1247
00:46:31,349 --> 00:46:29,599
meanwhile um

1248
00:46:34,470 --> 00:46:31,359
scientists being what they are

1249
00:46:36,550 --> 00:46:34,480
they're taking that data and doing uh a

1250
00:46:39,190 --> 00:46:36,560
amazing work with it i mean we actually

1251
00:46:40,470 --> 00:46:39,200
put on some really capable sensors the

1252
00:46:42,390 --> 00:46:40,480
magnetic

1253
00:46:44,550 --> 00:46:42,400
the magnetometer we put on is the first

1254
00:46:46,309 --> 00:46:44,560
magnetometer to uh

1255
00:46:49,349 --> 00:46:46,319
send data back from the surface of of

1256
00:46:51,829 --> 00:46:49,359
mars and we were able to both uh put

1257
00:46:52,630 --> 00:46:51,839
constraints on the uh the magnitude of

1258
00:46:58,150 --> 00:46:52,640
the

1259
00:47:00,390 --> 00:46:58,160
larger than

1260
00:47:01,750 --> 00:47:00,400
we expected from orbit

1261
00:47:03,829 --> 00:47:01,760
we were able to

1262
00:47:06,710 --> 00:47:03,839
look at the magnetic

1263
00:47:09,190 --> 00:47:06,720

variations at the surface of mars mostly

1264
00:47:12,150 --> 00:47:09,200
due to ionospheric currents in the upper

1265
00:47:15,190 --> 00:47:12,160
atmosphere of mars and relate those to

1266
00:47:16,309 --> 00:47:15,200
solar wind activity and to

1267
00:47:20,390 --> 00:47:16,319
the

1268
00:47:22,150 --> 00:47:20,400
and and that's a

1269
00:47:24,390 --> 00:47:22,160
really unique data that's been used in

1270
00:47:26,549 --> 00:47:24,400
conjunction with other magnetometers on

1271
00:47:28,630 --> 00:47:26,559
orbiting spacecraft to better understand

1272
00:47:31,349 --> 00:47:28,640
the magnetosphere of mars

1273
00:47:32,790 --> 00:47:31,359
the weather station has taken a a really

1274
00:47:35,109 --> 00:47:32,800
detailed

1275
00:47:37,589 --> 00:47:35,119
series of measurements of of the martian

1276
00:47:39,030 --> 00:47:37,599
weather at the insight location for

1277
00:47:41,510 --> 00:47:39,040
about two and a half years it's been a

1278
00:47:44,390 --> 00:47:41,520
little bit spottier for the last year as

1279
00:47:47,109 --> 00:47:44,400
our power has gone down but this is uh

1280
00:47:49,829 --> 00:47:47,119
probably the most precise and

1281
00:47:52,150 --> 00:47:49,839
high resolution pressure measurements

1282
00:47:54,230 --> 00:47:52,160
that have ever been taken at mars which

1283
00:47:55,670 --> 00:47:54,240
has allowed us to look at

1284
00:47:58,230 --> 00:47:55,680
various different

1285
00:47:59,829 --> 00:47:58,240
activities of weather fronts of

1286
00:48:02,309 --> 00:47:59,839
something called a bore wave which was

1287
00:48:04,790 --> 00:48:02,319
something never before seen on mars

1288
00:48:06,549 --> 00:48:04,800

looking at as i said we can

1289
00:48:09,270 --> 00:48:06,559
have been able to sense thousands of

1290
00:48:10,950 --> 00:48:09,280
dust devils using our pressure sensor

1291
00:48:12,710 --> 00:48:10,960
and also our seismometer actually is

1292
00:48:14,150 --> 00:48:12,720
able to see uh dust devils as well

1293
00:48:16,870 --> 00:48:14,160
looking at sort of the tilt of the

1294
00:48:19,190 --> 00:48:16,880
ground that they cause as the the low

1295
00:48:20,549 --> 00:48:19,200
pressure center of the of the dust devil

1296
00:48:23,430 --> 00:48:20,559
uh moves uh

1297
00:48:25,270 --> 00:48:23,440
within you know either tens to hundreds

1298
00:48:27,349 --> 00:48:25,280
of meters from from the lander the

