
InSight
. . into the Early
Evolution
of Terrestrial
Planets

1
00:00:00,320 --> 00:00:20,860
[Music]

2
00:00:25,070 --> 00:00:23,510
hello and welcome everybody to NASA's

3
00:00:27,620 --> 00:00:25,080
Jet Propulsion Laboratory in Pasadena

4
00:00:29,840 --> 00:00:27,630
California we're here today to talk

5
00:00:31,820 --> 00:00:29,850
about NASA's next mission to Mars the

6
00:00:33,200 --> 00:00:31,830
insight Lander were a little over a

7
00:00:35,720 --> 00:00:33,210
month from launch so we're getting

8
00:00:38,150 --> 00:00:35,730
pretty excited here I'm Shari cook of

9
00:00:39,770 --> 00:00:38,160
JPL's Media Relations office and I'm

10
00:00:42,110 --> 00:00:39,780
gonna be your moderator here for the

11
00:00:43,760 --> 00:00:42,120
news conference today we've got a great

12
00:00:45,890 --> 00:00:43,770
group of people who will help tell you

13
00:00:47,720 --> 00:00:45,900

what makes insite special so I'm gonna

14
00:00:49,220 --> 00:00:47,730
introduce them to you right now so right

15
00:00:51,910 --> 00:00:49,230
here we've got Bruce Banner

16
00:00:56,630 --> 00:00:51,920
he is insights principal investigator

17
00:01:02,060 --> 00:00:56,640
next to him next to him is Tom Hoffman

18
00:01:04,280 --> 00:01:02,070
he's insights project manager and in a

19
00:01:06,260 --> 00:01:04,290
very special location at JPL where we

20
00:01:08,240 --> 00:01:06,270
try and test our robots in a mars-like

21
00:01:10,850 --> 00:01:08,250
environment before we actually send them

22
00:01:16,730 --> 00:01:10,860
to Mars is Jamie singer she's insights

23
00:01:18,620 --> 00:01:16,740
instrument deployment lead but to kick

24
00:01:20,810 --> 00:01:18,630
us off today we have a very special

25
00:01:23,029 --> 00:01:20,820
pre-recorded message from Thomas Sir

26
00:01:24,469 --> 00:01:23,039
Buchan the associate administrator for

27
00:01:26,870 --> 00:01:24,479
the science Mission Directorate at NASA

28
00:01:30,859 --> 00:01:26,880
headquarters he's going to tell us how

29
00:01:33,679 --> 00:01:30,869
insight good afternoon okay ready for

30
00:01:36,249 --> 00:01:33,689
NASA science programs here at the

31
00:01:39,139 --> 00:01:36,259
agency's headquarters in Washington DC

32
00:01:41,899 --> 00:01:39,149
today you'll hear about our next journey

33
00:01:45,349 --> 00:01:41,909
to the red planet a lander called

34
00:01:48,620 --> 00:01:45,359
insight the first mission to study the

35
00:01:51,370 --> 00:01:48,630
interior of Mars something never done in

36
00:01:53,870 --> 00:01:51,380
the exploration of this planet a

37
00:01:57,889 --> 00:01:53,880
dictionary definition of insight is to

38
00:02:00,770 --> 00:01:57,899

see the inner nature of something inside

39
00:02:03,440 --> 00:02:00,780
will do just that in essence it will

40
00:02:07,130 --> 00:02:03,450
take the vital signs of Mars its pulse

41
00:02:09,710 --> 00:02:07,140
temperature and much more we like to say

42
00:02:11,540 --> 00:02:09,720
it's the first thorough checkup since

43
00:02:14,870 --> 00:02:11,550
the planet formed four-and-a-half

44
00:02:17,480 --> 00:02:14,880
billion years ago we've been studying

45
00:02:20,150 --> 00:02:17,490
Mars with orbiters Landers and Rovers

46
00:02:24,260 --> 00:02:20,160
for years now discovering and learning

47
00:02:27,350 --> 00:02:24,270
much with each mission we haven't landed

48
00:02:28,530 --> 00:02:27,360
on a planet since 2012 and now we're

49
00:02:31,530 --> 00:02:28,540
ready to go back

50
00:02:34,170 --> 00:02:31,540
this mission also has many firsts in

51
00:02:36,839 --> 00:02:34,180
science technology and even in location

52
00:02:39,959 --> 00:02:36,849
it's the first interplanetary launch

53
00:02:42,959 --> 00:02:39,969
from the west coast but this is more

54
00:02:44,729 --> 00:02:42,969
than just a Mars mission insight can

55
00:02:48,300 --> 00:02:44,739
teach us about the formation of our

56
00:02:51,449 --> 00:02:48,310
earth our moon and even rocky planets in

57
00:02:54,050 --> 00:02:51,459
other solar systems there's something we

58
00:02:57,629 --> 00:02:54,060
always remind ourselves here at NASA

59
00:02:59,789 --> 00:02:57,639
exploring Mars is really hard in fact

60
00:03:02,640 --> 00:02:59,799
nothing is more difficult in robotic

61
00:03:03,360 --> 00:03:02,650
planetary exploration than landing on

62
00:03:05,970 --> 00:03:03,370
Mars

63
00:03:08,759 --> 00:03:05,980

the u.s. is the only nation to

64
00:03:12,809 --> 00:03:08,769
successfully land on Mars still Mars

65
00:03:15,300 --> 00:03:12,819
always presents a huge challenge this

66
00:03:17,580 --> 00:03:15,310
mission is the culmination of the

67
00:03:20,069 --> 00:03:17,590
dedicated work by NASA along with

68
00:03:22,800 --> 00:03:20,079
industry and international partners

69
00:03:25,229 --> 00:03:22,810
we're proud to have the international

70
00:03:28,050 --> 00:03:25,239
team working with NASA to explore Mars

71
00:03:30,509 --> 00:03:28,060
and as we plan to return to the moon

72
00:03:32,250 --> 00:03:30,519
we'll expand our partnerships with

73
00:03:34,619 --> 00:03:32,260
industry and other nations to explore

74
00:03:39,059 --> 00:03:34,629
our lunar neighbor and advance our

75
00:03:41,129 --> 00:03:39,069
missions to Mars at the same time NASA

76
00:03:43,559 --> 00:03:41,139
science strives to impact and inspire

77
00:03:46,110 --> 00:03:43,569
the next generation and we will use

78
00:03:49,199 --> 00:03:46,120
every opportunity to engage everyone in

79
00:03:52,860 --> 00:03:49,209
our innovative work and help continue us

80
00:03:53,750 --> 00:03:52,870
all to discover today and for decades to

81
00:03:56,490 --> 00:03:53,760
come

82
00:04:01,589 --> 00:03:56,500
enjoy today's briefing and I'll see you

83
00:04:03,240 --> 00:04:01,599
at launch go inside okay all right well

84
00:04:05,129 --> 00:04:03,250
thanks to doctors or buchen for that

85
00:04:07,500 --> 00:04:05,139
message that helps us understand how

86
00:04:09,449 --> 00:04:07,510
insight fits in context with NASA's

87
00:04:11,759 --> 00:04:09,459
history of exploration so we're gonna

88
00:04:13,559 --> 00:04:11,769

have a discussion here at JPL then we're

89
00:04:15,149 --> 00:04:13,569
gonna open it up for questions so we'll

90
00:04:17,430 --> 00:04:15,159
take questions here and then we also

91
00:04:19,409 --> 00:04:17,440
have some reporters on a phone line and

92
00:04:20,879 --> 00:04:19,419
for those of you on the media line if

93
00:04:23,790 --> 00:04:20,889
you want to ask a question press star

94
00:04:25,950 --> 00:04:23,800
one we're also taking questions via

95
00:04:28,529 --> 00:04:25,960
social media so you can use the hashtag

96
00:04:30,659 --> 00:04:28,539
ask NASA all right so I'm going to turn

97
00:04:34,290 --> 00:04:30,669
it over to Bruce okay thanks Jerry

98
00:04:36,480 --> 00:04:34,300
so I don't think you could imagine just

99
00:04:40,050 --> 00:04:36,490
how excited I am not so much to be here

100
00:04:41,450 --> 00:04:40,060
today but to be 36 days away from launch

101
00:04:43,969 --> 00:04:41,460
of the insight mission this is some

102
00:04:47,420 --> 00:04:43,979
that I've dreamed about and and devoted

103
00:04:50,600 --> 00:04:47,430
my career for for for 30 years now been

104
00:04:53,510 --> 00:04:50,610
trying to refine this mission concept

105
00:04:55,969 --> 00:04:53,520
and get it ready to go and finally we're

106
00:04:58,640 --> 00:04:55,979
right on the verge of taking off for

107
00:05:00,050 --> 00:04:58,650
Mars so a little bit about the science

108
00:05:03,140 --> 00:05:00,060
on insight

109
00:05:05,390 --> 00:05:03,150
the goal of insight is is nothing less

110
00:05:07,070 --> 00:05:05,400
than to better understand the birth of

111
00:05:10,400 --> 00:05:07,080
the earth the birth of the planet that

112
00:05:12,379 --> 00:05:10,410
we live on and we're going to do that by

113
00:05:14,240 --> 00:05:12,389

going to Mars which seems a little bit

114
00:05:19,490 --> 00:05:14,250
counterintuitive so if I can have the

115
00:05:22,909 --> 00:05:19,500
first the first image planets are very

116
00:05:25,100 --> 00:05:22,919
very complex of objects so you know you

117
00:05:28,279 --> 00:05:25,110
start with a solar nebula which is kind

118
00:05:29,779 --> 00:05:28,289
of a uniform a cloud of meteoritic

119
00:05:31,939 --> 00:05:29,789
material which is not a very interesting

120
00:05:35,180 --> 00:05:31,949
Rock it's kind of gray and featureless

121
00:05:37,430 --> 00:05:35,190
it accretes into these bodies of some

122
00:05:38,360 --> 00:05:37,440
large or some smaller and then it goes

123
00:05:40,850 --> 00:05:38,370
through a process that we call

124
00:05:44,089 --> 00:05:40,860
differentiation it goes from a body of

125
00:05:47,540 --> 00:05:44,099
this uniform material into a very

126
00:05:49,279 --> 00:05:47,550
diverse and complex body that has a core

127
00:05:52,100 --> 00:05:49,289
that you can see at the center of each

128
00:05:55,610 --> 00:05:52,110
of these bodies its chords made up of

129
00:05:57,409 --> 00:05:55,620
dense iron and nickel it has a rocky

130
00:05:59,629 --> 00:05:57,419
mantle surrounding that core which is

131
00:06:02,180 --> 00:05:59,639
made up of rocks but they're rocks that

132
00:06:03,350 --> 00:06:02,190
are higher density and of a crystal

133
00:06:04,790 --> 00:06:03,360
nature that you don't really see at the

134
00:06:07,999 --> 00:06:04,800
surface because it only exists under

135
00:06:09,200 --> 00:06:08,009
pressure and finally a crust and that's

136
00:06:11,230 --> 00:06:09,210
the part of the planet that we interact

137
00:06:13,909 --> 00:06:11,240
with that we live on that has

138
00:06:15,950 --> 00:06:13,919

concentrated all the materials that are

139
00:06:20,659 --> 00:06:15,960
the building blocks from of life and so

140
00:06:23,899 --> 00:06:20,669
how we get from a ball of featureless

141
00:06:27,020 --> 00:06:23,909
rock onto into into a planet that may or

142
00:06:29,270 --> 00:06:27,030
may not support life is is is a key

143
00:06:31,310 --> 00:06:29,280
question in planetary science and these

144
00:06:33,740 --> 00:06:31,320
processes that do this all happen in the

145
00:06:36,140 --> 00:06:33,750
first a few tens of millions of years

146
00:06:37,550 --> 00:06:36,150
which is just a few seconds in the in at

147
00:06:39,770 --> 00:06:37,560
the beginning of the life of a planet

148
00:06:42,290 --> 00:06:39,780
that lasts for 1/2 billion years

149
00:06:45,740 --> 00:06:42,300
so we'd like to be able to understand

150
00:06:47,749 --> 00:06:45,750
what happened and the clues to that are

151
00:06:50,060 --> 00:06:47,759
in the structure of the planet that gets

152
00:06:52,879 --> 00:06:50,070
set up in these early years except for

153
00:06:55,429 --> 00:06:52,889
the earth all that information has been

154
00:06:57,679 --> 00:06:55,439
obscured by plate tectonics

155
00:07:00,709 --> 00:06:57,689
by vigorous convection in the mantle and

156
00:07:02,149 --> 00:07:00,719
so we're kind of it at a loss to see on

157
00:07:03,679 --> 00:07:02,159
the earth you know what what's the

158
00:07:06,079 --> 00:07:03,689
evidence for what happened in those

159
00:07:08,989 --> 00:07:06,089
early years but we can go to Mars and

160
00:07:10,850 --> 00:07:08,999
Mars is a smaller planet it's less

161
00:07:13,279 --> 00:07:10,860
active than the earth and so it has

162
00:07:15,769 --> 00:07:13,289
retained the the fingerprints of those

163
00:07:18,379 --> 00:07:15,779

early processes in its basic structure

164
00:07:20,659 --> 00:07:18,389
the the thickness of the crust the the

165
00:07:22,669 --> 00:07:20,669
the composition of the mantle the size

166
00:07:25,759 --> 00:07:22,679
and composition of its core and by

167
00:07:29,119 --> 00:07:25,769
mapping out these boundaries these

168
00:07:31,909 --> 00:07:29,129
various different sections of the inside

169
00:07:34,129 --> 00:07:31,919
the planet we can then understand better

170
00:07:36,499 --> 00:07:34,139
how the planet formed and and how our

171
00:07:38,719 --> 00:07:36,509
planet got to be the way it is where we

172
00:07:39,499 --> 00:07:38,729
can actually live and play and have a

173
00:07:41,959 --> 00:07:39,509
good time

174
00:07:44,629 --> 00:07:41,969
whereas other planets like Mars itself

175
00:07:46,879 --> 00:07:44,639
and like Venus our places where life

176
00:07:50,149 --> 00:07:46,889
really has a heart would have a hard

177
00:07:52,369 --> 00:07:50,159
time surviving so we're going to go to

178
00:07:55,069 --> 00:07:52,379
Mars and in order to do that we need to

179
00:07:57,469 --> 00:07:55,079
be able to probe deep into the planet

180
00:07:59,540 --> 00:07:57,479
not just down a few inches or a few feet

181
00:08:01,429 --> 00:07:59,550
as we have done with some other missions

182
00:08:03,469 --> 00:08:01,439
but all the way down to the very center

183
00:08:07,069 --> 00:08:03,479
of the planet roughly 2,000 miles

184
00:08:10,519 --> 00:08:07,079
beneath the surface we're going to do

185
00:08:15,589 --> 00:08:10,529
that with three investigations the first

186
00:08:19,879 --> 00:08:15,599
is a seismometer have the next slide the

187
00:08:22,069 --> 00:08:19,889
seismometer is a very very sensitive

188
00:08:23,629 --> 00:08:22,079

I mean sensitive is really an

189
00:08:26,479 --> 00:08:23,639
understatement it's it's exquisitely

190
00:08:28,519 --> 00:08:26,489
sensitive a device for measuring the

191
00:08:30,229 --> 00:08:28,529
motion of the ground and we're not

192
00:08:33,199 --> 00:08:30,239
talking about motion talking about

193
00:08:35,029 --> 00:08:33,209
vibrations that have an amplitude sort

194
00:08:36,800 --> 00:08:35,039
of comparable to the size of an atom so

195
00:08:38,540 --> 00:08:36,810
these are waves that were generated

196
00:08:40,790 --> 00:08:38,550
maybe by a Mars quake on the other side

197
00:08:42,829 --> 00:08:40,800
of the planet have traveled all the way

198
00:08:44,629 --> 00:08:42,839
through the planet getting the their

199
00:08:46,309 --> 00:08:44,639
waveform modified as they go through the

200
00:08:48,769 --> 00:08:46,319
planet and picking up information about

201
00:08:50,059 --> 00:08:48,779
the deep interior structure and then we

202
00:08:52,040 --> 00:08:50,069
are able to pick it up when it comes

203
00:08:52,759 --> 00:08:52,050
back up to the surface under the

204
00:08:55,639 --> 00:08:52,769
seismometer

205
00:08:57,829 --> 00:08:55,649
and in order to do that not only do you

206
00:09:00,049 --> 00:08:57,839
have to have a very sensitive device for

207
00:09:01,670 --> 00:09:00,059
for measuring those those those motions

208
00:09:03,290 --> 00:09:01,680
but you have to protect it from

209
00:09:05,210 --> 00:09:03,300
everything else that might affect it and

210
00:09:07,309 --> 00:09:05,220
so you can see in this picture we have

211
00:09:08,930 --> 00:09:07,319
the the sensors at the center that are

212
00:09:10,940 --> 00:09:08,940
doing the measuring and then we

213
00:09:13,070 --> 00:09:10,950

have several different layers of

214
00:09:14,660 --> 00:09:13,080
protection it's sort of like a Russian

215
00:09:15,890 --> 00:09:14,670
doll where you you open it up and

216
00:09:17,900 --> 00:09:15,900
there's another layer and another layer

217
00:09:20,180 --> 00:09:17,910
and another layer and finally in the

218
00:09:22,220 --> 00:09:20,190
inside you have these these very coddled

219
00:09:25,460 --> 00:09:22,230
protective instruments and so this is

220
00:09:29,840 --> 00:09:25,470
our basic a really key basic instrument

221
00:09:33,680 --> 00:09:29,850
for probing the inside of Mars the next

222
00:09:35,270 --> 00:09:33,690
investigation is the rise experiment

223
00:09:38,240 --> 00:09:35,280
which is a what we call a radio science

224
00:09:40,490 --> 00:09:38,250
experiment and uses the radios on the

225
00:09:41,990 --> 00:09:40,500
spacecraft communicating with a deep

226
00:09:44,630 --> 00:09:42,000
space network on earth which are those

227
00:09:47,920 --> 00:09:44,640
those huge radio dishes that communicate

228
00:09:50,990 --> 00:09:47,930
with the spacecraft and by using the the

229
00:09:53,390 --> 00:09:51,000
frequency shift of this communication we

230
00:09:56,150 --> 00:09:53,400
can track the location of the spacecraft

231
00:09:58,850 --> 00:09:56,160
at with an accuracy of just a handful of

232
00:10:01,340 --> 00:09:58,860
inches which is an incredible feat at

233
00:10:02,900 --> 00:10:01,350
you know 200 million miles away we can

234
00:10:05,000 --> 00:10:02,910
tell where that spacecraft is within a

235
00:10:06,680 --> 00:10:05,010
few inches and as the planet rotates

236
00:10:09,260 --> 00:10:06,690
with the spacecraft sitting on the

237
00:10:12,980 --> 00:10:09,270
surface we can watch that rotation and

238
00:10:15,980 --> 00:10:12,990

figure out the direction of the North

239
00:10:17,840 --> 00:10:15,990
Pole of Mars and watch that pole wobble

240
00:10:19,670 --> 00:10:17,850
over the course of the Martian year and

241
00:10:21,740 --> 00:10:19,680
the size of that wobble and the

242
00:10:23,300 --> 00:10:21,750
frequency that wobble is connected to

243
00:10:25,970 --> 00:10:23,310
the way that the core of the planet

244
00:10:28,100 --> 00:10:25,980
interacts with its mantle and we can

245
00:10:31,040 --> 00:10:28,110
actually derive the properties of the

246
00:10:35,660 --> 00:10:31,050
core its size and its density from the

247
00:10:37,460 --> 00:10:35,670
the characteristics of that wobbling and

248
00:10:40,070 --> 00:10:37,470
the third it's in spearmint that we're

249
00:10:41,270 --> 00:10:40,080
going to do on Mars is a heat flow

250
00:10:42,710 --> 00:10:41,280
experiment we're gonna measure the

251
00:10:45,650 --> 00:10:42,720
amount of heat coming out of the planet

252
00:10:50,050 --> 00:10:45,660
and we're gonna do that in a very kind

253
00:10:52,579 --> 00:10:50,060
of a novel way if I had the next slide

254
00:10:53,990 --> 00:10:52,589
it's it's it's novel in a sense but it's

255
00:10:56,840 --> 00:10:54,000
not new this is something that we

256
00:10:59,180 --> 00:10:56,850
actually did on the moon and we do that

257
00:11:02,120 --> 00:10:59,190
by pushing a temperature probe down