1299
00:48:30,150 --> 00:48:27,359
seismometer can actually see the tilt of

1300
00:48:32,950 --> 00:48:30,160
the ground from that and so um there's a

1301
00:48:34,230 --> 00:48:32,960
whole myriad of scientific questions

1302
00:48:35,750 --> 00:48:34,240
that have been addressed by the other

1303
00:48:37,750 --> 00:48:35,760
insight instruments over the course of

1304
00:48:40,549 --> 00:48:37,760
the mission

1305
00:48:46,309 --> 00:48:43,190
up next on the phone line is lauren

1306
00:48:48,150 --> 00:48:46,319
brush with the verge

1307
00:48:50,870 --> 00:48:48,160
hi thank you for taking my question i

1308
00:48:52,950 --> 00:48:50,880
think mine is for bruce um just now you

1309
00:48:55,750 --> 00:48:52,960
said that you were able to sense several

1310
00:48:57,750 --> 00:48:55,760
thousands of dust devils nearby insight

1311
00:49:00,470 --> 00:48:57,760
but earlier you said none have been dead

1312
00:49:02,150 --> 00:49:00,480
on i'm just wondering if you know why

1313
00:49:04,549 --> 00:49:02,160

that is the case does it have anything

1314
00:49:05,910 --> 00:49:04,559
to do with the landers location or is it

1315
00:49:07,910 --> 00:49:05,920
just bad luck

1316
00:49:09,910 --> 00:49:07,920
and also given the challenges that the

1317
00:49:11,510 --> 00:49:09,920
mole had with the soil are you still

1318
00:49:13,270 --> 00:49:11,520
happy with the landing spot that you

1319
00:49:15,270 --> 00:49:13,280
picked or would you have landed in a

1320
00:49:17,270 --> 00:49:15,280
different spot knowing what you know now

1321
00:49:18,870 --> 00:49:17,280
thanks

1322
00:49:21,030 --> 00:49:18,880
okay so as far as the dust devils are

1323
00:49:23,030 --> 00:49:21,040
concerned like i said we can actually uh

1324
00:49:24,230 --> 00:49:23,040
sense these dust devils out to many

1325
00:49:25,750 --> 00:49:24,240
hundreds of meters away from the

1326
00:49:28,549 --> 00:49:25,760
spacecraft and so

1327
00:49:30,470 --> 00:49:28,559
um just looking at the statistics and

1328
00:49:32,549 --> 00:49:30,480
and the sort of the width of dust devils

1329
00:49:34,950 --> 00:49:32,559
which are pretty narrow for the size of

1330
00:49:38,230 --> 00:49:34,960
size that we're looking at um it

1331
00:49:39,829 --> 00:49:38,240
actually takes a a pretty precise aim to

1332
00:49:41,589 --> 00:49:39,839
actually hit the spacecraft with one of

1333
00:49:44,069 --> 00:49:41,599
those so i think it's just if you look

1334
00:49:46,470 --> 00:49:44,079
at the statistics of the number of dust

1335
00:49:48,309 --> 00:49:46,480
devils the you know the their uh

1336
00:49:51,430 --> 00:49:48,319
distribution of

1337
00:49:53,030 --> 00:49:51,440
of uh speeds and and uh spacings across

1338
00:49:56,870 --> 00:49:53,040

the planes and and

1339
00:49:58,390 --> 00:49:56,880
their their width i think it's not uh

1340
00:50:00,790 --> 00:49:58,400
it's not unlikely that we haven't

1341
00:50:03,109 --> 00:50:00,800
actually had a direct hit uh and it

1342
00:50:05,030 --> 00:50:03,119
looks like our our inference is it

1343
00:50:06,470 --> 00:50:05,040
actually has to pass right over the

1344
00:50:09,270 --> 00:50:06,480
right over the spacecraft itself in

1345
00:50:10,710 --> 00:50:09,280
order to do any good even a near miss uh

1346
00:50:13,109 --> 00:50:10,720
doesn't really help us much and we've

1347
00:50:13,990 --> 00:50:13,119
seen uh actually you can see dust devil