258
00:11:03,620 --> 00:11:02,130
beneath the surface of the planet in the

259
00:11:05,750 --> 00:11:03,630
case of Apollo these they pushed it down

260
00:11:07,790 --> 00:11:05,760
several feet below the surface and you

261
00:11:09,650 --> 00:11:07,800
measure the temperature as you go down

262
00:11:11,360 --> 00:11:09,660
below the surface and it's going to

263
00:11:13,670 --> 00:11:11,370

increase slightly with death because

264
00:11:15,740 --> 00:11:13,680
planet is hotter at depth than it is at

265
00:11:17,720 --> 00:11:15,750
the surface it only increases maybe a

266
00:11:19,940 --> 00:11:17,730
few hundreds of degrees you go down that

267
00:11:22,850 --> 00:11:19,950
distance but we can measure that and

268
00:11:23,180 --> 00:11:22,860
extrapolate it down so if you have an

269
00:11:26,360 --> 00:11:23,190
ass

270
00:11:29,840 --> 00:11:26,370
on the planet you can do this and maybe

271
00:11:31,310 --> 00:11:29,850
20 minutes or half an hour but if you

272
00:11:33,580 --> 00:11:31,320
want to do it robotically you have to

273
00:11:39,160 --> 00:11:33,590
get a little bit more clever so the next

274
00:11:42,470 --> 00:11:39,170
image that we have I believe is a video

275
00:11:45,140 --> 00:11:42,480
now okay so this is an animation that

276
00:11:47,180 --> 00:11:45,150
shows what we're going to do we have a

277
00:11:49,550 --> 00:11:47,190
something we call a mole because it

278
00:11:51,230 --> 00:11:49,560
burrows down into the surface and what

279
00:11:53,390 --> 00:11:51,240
it is is it's a little torpedo about

280
00:11:55,460 --> 00:11:53,400
this big with a hammer on the inside

281
00:11:57,020 --> 00:11:55,470
that gets wound up on a motor and it

282
00:11:59,060 --> 00:11:57,030
goes over and over again about every

283
00:12:03,260 --> 00:11:59,070
three seconds hammers this thing down

284
00:12:05,930 --> 00:12:03,270
and finally it should go down about what

285
00:12:08,900 --> 00:12:05,940
we 5 meters or so which is about 15 or

286
00:12:11,300 --> 00:12:08,910
16 feet and it pulls behind itself a

287
00:12:13,340 --> 00:12:11,310
cable that has temperature sensors along

288
00:12:15,950 --> 00:12:13,350

the cable so instead of only going down

289
00:12:18,290 --> 00:12:15,960
a few feet we think this remote probe we

290
00:12:20,090 --> 00:12:18,300
can actually go down about 15 feet which

291
00:12:22,550 --> 00:12:20,100
gives us a better baseline to measure

292
00:12:24,710 --> 00:12:22,560
the temperature increase with depth and

293
00:12:26,390 --> 00:12:24,720
be able to estimate the amount of heat

294
00:12:29,630 --> 00:12:26,400
coming out of out of Mars and that

295
00:12:31,640 --> 00:12:29,640
amount of heat is tied to the geological

296
00:12:33,560 --> 00:12:31,650
activity of the planet it's the heat

297
00:12:36,740 --> 00:12:33,570
engine of the planet that drives

298
00:12:38,330 --> 00:12:36,750
volcanism it dries tectonic activity it

299
00:12:40,400 --> 00:12:38,340
dries mountain buildings so all the

300
00:12:43,130 --> 00:12:40,410
geological processes that happen on a

301
00:12:45,170 --> 00:12:43,140
planet are driven by its heat engine and

302
00:12:48,710 --> 00:12:45,180
we want to measure sort of the vigor of

303
00:12:49,970 --> 00:12:48,720
that heat engine the next video shows a

304
00:12:51,830 --> 00:12:49,980
little bit more about how this thing

305
00:12:54,350 --> 00:12:51,840
works this is a field test that we

306
00:12:56,900 --> 00:12:54,360
actually did in a you know the Mars yard

307
00:12:59,630 --> 00:12:56,910
here at JPL you can see the mole there

308
00:13:01,790 --> 00:12:59,640
in his hand and they're just halfway

309
00:13:03,320 --> 00:13:01,800
down I don't know if you can hear the

310
00:13:05,150 --> 00:13:03,330
sound but it goes click about every

311
00:13:06,710 --> 00:13:05,160
three seconds and if you look real

312
00:13:09,200 --> 00:13:06,720
closely you can see it move about a

313
00:13:11,420 --> 00:13:09,210

millimeter at a time and so it has to do

314
00:13:15,110 --> 00:13:11,430
that about 10,000 times to get down to

315
00:13:17,480 --> 00:13:15,120
depth but we've got lots of time to wait

316
00:13:19,370 --> 00:13:17,490
for it on Mars and so this is what's

317
00:13:24,230 --> 00:13:19,380
going to tell us just how active the

318
00:13:26,540 --> 00:13:24,240
planet is after we get to Mars so that's

319
00:13:28,190 --> 00:13:26,550
kind of an overview of the science that

320
00:13:30,440 --> 00:13:28,200
we're doing and in order to do that

321
00:13:32,240 --> 00:13:30,450
science of course we have to get to Mars

322
00:13:34,130 --> 00:13:32,250
and we have to put these these

323
00:13:35,920 --> 00:13:34,140
instruments in a place where they can

324
00:13:37,269 --> 00:13:35,930
make their measurements and Tom

325
00:13:38,530 --> 00:13:37,279
Hoffman the project manager is gonna

326
00:13:40,960 --> 00:13:38,540
tell you a little bit about how we're

327
00:13:42,550 --> 00:13:40,970
gonna do that thanks Bruce yeah I

328
00:13:44,200 --> 00:13:42,560
haven't been working quite as long as

329
00:13:45,760 --> 00:13:44,210
Bruce has on this project but it's been

330
00:13:48,730 --> 00:13:45,770
about seven years for me so it's been

331
00:13:51,070 --> 00:13:48,740
also a journey of passion that I've had

332
00:13:52,870 --> 00:13:51,080
so for the past couple of years we've

333
00:13:54,699 --> 00:13:52,880
been putting together the spacecraft at

334
00:13:56,710 --> 00:13:54,709
Lockheed Martin in Denver

335
00:13:59,170 --> 00:13:56,720
there the spacecraft contractor building

336
00:14:02,320 --> 00:13:59,180
the flight system that'll make Bruce's

337
00:14:04,389 --> 00:14:02,330
dreams a reality so we've been doing

338
00:14:06,310 --> 00:14:04,399

that for the last couple of years the

339
00:14:08,079 --> 00:14:06,320
last fall we've been doing the

340
00:14:09,610 --> 00:14:08,089
environmental testing so simulating the

341
00:14:11,530 --> 00:14:09,620
Mars environment that we're gonna see

342
00:14:13,210 --> 00:14:11,540
once we get to Mars doing all the

343
00:14:15,550 --> 00:14:13,220
testing necessary to verify that the

344
00:14:16,810 --> 00:14:15,560
system is fully ready to go just

345
00:14:18,730 --> 00:14:16,820
recently we actually shipped the

346
00:14:20,680 --> 00:14:18,740
spacecraft of Annenberg Air Force Base

347
00:14:22,269 --> 00:14:20,690
as you heard from Thomas er Buchan this

348
00:14:24,820 --> 00:14:22,279
will be the very first interplanetary

349
00:14:26,560 --> 00:14:24,830
launch from the west coast in California

350
00:14:28,840 --> 00:14:26,570
so we're breaking the monopoly that the

351
00:14:31,600 --> 00:14:28,850
East Coast has had on interplanetary

352
00:14:34,900 --> 00:14:31,610
launches with this launch if we go to

353
00:14:38,220 --> 00:14:34,910
the first image this isn't a picture of

354
00:14:41,199 --> 00:14:38,230
us video of us arriving in Vandenberg at

355
00:14:44,310 --> 00:14:41,209
on a c-17 inside of that white container

356
00:14:46,570 --> 00:14:44,320
is our spacecraft so it's been carefully

357
00:14:50,350 --> 00:14:46,580
secured in there and this is at

358
00:14:52,449 --> 00:14:50,360
Astrotech facility at at Vandenberg we

359
00:14:55,000 --> 00:14:52,459
have the spacecraft inside of what we

360
00:14:57,970 --> 00:14:55,010
call the birdcage we well be having a

361
00:14:59,980 --> 00:14:57,980
media day in on April 6 that if you're

362
00:15:03,070 --> 00:14:59,990
part of the media you're invited to come

363
00:15:04,900 --> 00:15:03,080

and actually see this in Vandenberg so

364
00:15:07,600 --> 00:15:04,910
you'll see that that spacecraft as its

365
00:15:10,060 --> 00:15:07,610
in its final preparation before we

366
00:15:14,050 --> 00:15:10,070
actually launch if we go to the next

367
00:15:16,570 --> 00:15:14,060
image this is what we hope we will see

368
00:15:19,050 --> 00:15:16,580
on May 5th this is a not our launch

369
00:15:21,970 --> 00:15:19,060
obviously but this is an Atlas from

370
00:15:24,790 --> 00:15:21,980
slick 3 at Vandenberg so you can see

371
00:15:27,010 --> 00:15:24,800
it's a beautiful area I'm really hoping

372
00:15:29,680 --> 00:15:27,020
that we have a clear day like this we'll

373
00:15:32,170 --> 00:15:29,690
see it's May in the middle of California

374
00:15:33,730 --> 00:15:32,180
but and we're also launching at 4:00

375
00:15:36,730 --> 00:15:33,740
a.m. so it'll be a little bit dark we

376
00:15:39,550 --> 00:15:36,740
have a an animation that we can show you

377
00:15:40,780 --> 00:15:39,560
if you run this one of the cool things

378
00:15:44,230 --> 00:15:40,790
is if you are in the Southern California

379
00:15:47,500 --> 00:15:44,240
area you'll see a slowly expanding blue

380
00:15:49,210 --> 00:15:47,510
circle this is sort of the view angle so

381
00:15:49,449 --> 00:15:49,220
depending on where you are in Southern

382
00:15:50,499 --> 00:15:49,459
Cal

383
00:15:52,540 --> 00:15:50,509
for you you'll be able to see the

384
00:15:55,210 --> 00:15:52,550
spacecraft in a very various points

385
00:15:57,639 --> 00:15:55,220
along its ascent as it heads off on its

386
00:15:59,679 --> 00:15:57,649
way to Mars this should be quite

387
00:16:01,780 --> 00:15:59,689
spectacular because it is early morning

388
00:16:03,579 --> 00:16:01,790

hours so it should light up the sky and

389
00:16:05,439 --> 00:16:03,589
be very visible throughout pretty much

390
00:16:06,879 --> 00:16:05,449
all of a Southern California even down

391
00:16:08,290 --> 00:16:06,889
into Mexico at some point it'll

392
00:16:10,689 --> 00:16:08,300
disappear because if we get too high up

393
00:16:12,549 --> 00:16:10,699
in the in the sky for actually be

394
00:16:13,900 --> 00:16:12,559
visible but it should be spectacular if

395
00:16:16,150 --> 00:16:13,910
you happen to be up and nothing better

396
00:16:17,799 --> 00:16:16,160
to do at 4:00 in the morning please take

397
00:16:21,579 --> 00:16:17,809
a look at this at the at your back

398
00:16:23,410 --> 00:16:21,589
window and so one of the the other

399
00:16:25,389 --> 00:16:23,420
things I mentioned is we are an evening

400
00:16:26,769 --> 00:16:25,399
launch so if we run the next video

401
00:16:30,879 --> 00:16:26,779
you'll get a better idea of what it will

402
00:16:33,210 --> 00:16:30,889
look like hopefully on a clear day we're

403
00:16:35,439 --> 00:16:33,220
gonna run that so that'll be it'll be

404
00:16:38,889 --> 00:16:35,449
evening time we'll have the tower all

405
00:16:41,710 --> 00:16:38,899
lit up we'll send the rocket on its way

406
00:16:44,139 --> 00:16:41,720
taking the spacecraft to Mars this is an

407
00:16:45,730 --> 00:16:44,149
Atlas 5 it's a very capable rocket and

408
00:16:47,460 --> 00:16:45,740
one of the questions we often get is why

409
00:16:49,239 --> 00:16:47,470
are we launching from the west coast

410
00:16:51,699 --> 00:16:49,249
originally the spacecraft was designed

411
00:16:54,910 --> 00:16:51,709
for a smaller rocket that we built on

412
00:16:56,859 --> 00:16:54,920
heritage Delta tube we're on an Atlas 5

413
00:16:59,410 --> 00:16:56,869

so that gives us an us throw capability

414
00:17:01,509 --> 00:16:59,420
to get to Mars from either the west or

415
00:17:02,769 --> 00:17:01,519
the east coast a little less congestion

416
00:17:05,889 --> 00:17:02,779
on the west coast so that's why we chose

417
00:17:07,990 --> 00:17:05,899
that on the way to Mars we do a series

418
00:17:10,569 --> 00:17:08,000
of trajectory correction maneuvers the

419
00:17:13,569 --> 00:17:10,579
TCM shown here what that does is it

420
00:17:15,970 --> 00:17:13,579
actually allows us to arrive at Mars on

421
00:17:18,549 --> 00:17:15,980
November 26 regardless of which day we

422
00:17:20,529 --> 00:17:18,559
launch during the launch period I've

423
00:17:22,449 --> 00:17:20,539
been told and reminded that that's the

424
00:17:25,120 --> 00:17:22,459
Monday after Thanksgiving so it's Cyber

425
00:17:28,000 --> 00:17:25,130
Monday so if you're if you're all

426
00:17:30,029 --> 00:17:28,010
shopping online and you're interested in

427
00:17:32,680 --> 00:17:30,039
your shopping at 4 a.m. in the morning

428
00:17:35,080 --> 00:17:32,690
online you can actually watch the video

429
00:17:39,299 --> 00:17:35,090
of the launch and even after the launch

430
00:17:42,100 --> 00:17:39,309
period of time on your own computer so

431
00:17:43,480 --> 00:17:42,110
once we get too close to Mars we go

432
00:17:45,340 --> 00:17:43,490
through what we call our entry descent

433
00:17:47,230 --> 00:17:45,350
and landing phase so that's where we

434
00:17:49,330 --> 00:17:47,240
actually go through the atmosphere about

435
00:17:50,860 --> 00:17:49,340
7 minutes also referred to seven minutes

436
00:17:53,139 --> 00:17:50,870
of Terror because that's when the

437
00:17:55,210 --> 00:17:53,149
project manager and maybe even the PIR

438
00:17:56,830 --> 00:17:55,220

completely terrorized but by what all

439
00:17:59,889 --> 00:17:56,840
the possible things that Mars could

440
00:18:01,570 --> 00:17:59,899
throw at us as Tom mr. Buchan said Mars

441
00:18:02,500 --> 00:18:01,580
is always throwing us a surprise

442
00:18:04,000 --> 00:18:02,510
hopefully

443
00:18:06,430 --> 00:18:04,010
we won't get any surprises on our

444
00:18:09,550 --> 00:18:06,440
landing day but you never know we've

445
00:18:10,720 --> 00:18:09,560
done a lot of testing a lot of analysis

446
00:18:13,840 --> 00:18:10,730
to make sure we've done everything we

447
00:18:15,190 --> 00:18:13,850
possibly can to land safely and so I

448
00:18:17,620 --> 00:18:15,200
believe that we're gonna do that if we

449
00:18:19,570 --> 00:18:17,630
show the next video that will show

450
00:18:22,560 --> 00:18:19,580
actually our what happens during that

451
00:18:24,760 --> 00:18:22,570
phase so we have we're starting at about

452
00:18:27,100 --> 00:18:24,770
12,500 miles per hour we hit the

453
00:18:29,740 --> 00:18:27,110
atmosphere we slow down with the heat

454
00:18:33,010 --> 00:18:29,750
shield then we throw a parachute that

455
00:18:35,080 --> 00:18:33,020
further slows us down we eventually drop

456
00:18:38,110 --> 00:18:35,090
the heat shield as shown here in just a

457
00:18:40,750 --> 00:18:38,120
second and then we acquire the ground

458
00:18:42,340 --> 00:18:40,760
with a radar that shows us just how fast

459
00:18:44,650 --> 00:18:42,350
we're moving as well as how far we are

460
00:18:46,780 --> 00:18:44,660
from the ground once we get close enough

461
00:18:49,270 --> 00:18:46,790
to the ground we let go of the parachute

462
00:18:51,100 --> 00:18:49,280
and the lander drops then it starts

463
00:18:53,530 --> 00:18:51,110

firing thrusters as it gets closer to

464
00:18:55,150 --> 00:18:53,540
the ground as it gets all the way to the

465
00:18:57,720 --> 00:18:55,160
surface we're going about five miles an

466
00:18:59,800 --> 00:18:57,730
hour so in seven minutes we've gone from

467
00:19:02,140 --> 00:18:59,810
12,500 miles per hour to about five

468
00:19:03,880 --> 00:19:02,150
miles an hour and we land and the legs

469
00:19:06,120 --> 00:19:03,890
are shock absorbers - essentially they

470
00:19:08,380 --> 00:19:06,130
absorb the remaining energy there and

471
00:19:10,930 --> 00:19:08,390
that gets us through our entry descent

472
00:19:12,520 --> 00:19:10,940
and landing but but unlike a lot of

473
00:19:14,590 --> 00:19:12,530
missions that's not the end of entry

474
00:19:17,170 --> 00:19:14,600
descent and landing for us we actually

475
00:19:18,910 --> 00:19:17,180
have the three elements on the lander

476
00:19:20,860 --> 00:19:18,920
deck that we then have to take from the

477
00:19:22,660 --> 00:19:20,870
lander deck and put it on to the surface

478
00:19:25,060 --> 00:19:22,670
of Mars so I consider that sort of our

479
00:19:26,620 --> 00:19:25,070
second EDL and that that takes a lot

480
00:19:28,750 --> 00:19:26,630
longer than seven seconds that takes

481
00:19:31,330 --> 00:19:28,760
about two months to finish that

482
00:19:33,430 --> 00:19:31,340
operation we've been working on that as

483
00:19:35,290 --> 00:19:33,440
well to understand that how well that's

484
00:19:37,930 --> 00:19:35,300
going to work we have a animation that

485
00:19:40,090 --> 00:19:37,940
we can run that shows you how that works

486
00:19:41,620 --> 00:19:40,100
this takes about one minute so that

487
00:19:42,970 --> 00:19:41,630
would be great if it was one minute but

488
00:19:45,010 --> 00:19:42,980

like I said it's about two months long

489
00:19:46,390 --> 00:19:45,020
we have to go through a process of

490
00:19:48,850 --> 00:19:46,400
understanding what the terrains like

491
00:19:50,800 --> 00:19:48,860
before we even start the deployment then

492
00:19:51,940 --> 00:19:50,810
we'll place this ice down we have to

493
00:19:55,330 --> 00:19:51,950
make sure that it's in a very good

494
00:19:56,650 --> 00:19:55,340
position and area for it to get the

495
00:19:58,060 --> 00:19:56,660
measurements back that Bruce and the

496
00:19:59,350 --> 00:19:58,070
rest of the science team needs to make

497
00:20:02,170 --> 00:19:59,360
sure that we get the science that we

498
00:20:03,670 --> 00:20:02,180
want and then we take this wind and

499
00:20:07,180 --> 00:20:03,680
thermal shield and place it over the

500
00:20:09,700 --> 00:20:07,190
seismometer that basically is intended

501
00:20:11,320 --> 00:20:09,710
to duplicate what we do on the earth on

502
00:20:13,180 --> 00:20:11,330
earth seismometers are typically in

503
00:20:14,200 --> 00:20:13,190
vaults that are climate-controlled well

504
00:20:16,159 --> 00:20:14,210
into the ground

505
00:20:20,330 --> 00:20:16,169
no pressure changes

506
00:20:21,649 --> 00:20:20,340
very little environmental impact on Mars

507
00:20:24,200 --> 00:20:21,659
we don't have any of that we're out in

508
00:20:25,849 --> 00:20:24,210
the middle of a plane with wind and

509
00:20:28,399 --> 00:20:25,859
pressure and all kinds of stuff so that

510
00:20:30,799 --> 00:20:28,409
when in thermal shield actually tries to

511
00:20:33,289 --> 00:20:30,809
emulate as well as we can that evolved

512
00:20:34,789 --> 00:20:33,299
after that's done as you saw the heat