1348
00:50:15,829 --> 00:50:14,000
tracks

1349
00:50:18,470 --> 00:50:15,839
on the surface that have been caused by

1350
00:50:20,870 --> 00:50:18,480
dust levels moving past us um

1351
00:50:23,510 --> 00:50:20,880
just a few tens of meters away and so

1352
00:50:25,109 --> 00:50:23,520
some of them will come come pretty close

1353
00:50:26,630 --> 00:50:25,119
another interesting fact is we haven't

1354
00:50:29,670 --> 00:50:26,640
actually ever seen a dust devil with our

1355
00:50:31,510 --> 00:50:29,680
cameras and so many of these uh uh dust

1356
00:50:33,990 --> 00:50:31,520
devils might be dust free there might

1357
00:50:36,230 --> 00:50:34,000
they may just be uh vortices you know or

1358
00:50:39,430 --> 00:50:36,240
just uh whirlwinds without actually any

1359
00:50:42,870 --> 00:50:39,440
dust in them um and and so that's just

1360
00:50:45,109 --> 00:50:42,880
another another interesting fact um

1361
00:50:46,790 --> 00:50:45,119
let's see

1362
00:50:48,470 --> 00:50:46,800
and then your landing spot are you still

1363
00:50:50,549 --> 00:50:48,480

happy with it

1364
00:50:51,829 --> 00:50:50,559
i'm still i'm still really ecstatic

1365
00:50:53,510 --> 00:50:51,839
about the landing spot because it

1366
00:50:56,030 --> 00:50:53,520
allowed us to land safely and that was

1367
00:50:59,270 --> 00:50:56,040
the that was the primary you know goal

1368
00:51:01,990 --> 00:50:59,280
of our landing site selection was to

1369
00:51:03,670 --> 00:51:02,000
find a place where we could land safely

1370
00:51:04,870 --> 00:51:03,680
landing on mars is one of the most

1371
00:51:08,790 --> 00:51:04,880
difficult

1372
00:51:09,589 --> 00:51:08,800
operations in planetary science um

1373
00:51:14,390 --> 00:51:09,599
it's

1374
00:51:17,030 --> 00:51:14,400
times now in in the last decade or so

1375
00:51:19,190 --> 00:51:17,040
but um if you go back further you'll

1376
00:51:20,150 --> 00:51:19,200
understand just how difficult that was

1377
00:51:22,069 --> 00:51:20,160
and so

1378
00:51:24,630 --> 00:51:22,079
with the seismometer which was our main

1379
00:51:26,630 --> 00:51:24,640
instrument um the beauty of that was we

1380
00:51:28,630 --> 00:51:26,640
could land anywhere on the planet and

1381
00:51:30,549 --> 00:51:28,640
still do our science i mean when you're

1382
00:51:31,990 --> 00:51:30,559
trying to look at the core anywhere you

1383
00:51:34,630 --> 00:51:32,000
land the core is going to be right under

1384
00:51:36,630 --> 00:51:34,640
your feet so um that sort of was taken

1385
00:51:38,390 --> 00:51:36,640
off the table in terms of driving the

1386
00:51:40,870 --> 00:51:38,400
landing spot and we really were looking

1387
00:51:42,150 --> 00:51:40,880
for some place that was flat without

1388
00:51:44,870 --> 00:51:42,160

many rocks

1389
00:51:46,069 --> 00:51:44,880
where the lander could land without any

1390
00:51:48,150 --> 00:51:46,079
danger

1391
00:51:50,390 --> 00:51:48,160
and i'm still you know just really

1392
00:51:52,470 --> 00:51:50,400
really glad and thankful that we were

1393
00:51:54,950 --> 00:51:52,480
able to land safely and so i wouldn't i

1394
00:51:57,990 --> 00:51:54,960
wouldn't trade that back for a risk of

1395
00:51:59,589 --> 00:51:58,000
landing uh in

1396
00:52:01,270 --> 00:51:59,599
and

1397
00:52:05,190 --> 00:52:01,280
having the possibility of not having any

1398
00:52:10,710 --> 00:52:07,589
thanks up next on the phone line is lucy