513
00:20:37,159 --> 00:20:34,799

flow and physical properties probe gets

514
00:20:39,259 --> 00:20:37,169
placed down and then actually it will

515
00:20:41,989 --> 00:20:39,269
start the process of hammering into the

516
00:20:45,739 --> 00:20:41,999
Mars itself and that takes about a month

517
00:20:47,869 --> 00:20:45,749
longer to do that process and so we've

518
00:20:50,180 --> 00:20:47,879
been practicing that as I said for

519
00:20:51,499 --> 00:20:50,190
several years now trying to get the

520
00:20:53,720 --> 00:20:51,509
process down to make sure we fully

521
00:20:56,180 --> 00:20:53,730
understand how well that's going to work

522
00:20:57,649 --> 00:20:56,190
all the challenges in that trying to

523
00:20:59,989 --> 00:20:57,659
beat down those challenges and make sure

524
00:21:01,700 --> 00:20:59,999
that we have a solid program there and

525
00:21:03,139 --> 00:21:01,710
so to tell you more about exactly how

526
00:21:05,450 --> 00:21:03,149
we've been doing that and where we stand

527
00:21:07,129 --> 00:21:05,460
with that we have Jamie Sanger over in

528
00:21:10,700 --> 00:21:07,139
the Issel lab and so I'm going to hand

529
00:21:12,950 --> 00:21:10,710
it over to Jamie go ahead thanks Tom

530
00:21:15,409 --> 00:21:12,960
welcome everyone to the institute

531
00:21:17,359 --> 00:21:15,419
instrument laboratory here at JPL this

532
00:21:19,159 --> 00:21:17,369
is a facility where many of our previous

533
00:21:20,989 --> 00:21:19,169
Mars missions have prepared to do Mars

534
00:21:23,720 --> 00:21:20,999
surface operations and that's what we're

535
00:21:25,399 --> 00:21:23,730
doing here with insight so this land are

536
00:21:27,349 --> 00:21:25,409
behind me is the insight deployment

537
00:21:28,849 --> 00:21:27,359
testbed it's not the real flight Lander

538
00:21:31,279 --> 00:21:28,859

that ones at Vandenberg Air Force Base

539
00:21:32,389 --> 00:21:31,289
getting ready to launch this one's more

540
00:21:35,029 --> 00:21:32,399
like the stunt double and allows

541
00:21:36,950 --> 00:21:35,039
engineers like me to test things out

542
00:21:39,320 --> 00:21:36,960
with the lander prior to doing them with

543
00:21:41,659 --> 00:21:39,330
a flight lander that's going to Mars so

544
00:21:43,909 --> 00:21:41,669
it has representations of much of

545
00:21:46,489 --> 00:21:43,919
Insights hardware and allows me to point

546
00:21:48,950 --> 00:21:46,499
a few things out to you so you can see

547
00:21:50,299 --> 00:21:48,960
the lander here in the deployed surface

548
00:21:51,950 --> 00:21:50,309
configuration sorry the service

549
00:21:54,979 --> 00:21:51,960
configuration with the solar arrays

550
00:21:58,190 --> 00:21:54,989
deployed so there are 3200 solar cells

551
00:22:00,320 --> 00:21:58,200
on the solar arrays and those charge

552
00:22:02,830 --> 00:22:00,330
Insights batteries and provide power to

553
00:22:05,359 --> 00:22:02,840
all the components on the lander

554
00:22:06,889 --> 00:22:05,369
insights gonna land in a new place on

555
00:22:09,440 --> 00:22:06,899
Mars but none of us have ever seen the

556
00:22:11,659 --> 00:22:09,450
surface from surface from the surface

557
00:22:13,909 --> 00:22:11,669
before so like any tourist we're gonna

558
00:22:16,159 --> 00:22:13,919
want to take some pictures insight has

559
00:22:17,960 --> 00:22:16,169
two cameras for that purpose so we've

560
00:22:19,909 --> 00:22:17,970
got the instrument context camera right

561
00:22:21,710 --> 00:22:19,919
here on the body of the lander under the

562
00:22:24,169 --> 00:22:21,720
deck and then we have the instrument

563
00:22:26,089 --> 00:22:24,179

deployment camera right here on the

564
00:22:29,180 --> 00:22:26,099
robotic arm which I'll talk more about

565
00:22:29,840 --> 00:22:29,190
in a moment this camera on the body of

566
00:22:31,430 --> 00:22:29,850
the lander

567
00:22:35,240 --> 00:22:31,440
take the first image that we get back

568
00:22:37,250 --> 00:22:35,250
from Mars so of the three science

569
00:22:38,990 --> 00:22:37,260
investigations experiments that Bruce

570
00:22:41,779 --> 00:22:39,000
talked about I'm gonna first point out

571
00:22:43,909 --> 00:22:41,789
some of the hardware for Rhys surprises

572
00:22:46,039 --> 00:22:43,919
the radio science experiment it has uses

573
00:22:48,430 --> 00:22:46,049
two antennas one is right here

574
00:22:51,409 --> 00:22:48,440
and the other one is on the other side

575
00:22:54,320 --> 00:22:51,419
these antennas are fixed on the lander

576
00:22:55,909 --> 00:22:54,330
ducking point towards Earth a fun fact

577
00:22:57,650 --> 00:22:55,919
is that it takes a signal sent from

578
00:23:00,020 --> 00:22:57,660
insight anywhere from around three

579
00:23:01,669 --> 00:23:00,030
minutes to 20 minutes to be received on

580
00:23:05,930 --> 00:23:01,679
earth depending on where the planets are

581
00:23:07,940 --> 00:23:05,940
in their orbits okay so now for the

582
00:23:10,159 --> 00:23:07,950
really exciting part the instrument

583
00:23:11,930 --> 00:23:10,169
deployment alright so you can see we've

584
00:23:15,200 --> 00:23:11,940
already deployed one of our instruments

585
00:23:17,899 --> 00:23:15,210
today to the surface so one thing is

586
00:23:19,430 --> 00:23:17,909
that we're gonna use the cameras not

587
00:23:21,380 --> 00:23:19,440
just because it's cool to see the

588
00:23:23,720 --> 00:23:21,390

surface of Mars but also because they

589
00:23:25,190 --> 00:23:23,730
allow us to select a site in front of

590
00:23:26,720 --> 00:23:25,200
insight to deploy each of the

591
00:23:30,049 --> 00:23:26,730
instruments that are within the

592
00:23:31,820 --> 00:23:30,059
instruments constraints so we're looking

593
00:23:34,010 --> 00:23:31,830
for somewhere that doesn't have a slope

594
00:23:36,470 --> 00:23:34,020
that's too high so roughly pretty flat

595
00:23:38,840 --> 00:23:36,480
and it's free of obstacles relative of

596
00:23:40,870 --> 00:23:38,850
sizes that are relatively small compared

597
00:23:43,220 --> 00:23:40,880
to the size of each of the instruments

598
00:23:45,260 --> 00:23:43,230
so you can here see here the seismometer

599
00:23:46,610 --> 00:23:45,270
is deployed right now it's under its

600
00:23:48,200 --> 00:23:46,620
wind and thermal shield which has

601
00:23:50,750 --> 00:23:48,210
already been deployed on top of the

602
00:23:53,180 --> 00:23:50,760
seismometer this keeps the seismometer

603
00:23:55,340 --> 00:23:53,190
cold throughout the Martian night and

604
00:23:58,700 --> 00:23:55,350
also protects it from wind during the

605
00:24:01,039 --> 00:23:58,710
day so lift us up you can see a mylar

606
00:24:05,470 --> 00:24:01,049
and chainmail skirt but it was over

607
00:24:09,940 --> 00:24:07,400
today I can see here this is a

608
00:24:12,710 --> 00:24:09,950
seismometer and the deploy configuration

609
00:24:14,660 --> 00:24:12,720
today it's in our sandbox it's a plate

610
00:24:15,950 --> 00:24:14,670
on this crushed garnet surface that's

611
00:24:17,480 --> 00:24:15,960
something we use in the test bed to

612
00:24:20,480 --> 00:24:17,490
simulate the Martian surface without

613
00:24:23,810 --> 00:24:20,490

generating too much dust as a barometer

614
00:24:25,310 --> 00:24:23,820
is tethered to the lander as you can see

615
00:24:26,990 --> 00:24:25,320
the tether here that's cabling that

616
00:24:28,970 --> 00:24:27,000
allows the lander to power the

617
00:24:30,920 --> 00:24:28,980
seismometer and also allows the

618
00:24:36,770 --> 00:24:30,930
seismometer to communicate with the

619
00:24:39,230 --> 00:24:36,780
lander so we have the robotic arm up

620
00:24:41,930 --> 00:24:39,240
here we're getting ready to deploy the

621
00:24:45,740 --> 00:24:41,940
heat flow probe instrument HP cube which

622
00:24:47,420 --> 00:24:45,750
you can see right here so the robotic

623
00:24:49,190 --> 00:24:47,430
arm has three joints that we use for the

624
00:24:50,600 --> 00:24:49,200
instrument deployment we've got the

625
00:24:52,100 --> 00:24:50,610
shoulder right here that moves an

626
00:24:55,490 --> 00:24:52,110
azimuth side to side as well as

627
00:24:58,730 --> 00:24:55,500
elevation up and down we also have the

628
00:25:00,500 --> 00:24:58,740
elbow joint that's right here at the end

629
00:25:02,210 --> 00:25:00,510
of the arm we have a grapple you can see

630
00:25:04,340 --> 00:25:02,220
that the grapple is connected to the

631
00:25:06,860 --> 00:25:04,350
grapple hook on the heat flow probe

632
00:25:08,360 --> 00:25:06,870
instrument each instrument has one of

633
00:25:10,070 --> 00:25:08,370
those grapple hooks that meets to the

634
00:25:12,230 --> 00:25:10,080
grapple which is like a hand or claw

635
00:25:17,360 --> 00:25:12,240
that allows the robotic arm to lift the

636
00:25:19,250 --> 00:25:17,370
instrument so you can see when HB cube

637
00:25:22,040 --> 00:25:19,260
is lifted it also has a tether that goes

638
00:25:24,860 --> 00:25:22,050

from the instrument to the lander that

639
00:25:26,890 --> 00:25:24,870
gets extracted out of the back o our

640
00:25:29,840 --> 00:25:26,900
deployment of HB cube is starting now

641
00:25:32,330 --> 00:25:29,850
see here's the tether I was talking

642
00:25:38,120 --> 00:25:32,340
about that gets pulled out of the

643
00:25:42,770 --> 00:25:38,130
support structure of H P cubed it's

644
00:25:44,780 --> 00:25:42,780
gonna pause here so the robotic arms

645
00:25:46,370 --> 00:25:44,790
pausing here to take a picture with the

646
00:25:48,800 --> 00:25:46,380
instrument deployment camera the one on

647
00:25:50,750 --> 00:25:48,810
the robotic arm so that's some data that

648
00:25:51,890 --> 00:25:50,760
we want to have when we look and see how

649
00:25:55,010 --> 00:25:51,900
the deployment went when we get that

650
00:25:58,280 --> 00:25:55,020
data back on Mars this entire sequence

651
00:26:00,590 --> 00:25:58,290
takes about 15 minutes so it's gonna

652
00:26:02,030 --> 00:26:00,600
bring me to the cube over the deck here

653
00:26:04,010 --> 00:26:02,040
and place it right here on the surface

654
00:26:05,930 --> 00:26:04,020
so you guys should check back with us in

655
00:26:09,680 --> 00:26:05,940
a little bit and see how the deployment

656
00:26:12,230 --> 00:26:09,690
of H P cube went back to you Jerry okay

657
00:26:13,760 --> 00:26:12,240
all right thank you Jamie so we're gonna

658
00:26:15,500 --> 00:26:13,770
head into the question and answer period

659
00:26:17,480 --> 00:26:15,510
very soon but first we're gonna have

660
00:26:18,400 --> 00:26:17,490
Bruce tell us something because he's got

661
00:26:21,730 --> 00:26:18,410
a very special

662
00:26:24,700 --> 00:26:21,740
prop for you guys yeah so in addition to

663
00:26:26,980 --> 00:26:24,710

the science investigations that we're

664
00:26:29,320 --> 00:26:26,990
doing on insight we also have another

665
00:26:31,660 --> 00:26:29,330
experiment and that is an experiment to

666
00:26:35,020 --> 00:26:31,670
see just how many people can participate

667
00:26:37,630 --> 00:26:35,030
in a Mars mission so this is one of two

668
00:26:41,650 --> 00:26:37,640
chips that we put on the spacecraft and

669
00:26:44,230 --> 00:26:41,660
these two chips hold 2.4 million names

670
00:26:46,660 --> 00:26:44,240
that were sent into the insight project

671
00:26:49,270 --> 00:26:46,670
you know we advertise this opportunity

672
00:26:51,340 --> 00:26:49,280
in the media and over social media and

673
00:26:54,070 --> 00:26:51,350
ask people to you know come to our

674
00:26:56,830 --> 00:26:54,080
website put their names in and we would

675
00:27:00,580 --> 00:26:56,840
put it on the spacecraft and so this

676
00:27:04,780 --> 00:27:00,590
chip was engraved with a micro engraving

677
00:27:07,090 --> 00:27:04,790
machined each one holds up to about 1.8

678
00:27:09,910 --> 00:27:07,100
million names and we got 2.4 million

679
00:27:12,670 --> 00:27:09,920
people who who are participating on it

680
00:27:14,260 --> 00:27:12,680
these were both glued on to the

681
00:27:16,630 --> 00:27:14,270
spacecraft actually they're right about

682
00:27:20,050 --> 00:27:16,640
here on the spacecraft deck right now

683
00:27:22,720 --> 00:27:20,060
and they'll be going to Mars with your

684
00:27:25,780 --> 00:27:22,730
name on it if you signed up your name on

685
00:27:28,660 --> 00:27:25,790
the on the website and so we're really

686
00:27:30,460 --> 00:27:28,670
excited about this excited that people

687
00:27:33,160 --> 00:27:30,470
all over the country all over the world

688
00:27:35,320 --> 00:27:33,170

were able to sort of participate and go

689
00:27:38,380 --> 00:27:35,330
to Mars with us the other thing I wanted

690
00:27:40,540 --> 00:27:38,390
to mention that I neglected I really

691
00:27:44,140 --> 00:27:40,550
want to give some credit to some of our

692
00:27:46,960 --> 00:27:44,150
partners these amazing instruments that

693
00:27:49,690 --> 00:27:46,970
we have on the spacecraft are being

694
00:27:52,300 --> 00:27:49,700
supplied to us by some of our foreign

695
00:27:55,330 --> 00:27:52,310
partners the seismometer is is an

696
00:27:58,450 --> 00:27:55,340
instrument that was built in France and

697
00:27:59,830 --> 00:27:58,460
if the the French Space Agency was in

698
00:28:01,870 --> 00:27:59,840
charge of it but it actually had

699
00:28:04,600 --> 00:28:01,880
contributions from several countries

700
00:28:06,220 --> 00:28:04,610
from Germany Switzerland the United

701
00:28:08,920 --> 00:28:06,230
Kingdom and the United States we all

702
00:28:11,470 --> 00:28:08,930
contributed to the the seismometer

703
00:28:13,930 --> 00:28:11,480
instrument on insight and the heat flow

704
00:28:17,370 --> 00:28:13,940
probe was built in Germany by the the

705
00:28:19,930 --> 00:28:17,380
German space agency and this is really

706
00:28:22,090 --> 00:28:19,940
an international effort to go and

707
00:28:25,690 --> 00:28:22,100
understand Mars and understand our own

708
00:28:28,330 --> 00:28:25,700
planet ok alright so we're gonna now

709
00:28:30,460 --> 00:28:28,340
throw it open for questions so as a

710
00:28:31,900 --> 00:28:30,470
reminder for the media on the phone line

711
00:28:34,120 --> 00:28:31,910
if you want to ask

712
00:28:36,310 --> 00:28:34,130
you press star-1 we're collecting

713
00:28:40,420 --> 00:28:36,320

questions on social media at the hashtag

714
00:28:45,940 --> 00:28:40,430
ask NASA and so I'm gonna open it up for

715
00:28:47,830 --> 00:28:45,950
questions so okay well I know that we do

716
00:28:49,480 --> 00:28:47,840
have a question on the phone line first

717
00:28:53,140 --> 00:28:49,490
so why don't we get started there so I

718
00:28:53,940 --> 00:28:53,150
have Sarah Lewin of space comm please go

719
00:28:56,860 --> 00:28:53,950
ahead

720
00:28:59,320 --> 00:28:56,870
hi did you learn anything from

721
00:29:02,080 --> 00:28:59,330
curiosity's seven minutes of Terror that

722
00:29:03,040 --> 00:29:02,090
went into planning for insights yeah

723
00:29:05,620 --> 00:29:03,050
absolutely

724
00:29:07,540 --> 00:29:05,630
every every time we do an entry and

725
00:29:10,360 --> 00:29:07,550
descent and landing phase of a mission

726
00:29:12,900 --> 00:29:10,370
we learned something from it ours is

727
00:29:16,690 --> 00:29:12,910
much more similar to the Phoenix mission

728
00:29:19,150 --> 00:29:16,700
we had the exact same type of entry

729
00:29:21,730 --> 00:29:19,160
descent and landing curiosity had a

730
00:29:23,290 --> 00:29:21,740
slightly different type of landing

731
00:29:25,540 --> 00:29:23,300
system that they use with their sky

732
00:29:28,960 --> 00:29:25,550
crane but nonetheless we learned a lot

733
00:29:30,340 --> 00:29:28,970
about how their parachute worked how

734
00:29:33,640 --> 00:29:30,350
they're different their heat shield work

735
00:29:36,340 --> 00:29:33,650
so many of the same phases of the entry

736
00:29:38,410 --> 00:29:36,350
descent and landing we learned from we

737
00:29:41,200 --> 00:29:38,420
learned from every every time we land on

738
00:29:42,520 --> 00:29:41,210

Mars we learned something new so we did

739
00:29:44,260 --> 00:29:42,530
learn from that but it's actually a

740
00:29:48,730 --> 00:29:44,270
little bit more heritage back to Phoenix

741
00:29:50,500 --> 00:29:48,740
and even Viking great thank you all

742
00:29:52,360 --> 00:29:50,510
right we have a second question Oh

743
00:29:55,480 --> 00:29:52,370
actually we have a question here in the

744
00:30:02,140 --> 00:29:55,490
room so can we get a mic over to the

745
00:30:03,490 --> 00:30:02,150
reporter back there you said that you're

746
00:30:06,130 --> 00:30:03,500
doing this mission to learn more about

747
00:30:10,000 --> 00:30:06,140
our planet what kind of differences does

748
00:30:11,820 --> 00:30:10,010
the atmosphere the atmosphere change how

749
00:30:14,860 --> 00:30:11,830
does that factor into your experiment

750
00:30:17,230 --> 00:30:14,870
well for the the science that we're

751
00:30:19,210 --> 00:30:17,240
doing the atmosphere is not so important

752
00:30:21,150 --> 00:30:19,220
we're really interested in the the solid

753
00:30:23,230 --> 00:30:21,160
planet and the depths of the planet

754
00:30:27,640 --> 00:30:23,240
certainly in terms of the history of the

755
00:30:29,590 --> 00:30:27,650
atmosphere the gases and liquids on the

756
00:30:32,290 --> 00:30:29,600
surface of the earth and the atmosphere

757
00:30:34,330 --> 00:30:32,300
of Mars they all originally came from

758
00:30:36,910 --> 00:30:34,340
inside the planet from the the deep

759
00:30:39,400 --> 00:30:36,920
mantle and so those gases came out both

760
00:30:40,800 --> 00:30:39,410
through volcanism and other ways to get

761
00:30:43,870 --> 00:30:40,810
to the surface and so by understanding

762
00:30:45,670 --> 00:30:43,880
both the composition of the interior and

763
00:30:46,990 --> 00:30:45,680

its thermal history

764
00:30:50,020 --> 00:30:47,000
we'll understand better sort of the

765
00:30:54,310 --> 00:30:50,030
history of the atmosphere one thing

766
00:30:58,150 --> 00:30:54,320
about the atmosphere is is it's

767
00:31:01,210 --> 00:30:58,160
evolutions also determined by the solar

768