1399
00:52:13,829 --> 00:52:10,720
o'board of afp

1400
00:52:16,549 --> 00:52:13,839
hi thanks for doing this uh for bruce

1401
00:52:19,750 --> 00:52:16,559
again um could you try to sum up what

1402
00:52:23,349 --> 00:52:19,760
we've learned so far on mars core mental

1403
00:52:25,270 --> 00:52:23,359
and and trust and it's difficult but

1404
00:52:28,549 --> 00:52:25,280
what we didn't know before that we know

1405
00:52:30,829 --> 00:52:28,559
now uh thanks to insight kind of the the

1406
00:52:32,470 --> 00:52:30,839
main findings thank

1407
00:52:34,790 --> 00:52:32,480
you

1408
00:52:36,630 --> 00:52:34,800
the thing was before insight the

1409
00:52:38,710 --> 00:52:36,640
interior of mars was kind of just a

1410
00:52:40,950 --> 00:52:38,720
giant question mark i mean we knew that

1411
00:52:44,150 --> 00:52:40,960
mars had a had an iron core we knew that

1412
00:52:46,470 --> 00:52:44,160
it had a crust um but for example the

1413
00:52:49,910 --> 00:52:46,480

crust it could have been anywhere from

1414
00:52:51,109 --> 00:52:49,920
20 kilometers thick to 120 kilometers

1415
00:52:53,750 --> 00:52:51,119
thick the core

1416
00:52:55,829 --> 00:52:53,760
had an uncertainty of uh you know plus

1417
00:52:58,230 --> 00:52:55,839
or minus uh two or three hundred

1418
00:52:59,990 --> 00:52:58,240
kilometers and and so you know we just

1419
00:53:02,470 --> 00:53:00,000
had this really fuzzy picture of what

1420
00:53:03,829 --> 00:53:02,480
was going on inside mars and i think

1421
00:53:05,589 --> 00:53:03,839
insight's

1422
00:53:07,750 --> 00:53:05,599
real

1423
00:53:10,790 --> 00:53:07,760
contribution is now we can we can

1424
00:53:12,790 --> 00:53:10,800
actually draw a quantitatively precise

1425
00:53:14,710 --> 00:53:12,800
picture of the inside of mars we know

1426
00:53:17,030 --> 00:53:14,720
what the thickness of the crust is to

1427
00:53:19,829 --> 00:53:17,040
within about 10 kilometers we know what

1428
00:53:21,670 --> 00:53:19,839
the the size of the core is so within uh

1429
00:53:23,589 --> 00:53:21,680
better than 50 kilometers and i think

1430
00:53:26,630 --> 00:53:23,599
we'll be able to actually improve on

1431
00:53:29,270 --> 00:53:26,640
those numbers as our analysis proceeds

1432
00:53:32,549 --> 00:53:29,280
and the importance of those kinds of of

1433
00:53:34,150 --> 00:53:32,559
precision are that they allow us to now

1434
00:53:36,549 --> 00:53:34,160
go back and look at our models of

1435
00:53:39,349 --> 00:53:36,559
planetary formation look at how the

1436
00:53:41,349 --> 00:53:39,359
planet evolved from just a cloud of dust

1437
00:53:44,069 --> 00:53:41,359
that was circling around the sun as it

1438
00:53:46,950 --> 00:53:44,079

coagulates into into a planet starts to

1439
00:53:49,990 --> 00:53:46,960
heat up and melt and then differentiate

1440
00:53:50,950 --> 00:53:50,000
you know separate into a planet with a a

1441
00:53:53,670 --> 00:53:50,960
dense

1442
00:53:56,950 --> 00:53:53,680
core at the center a low density crust

1443
00:53:58,470 --> 00:53:56,960
at the surface how that process works

1444
00:54:00,470 --> 00:53:58,480
is

1445
00:54:02,390 --> 00:54:00,480
something we know that planets do we

1446
00:54:04,309 --> 00:54:02,400
know a lot of about it but the details

1447
00:54:06,710 --> 00:54:04,319
of that process are very very difficult

1448
00:54:09,030 --> 00:54:06,720
to understand uh in