00:31:03,040 --> 00:31:01,220
wind because on Mars particularly the

769
00:31:04,480 --> 00:31:03,050
solar wind actually can kind of row the

770
00:31:06,520 --> 00:31:04,490
top of the asset it kind of blows away

771
00:31:08,320 --> 00:31:06,530
part of the atmosphere and so we could

772
00:31:11,020 --> 00:31:08,330
have had or we know that we had a much

773
00:31:14,800 --> 00:31:11,030
thicker atmosphere on Mars early in its

774
00:31:17,020 --> 00:31:14,810
history and it's been depleted by

775
00:31:19,330 --> 00:31:17,030
erosion the solar wind and one thing

776
00:31:20,770 --> 00:31:19,340
that can prevent that is a magnetic

777
00:31:23,320 --> 00:31:20,780
field and of course the magnetic field

778
00:31:25,810 --> 00:31:23,330
is generated in the core and so we hope

779
00:31:28,090 --> 00:31:25,820
to understand better the core and its

780
00:31:29,830 --> 00:31:28,100
evolution to understand when Mars could

781
00:31:31,990 --> 00:31:29,840
have had a magnetic field whether that

782
00:31:34,150 --> 00:31:32,000
would have protected the atmosphere for

783
00:31:36,970 --> 00:31:34,160
part of its history and maybe could have

784
00:31:40,600 --> 00:31:36,980
left Mars as a habitable planet maybe

785
00:31:43,030 --> 00:31:40,610
early in its history alright we're gonna

786
00:31:48,450 --> 00:31:43,040
go back to the phone lines and we've got

787
00:31:55,270 --> 00:31:52,330
thanks for taking my call I have a

788
00:31:59,050 --> 00:31:55,280

couple of questions one programmatic and

789
00:32:00,670 --> 00:31:59,060
one science for Bruce can you tell me a

790
00:32:04,120 --> 00:32:00,680
little bit about you know the confidence

791
00:32:04,900 --> 00:32:04,130
you have in detecting a Mars quake you

792
00:32:06,640 --> 00:32:04,910
know I know

793
00:32:08,830 --> 00:32:06,650
Viking his measurements prove proved

794
00:32:11,230 --> 00:32:08,840
somewhat inconclusive but they did they

795
00:32:14,530 --> 00:32:11,240
set an upper limit for what you expect

796
00:32:16,660 --> 00:32:14,540
to find and also if one of you can

797
00:32:18,940 --> 00:32:16,670
provide a total cost of the mission and

798
00:32:21,990 --> 00:32:18,950
if you can total cost that includes the

799
00:32:25,450 --> 00:32:22,000
international contributions thank you

800
00:32:27,850 --> 00:32:25,460
the the level of size missus or the

801
00:32:30,190 --> 00:32:27,860
frequency of Mars quakes of course is a

802
00:32:31,450 --> 00:32:30,200
really key ingredient in to the end of

803
00:32:34,780 --> 00:32:31,460
this mission we put a lot of thought

804
00:32:36,610 --> 00:32:34,790
into that the the first thing that you

805
00:32:39,070 --> 00:32:36,620
can look at is the the the relative

806
00:32:40,750 --> 00:32:39,080
seismic activity on the earth and on the

807
00:32:43,090 --> 00:32:40,760
moon we put seismometers on the moon

808
00:32:46,630 --> 00:32:43,100
back in the 70s for apollo and they

809
00:32:49,390 --> 00:32:46,640
measured something like twelve thousand

810
00:32:50,950 --> 00:32:49,400
sixteen thousand moon quakes mostly very

811
00:32:53,050 --> 00:32:50,960
small but but still moon quakes

812
00:32:54,310 --> 00:32:53,060
nonetheless and then we can compare that

813
00:32:57,220 --> 00:32:54,320

to the earth which is extremely

814
00:32:59,170 --> 00:32:57,230
seismically active and guess that mars

815
00:32:59,789 --> 00:32:59,180
is likely somewhere in between and then

816
00:33:02,350 --> 00:32:59,799
we can

817
00:33:05,169 --> 00:33:02,360
faulting on Mars so a lot of the the

818
00:33:07,000 --> 00:33:05,179
ridges that you see the canyons that you

819
00:33:09,549 --> 00:33:07,010
see those are all caused by faults on

820
00:33:11,950 --> 00:33:09,559
Mars and we can estimate sort of the

821
00:33:14,110 --> 00:33:11,960
amount of motion that had to happen on

822
00:33:16,720 --> 00:33:14,120
those faults and that motion is is

823
00:33:18,669 --> 00:33:16,730
accommodated by Mars quakes and look at

824
00:33:20,110 --> 00:33:18,679
that activity is a function of time

825
00:33:22,330 --> 00:33:20,120
because we can put dates on all these

826
00:33:23,830 --> 00:33:22,340
Falls and extrapolate that to the the

827
00:33:26,799 --> 00:33:23,840
president and you come up with a an

828
00:33:28,690 --> 00:33:26,809
activity level that is again just kind

829
00:33:32,169 --> 00:33:28,700
of halfway between the earth and the

830
00:33:34,990 --> 00:33:32,179
moon and so based on those calculations

831
00:33:36,549 --> 00:33:35,000
and just based on calculations of the

832
00:33:38,980 --> 00:33:36,559
amount of stress that would accumulate

833
00:33:42,190 --> 00:33:38,990
in Mars is crust as it cools off

834
00:33:46,840 --> 00:33:42,200
over time we can come up with estimates

835
00:33:48,610 --> 00:33:46,850
of the Mars and seismic activity that we

836
00:33:51,610 --> 00:33:48,620
think will give us something of the

837
00:33:53,320 --> 00:33:51,620
order of 50 to 100 Mars quakes over the

838
00:33:57,399 --> 00:33:53,330

course of the mission that we can see

839
00:33:58,810 --> 00:33:57,409
with our seismometer and so using those

840
00:34:00,760 --> 00:33:58,820
Mars quakes of course that's how we're

841
00:34:03,159 --> 00:34:00,770
going to going to probe the the interior

842
00:34:04,870 --> 00:34:03,169
viking did have a seismometer one of the

843
00:34:09,300 --> 00:34:04,880
seismometer some viking work the other

844
00:34:12,129 --> 00:34:09,310
one unfortunately broke on on landing

845
00:34:14,200 --> 00:34:12,139
but the fact that that seismometer was

846
00:34:16,659 --> 00:34:14,210
bolted to the top of the spacecraft and

847
00:34:18,399 --> 00:34:16,669
didn't have the capability to pick it up

848
00:34:20,230 --> 00:34:18,409
with a robotic arm like insight does

849
00:34:22,450 --> 00:34:20,240
meant that it was much less sensitive

850
00:34:24,669 --> 00:34:22,460
than the seismometer we're sending and

851
00:34:27,820 --> 00:34:24,679
you can do a calculation on its

852
00:34:29,859 --> 00:34:27,830
sensitivity and and conclude that unless

853
00:34:31,840 --> 00:34:29,869
Mars was more active than say the

854
00:34:33,340 --> 00:34:31,850
continental United States that you

855
00:34:34,840 --> 00:34:33,350
probably would not have seen a Mars

856
00:34:37,270 --> 00:34:34,850
quake and so that does set an upper

857
00:34:39,129 --> 00:34:37,280
bound but that upper bound is is

858
00:34:42,520 --> 00:34:39,139
somewhat higher than what we explode we

859
00:34:44,290 --> 00:34:42,530
actually expect today all right we're

860
00:34:46,300 --> 00:34:44,300
gonna actually go to some social media

861
00:34:48,609 --> 00:34:46,310
questions so I'll throw it to Stephanie

862
00:34:50,710 --> 00:34:48,619
here absolutely so we've been having a

863
00:34:53,980 --> 00:34:50,720

very dynamic conversation on Twitter and

864
00:34:55,119 --> 00:34:53,990
Facebook and in our YouTube chat lots of

865
00:34:57,460 --> 00:34:55,129
questions for you

866
00:34:59,980 --> 00:34:57,470
Adithya on youtube would like to know is

867
00:35:01,630 --> 00:34:59,990
there a plan for HP cubed to have a

868
00:35:04,570 --> 00:35:01,640
retraction mechanism in case it

869
00:35:07,750 --> 00:35:04,580
encounters a hard rock and if not why

870
00:35:10,270 --> 00:35:07,760
wasn't it implemented we did consider

871
00:35:11,680 --> 00:35:10,280
that early on but that would have that

872
00:35:13,270 --> 00:35:11,690
would have increased the complexity

873
00:35:15,790 --> 00:35:13,280
increased the cost

874
00:35:19,030 --> 00:35:15,800
pass what we were capable of doing

875
00:35:21,730 --> 00:35:19,040
within our budget so we did a lot of

876
00:35:24,309 --> 00:35:21,740
testing and we designed it specifically

877
00:35:27,160 --> 00:35:24,319
so that it actually can tolerate some

878
00:35:29,740 --> 00:35:27,170
level of rockiness so any any rock let

879
00:35:33,160 --> 00:35:29,750
smaller than an inch or so maybe even

880
00:35:35,380 --> 00:35:33,170
two inches the the hammer on the the the

881
00:35:37,210 --> 00:35:35,390
mole is is powerful enough that it

882
00:35:40,599 --> 00:35:37,220
basically just will push that rock aside

883
00:35:42,390 --> 00:35:40,609
in in the in the soil for a larger rock

884
00:35:44,710 --> 00:35:42,400
if we hit a rock straight on

885
00:35:46,780 --> 00:35:44,720
unfortunately that'll just stop the the

886
00:35:48,970 --> 00:35:46,790
penetration and we'll have to live with

887
00:35:51,940 --> 00:35:48,980
whatever depth we get but if the the

888
00:35:55,870 --> 00:35:51,950

face of that rock is inclined by say 45

889
00:35:57,970 --> 00:35:55,880
degrees or so the mole actually slide

890
00:36:00,069 --> 00:35:57,980
down the rock and sort of redirect

891
00:36:01,720 --> 00:36:00,079
itself and go around the rock and once

892
00:36:04,150 --> 00:36:01,730
it's left the rock it'll tend to go back

893
00:36:06,579 --> 00:36:04,160
down into into a vertical descent and

894
00:36:09,160 --> 00:36:06,589
we're able to compensate for that you

895
00:36:11,890 --> 00:36:09,170
know in our calculation so based on that