1449
00:54:10,870 --> 00:54:09,040
a laboratory you know

1450
00:54:13,109 --> 00:54:10,880
on the surface of the earth the best

1451
00:54:15,750 --> 00:54:13,119
laboratory is actually the planet itself

1452
00:54:17,910 --> 00:54:15,760
and and insight is actually able to go

1453
00:54:20,150 --> 00:54:17,920
to the laboratory that is mars and make

1454
00:54:22,950 --> 00:54:20,160
the measurements of what that planet was

1455
00:54:25,349 --> 00:54:22,960
that that resulted from this process and

1456
00:54:27,589 --> 00:54:25,359
we've already been able to to uh

1457
00:54:29,349 --> 00:54:27,599
eliminate probably two-thirds of the

1458
00:54:31,589 --> 00:54:29,359
models for planetary formation that are

1459
00:54:33,109 --> 00:54:31,599
out there just by looking at the size

1460
00:54:35,270 --> 00:54:33,119
and the density of the core and the

1461
00:54:36,470 --> 00:54:35,280
thickness of the crust and and that's

1462
00:54:38,630 --> 00:54:36,480
just with the

1463
00:54:40,470 --> 00:54:38,640

the data that that's uh been published

1464
00:54:42,549 --> 00:54:40,480
just in the in in the last year or so so

1465
00:54:44,309 --> 00:54:42,559
this is just beginning a process that's

1466
00:54:46,150 --> 00:54:44,319
beginning and so

1467
00:54:48,789 --> 00:54:46,160
i think what insight's done is it's

1468
00:54:51,430 --> 00:54:48,799
actually shown a light on the the inside

1469
00:54:53,589 --> 00:54:51,440
of mars whereas we know a lot about the

1470
00:54:56,150 --> 00:54:53,599
outside of mars we've taken images we've

1471
00:54:58,069 --> 00:54:56,160
taken spectra we've made measurements of

1472
00:54:59,670 --> 00:54:58,079
on the surface of mars you know for the

1473
00:55:01,910 --> 00:54:59,680
last 50 years

1474
00:55:03,510 --> 00:55:01,920
incites the first mission that actually

1475
00:55:05,109 --> 00:55:03,520
shown a light beneath the surface of

1476
00:55:07,430 --> 00:55:05,119
mars and showed us what the rest of the

1477
00:55:10,230 --> 00:55:07,440
planet looks like

1478
00:55:14,789 --> 00:55:12,549
great thank you unfortunately that is

1479
00:55:16,789 --> 00:55:14,799
all the time we have for questions if

1480
00:55:19,430 --> 00:55:16,799
you're a member of the media you can

1481
00:55:21,990 --> 00:55:19,440
contact the jpl digital news and media

1482
00:55:24,309 --> 00:55:22,000
office if you have additional questions

1483
00:55:26,549 --> 00:55:24,319
we'll also try to answer as many social

1484
00:55:28,230 --> 00:55:26,559
questions we have the operator will

1485
00:55:31,829 --> 00:55:28,240
provide the phone number on the media

1486
00:55:34,510 --> 00:55:31,839
telecom line so stay tuned and then for

1487
00:55:36,309 --> 00:55:34,520
more updates on the mission visit

1488
00:55:38,870 --> 00:55:36,319

mars.nasa.gov

1489
00:55:43,510 --> 00:55:38,880
insight you can also follow us on social

1490
00:55:46,069 --> 00:55:43,520
media at navajpl and at nasa insight

1491
00:55:48,150 --> 00:55:46,079
we'll also have a video that summarizes

1492
00:55:50,470 --> 00:55:48,160
insight's journey to wrap up this

1493
00:55:53,349 --> 00:55:50,480
teleconference members of the media can

1494
00:55:55,829 --> 00:55:53,359
watch the video and a replay of the

1495
00:55:58,380 --> 00:55:55,839
entire teleconference on our youtube

1496
00:55:59,710 --> 00:55:58,390
page which is youtube.com

1497
00:56:01,670 --> 00:55:59,720
[Music]

1498
00:56:03,990 --> 00:56:01,680
nasajpl

1499
00:56:06,789 --> 00:56:04,000
images from today's teleconference with

1500
00:56:10,230 --> 00:56:06,799
sound will also be available at

1501
00:56:17,589 --> 00:56:11,349
insight

1502
00:56:17,599 --> 00:56:28,230
thank you for joining us

1503
00:56:28,240 --> 00:56:33,430
touchdown confirmed

1504
00:56:37,910 --> 00:56:35,510
insight has been fantastically

1505
00:56:39,910 --> 00:56:37,920
successful we've gotten more science

1506
00:56:41,990 --> 00:56:39,920
than we had ever dreamed that we would

1507
00:56:44,789 --> 00:56:42,000
get during the course of this mission

1508
00:56:47,430 --> 00:56:44,799
insight's primary goal was to better

1509
00:56:49,190 --> 00:56:47,440
understand how the terrestrial planets

1510
00:56:50,789 --> 00:56:49,200
the rocky planets

1511
00:56:53,349 --> 00:56:50,799
formed and evolved

1512
00:56:55,510 --> 00:56:53,359
first we landed an incredibly sensitive

1513
00:56:57,510 --> 00:56:55,520

seismometer on the surface of mars and

1514
00:57:00,230 --> 00:56:57,520
with that we are able to record over

1515
00:57:02,630 --> 00:57:00,240
1300 marsquakes and these range all the

1516
00:57:05,750 --> 00:57:02,640
way from tiny little tumblers that just

1517
00:57:07,670 --> 00:57:05,760
barely go over the noise background to a

1518
00:57:09,910 --> 00:57:07,680
handful of quakes that were larger than

1519
00:57:11,829 --> 00:57:09,920
magnitude four and feeling those

1520
00:57:13,589 --> 00:57:11,839
vibrations the scientists can actually

1521
00:57:16,549 --> 00:57:13,599
take that information and use that to

1522
00:57:18,470 --> 00:57:16,559
reconstruct all the material that those

1523
00:57:21,109 --> 00:57:18,480
mars quakes traveled through and thereby

1524
00:57:23,510 --> 00:57:21,119
see the interior of the planet

1525
00:57:25,589 --> 00:57:23,520
we looked at its core which is

1526
00:57:27,430 --> 00:57:25,599
big and not very dense we looked at its

1527
00:57:29,829 --> 00:57:27,440
mantle which is

1528
00:57:31,030 --> 00:57:29,839
not so hot and we looked at its crust

1529
00:57:33,510 --> 00:57:31,040
which is

1530
00:57:35,910 --> 00:57:33,520
not too thick and not too dense compared

1531
00:57:37,589 --> 00:57:35,920
to some of our pre-mission expectations

1532
00:57:38,390 --> 00:57:37,599
by measuring

1533
00:57:45,109 --> 00:57:38,400
the

1534
00:57:47,430 --> 00:57:45,119
planet looked like

1535
00:57:48,789 --> 00:57:47,440
four and a half billion years ago

1536
00:57:52,309 --> 00:57:48,799
the other thing that we've been able to

1537
00:57:55,190 --> 00:57:52,319
do is make a very detailed record of the

1538
00:57:57,030 --> 00:57:55,200

weather at mars we have a really good

1539
00:57:59,430 --> 00:57:57,040
weather station which has allowed

1540
00:58:01,510 --> 00:57:59,440
meteorologists to study the the weather

1541
00:58:03,990 --> 00:58:01,520
at the at the insight landing site and

1542
00:58:05,270 --> 00:58:04,000
relate that to the climate changes on

1543
00:58:07,190 --> 00:58:05,280
mars

1544
00:58:08,710 --> 00:58:07,200
what we didn't do unfortunately was make

1545
00:58:10,870 --> 00:58:08,720
the heat flow measurement we wanted to

1546
00:58:13,349 --> 00:58:10,880
make our heat flow probe was supposed to

1547
00:58:15,990 --> 00:58:13,359
get three to five meters down and we

1548
00:58:17,270 --> 00:58:16,000
were unable to reach that depth but we

1549
00:58:19,670 --> 00:58:17,280
were able to get some of those

1550
00:58:21,349 --> 00:58:19,680
measurements such as the heat transfer

1551
00:58:23,750 --> 00:58:21,359
amongst the soil

1552
00:58:25,829 --> 00:58:23,760
insight is a solar powered mission we

1553
00:58:27,910 --> 00:58:25,839
have solar panels and they were designed

1554
00:58:29,589 --> 00:58:27,920
to give us enough power to easily get

1555
00:58:31,190 --> 00:58:29,599
through the first two years

1556
00:58:32,789 --> 00:58:31,200
but there's a lot of dust in mars

1557
00:58:34,950 --> 00:58:32,799
atmosphere and that's falling down on

1558
00:58:36,470 --> 00:58:34,960
top of our solar arrays and slowly

1559
00:58:38,230 --> 00:58:36,480
blocking the sun

1560
00:58:39,910 --> 00:58:38,240
as the panels are getting dustier we

1561
00:58:41,750 --> 00:58:39,920
started racking our brains with whether

1562
00:58:43,750 --> 00:58:41,760
there's anything we can do to try to

1563
00:58:45,670 --> 00:58:43,760

clean off those panels ourselves when

1564
00:58:47,910 --> 00:58:45,680
the idea of using dirt to clean the

1565
00:58:49,670 --> 00:58:47,920
solar arrays was first proposed it

1566
00:58:51,510 --> 00:58:49,680
seemed counterintuitive we were actually

1567
00:58:53,990 --> 00:58:51,520
able to use the arm and the scoop to

1568
00:58:56,309 --> 00:58:54,000
scoop up some soil from the ground and

1569
00:58:59,589 --> 00:58:56,319
dump it over the lander having some of

1570
00:59:01,270 --> 00:58:59,599
that heavier sand blow onto the arrays

1571
00:59:03,349 --> 00:59:01,280
and knock some of the dust off so we

1572
00:59:06,630 --> 00:59:03,359
essentially used it as an array cleaning

1573
00:59:08,309 --> 00:59:06,640
tool cleaning with dirt actually worked

1574
00:59:11,030 --> 00:59:08,319
it allowed us to actually keep the

1575
00:59:13,109 --> 00:59:11,040
instruments going during the low power

1576
00:59:14,950 --> 00:59:13,119
season where the the mars is farthest

1577
00:59:16,950 --> 00:59:14,960
from the sun during the winter

1578
00:59:18,069 --> 00:59:16,960
unfortunately later in the summer we

1579
00:59:20,230 --> 00:59:18,079
think that the power is going to be

1580
00:59:22,710 --> 00:59:20,240
dropping so quickly due to

1581
00:59:25,270 --> 00:59:22,720
the atmosphere getting dustier due to

1582
00:59:26,549 --> 00:59:25,280
the alignment of mars in the sun we're

1583
00:59:28,870 --> 00:59:26,559
going to be at a point where we can no

1584
00:59:30,150 --> 00:59:28,880
longer have all of our instruments on

1585
00:59:32,549 --> 00:59:30,160
which means we'll be turning off the

1586
00:59:34,390 --> 00:59:32,559
seismometer and other instruments on

1587
00:59:35,750 --> 00:59:34,400
board the last day is going to be

1588
00:59:37,589 --> 00:59:35,760

bittersweet

1589
00:59:38,870 --> 00:59:37,599
obviously we're preparing for it we know

1590
00:59:41,030 --> 00:59:38,880
it's coming

1591
00:59:44,230 --> 00:59:41,040
but that first moment where we don't

1592
00:59:45,829 --> 00:59:44,240
hear from the lander when we expect to

1593
00:59:48,230 --> 00:59:45,839
that's going to be tough

1594
00:59:50,870 --> 00:59:48,240
it's left a permanent mark on me i

1595
00:59:52,549 --> 00:59:50,880
literally tattooed insight onto my arm

1596
00:59:55,829 --> 00:59:52,559
i'll never let it go

1597
00:59:57,990 --> 00:59:55,839
we've really rewritten sort of the the

1598
00:59:59,750 --> 00:59:58,000
chapter of the encyclopedia on the

1599
01:00:01,990 --> 00:59:59,760
interior of mars

1600
01:00:03,829 --> 01:00:02,000
that was our last big hole in our

1601
01:00:05,430 --> 01:00:03,839
understanding of the planet

1602
01:00:06,870 --> 01:00:05,440
there's a lot of data that people are

1603
01:00:08,870 --> 01:00:06,880
going to be looking at for decades to

1604
01:00:10,870 --> 01:00:08,880
come we accomplished so many of our