896
00:36:14,020 --> 00:36:11,900
and based on our calculations of the

897
00:36:16,770 --> 00:36:14,030
number of rocks that we expect in this

898
00:36:20,170 --> 00:36:16,780
area that we can actually calculate from

899
00:36:22,720 --> 00:36:20,180
extrapolation of foes we're pretty sure

900
00:36:24,849 --> 00:36:22,730
that it's going to be pretty pretty low

901
00:36:27,309 --> 00:36:24,859
in rocks we've actually picked up sort

902
00:36:29,260 --> 00:36:27,319
of the biggest parking lot on Mars and

903
00:36:31,329 --> 00:36:29,270
you can actually see any rocks bigger

904
00:36:34,240 --> 00:36:31,339
than about this in the high-resolution

905
00:36:36,490 --> 00:36:34,250
pictures from orbit and you can go for

906
00:36:38,859 --> 00:36:36,500
you know kilometers without running into

907
00:36:40,510 --> 00:36:38,869
anything bigger than a football and so

908
00:36:42,250 --> 00:36:40,520
we think that we have a pretty high

909
00:36:45,190 --> 00:36:42,260
confidence or we have a pretty high

910
00:36:47,109 --> 00:36:45,200
confidence of the mole reaching down at

911
00:36:49,240 --> 00:36:47,119
least several meters and perhaps all the

912
00:36:53,290 --> 00:36:49,250
way down to the five meters that we have

913
00:36:55,000 --> 00:36:53,300

as a goal okay next up from Conrad will

914
00:36:58,319 --> 00:36:55,010
the data from the wind sensors and

915
00:37:01,870 --> 00:36:58,329
photographs be released to the public

916
00:37:03,700 --> 00:37:01,880
yeah we do we will release all the data

917
00:37:06,579 --> 00:37:03,710
to the public I mean it's it's NASA's

918
00:37:09,339 --> 00:37:06,589
policy that the data that is acquired by

919
00:37:11,890 --> 00:37:09,349
NASA missions belongs to belongs to the

920
00:37:15,010 --> 00:37:11,900
world belongs to the taxpayers that are

921
00:37:16,510 --> 00:37:15,020
paid for it and so we we will be

922
00:37:18,760 --> 00:37:16,520
releasing our data

923
00:37:20,920 --> 00:37:18,770
the plan is once we get the the the

924
00:37:23,020 --> 00:37:20,930
mission running and we get our pipeline

925
00:37:26,080 --> 00:37:23,030
in line that we will get our data out

926
00:37:27,670 --> 00:37:26,090
within about three months of acquisition

927
00:37:30,100 --> 00:37:27,680
we hope to release the photos even

928
00:37:32,350 --> 00:37:30,110
quicker than that again you know once we

929
00:37:35,830 --> 00:37:32,360
have the photos in hand and have the

930
00:37:37,900 --> 00:37:35,840
processing fine-tuned for our particular

931
00:37:40,090 --> 00:37:37,910
place on Mars we'll probably be putting

932
00:37:41,950 --> 00:37:40,100
out the photos within a matter of days

933
00:37:44,800 --> 00:37:41,960
of their acquisitions so you'll be able

934
00:37:47,050 --> 00:37:44,810
to go online and and and see what what

935
00:37:50,710 --> 00:37:47,060
insights saw on Mars not that long after

936
00:37:54,040 --> 00:37:50,720
we do and Shasta robotics on Facebook

937
00:37:56,530 --> 00:37:54,050
asks why hasn't NASA used Vandenberg for

938
00:37:58,300 --> 00:37:56,540

previous interplanetary missions yes I

939
00:38:01,060 --> 00:37:58,310
gave a partial answer a little bit

940
00:38:02,680 --> 00:38:01,070
earlier but this this spacecraft that

941
00:38:04,570 --> 00:38:02,690
we're flying was actually designed

942
00:38:07,330 --> 00:38:04,580
initially to fly on a delta 2 rocket

943
00:38:09,700 --> 00:38:07,340
which is a much smaller rocket than the

944
00:38:11,290 --> 00:38:09,710
Atlas 5 that we're launching on and so

945
00:38:13,390 --> 00:38:11,300
with the extra capability that we have

946
00:38:15,610 --> 00:38:13,400
in an Atlas 5 it actually allowed us to

947
00:38:18,280 --> 00:38:15,620
go from either the west coast or the

948
00:38:20,650 --> 00:38:18,290
East Coast for a variety of reasons it's

949
00:38:22,510 --> 00:38:20,660
actually much easier to find a launch

950
00:38:24,460 --> 00:38:22,520
slot find for that we need for our

951
00:38:26,290 --> 00:38:24,470
planetary window on the west coast and

952
00:38:28,450 --> 00:38:26,300
so that was the primary reason that we

953
00:38:30,070 --> 00:38:28,460
chose the West Coast and and like I said

954
00:38:32,260 --> 00:38:30,080
to break the monopoly that the East

955
00:38:34,510 --> 00:38:32,270
Coast has on planetary launches as a

956
00:38:37,330 --> 00:38:34,520
California person that was part of my

957
00:38:38,470 --> 00:38:37,340
motivation so we're going to go back to

958
00:38:40,090 --> 00:38:38,480
the phones for a minute but I just

959
00:38:41,410 --> 00:38:40,100
wanted to follow up on Steven Clark's

960
00:38:44,110 --> 00:38:41,420
question about the financial information

961
00:38:45,940 --> 00:38:44,120
and we will get that to you from NASA

962
00:38:48,820 --> 00:38:45,950
headquarters because they're the go-to

963
00:38:51,700 --> 00:38:48,830

people on the financial information okay

964
00:38:58,240 --> 00:38:51,710
so next up we have Leo and right from

965
00:39:00,700 --> 00:38:58,250
Irish TV go ahead Leo thanks thanks very

966
00:39:03,340 --> 00:39:00,710
much for taking my question I enjoyed

967
00:39:05,980 --> 00:39:03,350
the presentation at the mock-up Lander

968
00:39:08,650 --> 00:39:05,990
and I have a question about the TV

969
00:39:12,190 --> 00:39:08,660
pictures but if I may first of all ask

970
00:39:14,190 --> 00:39:12,200
about data release there are a lot of

971
00:39:17,290 --> 00:39:14,200
schoolchildren and Ireland

972
00:39:22,270 --> 00:39:17,300
involved in size seismology and school

973
00:39:25,180 --> 00:39:22,280
programs who are watching everyday data

974
00:39:27,340 --> 00:39:25,190
produced by their own seismometers and

975
00:39:29,830 --> 00:39:27,350
they're quite excited that they might be

976
00:39:33,550 --> 00:39:29,840
involved now with the schools program

977
00:39:35,170 --> 00:39:33,560
involving Mars so is there somebody on

978
00:39:36,450 --> 00:39:35,180
the panel who can talk a little bit

979
00:39:39,690 --> 00:39:36,460
about the schools in

980
00:39:42,750 --> 00:39:39,700
grayskin I heard you say three months

981
00:39:47,280 --> 00:39:42,760
for data release that seems like an

982
00:39:49,050 --> 00:39:47,290
awful long time if a school kid okay

983
00:39:52,170 --> 00:39:49,060
yeah I can definitely talk to that and

984
00:39:54,180 --> 00:39:52,180
in fact we do have a direct connection

985
00:39:58,140 --> 00:39:54,190
with the seismometers in the school's

986
00:40:00,839 --> 00:39:58,150
program in in in Ireland in the UK in

987
00:40:05,370 --> 00:40:00,849
France Germany in the United States and

988
00:40:08,160 --> 00:40:05,380

in our plan right now is to stream the

989
00:40:09,599 --> 00:40:08,170
data directly to the schools and in some

990
00:40:11,160 --> 00:40:09,609
cases the schools might get the data

991
00:40:15,960 --> 00:40:11,170
even before the scientists on the team

992
00:40:18,810 --> 00:40:15,970
get the data so we do have a very active

993
00:40:21,570 --> 00:40:18,820
program connected to the seismometers in

994
00:40:22,710 --> 00:40:21,580
the schools and we hope to have students

995
00:40:24,720 --> 00:40:22,720
telling us where that some of the

996
00:40:28,230 --> 00:40:24,730
earthquakes of the Mars quakes are

997
00:40:29,520 --> 00:40:28,240
before we figure it out ourselves all

998
00:40:32,490 --> 00:40:29,530
right we're gonna take another question

999
00:40:35,280 --> 00:40:32,500
from the phone line that's Omnicon from

1000
00:40:37,320 --> 00:40:35,290
the LA Times I think for holding this

1001
00:40:40,050 --> 00:40:37,330
briefing and taking my question I have

1002
00:40:42,599 --> 00:40:40,060
two questions first off you mentioned

1003
00:40:45,079 --> 00:40:42,609
the interior of the planet is

1004
00:40:48,150 --> 00:40:45,089
responsible for the atmospheric gases

1005
00:40:49,950 --> 00:40:48,160
are there ways in which the findings

1006
00:40:52,730 --> 00:40:49,960
from insight and the findings from maven

1007
00:40:57,470 --> 00:40:52,740
will fit together or inform each other

1008
00:41:01,170 --> 00:40:57,480
yes and and we actually have are

1009
00:41:03,060 --> 00:41:01,180
integrating our our measurements and in

1010
00:41:04,950 --> 00:41:03,070
our science with all the previous Mars

1011
00:41:07,230 --> 00:41:04,960
missions but maven in particular will

1012
00:41:09,450 --> 00:41:07,240
still be presumably will still be in

1013
00:41:12,240 --> 00:41:09,460

orbit when we get there and specifically

1014
00:41:14,670 --> 00:41:12,250
the magnetic field experiment on maven

1015
00:41:17,190 --> 00:41:14,680
and our magnetometer on insight can work

1016
00:41:19,320 --> 00:41:17,200
together in order to be able to measure

1017
00:41:21,810 --> 00:41:19,330
the the magnetic fields simultaneously

1018
00:41:24,839 --> 00:41:21,820
at two different locations and by doing

1019
00:41:27,570 --> 00:41:24,849
that we're actually able to do an

1020
00:41:29,130 --> 00:41:27,580
analyses of the magnetic field that are

1021
00:41:30,870 --> 00:41:29,140
very difficult to do from from an

1022
00:41:33,089 --> 00:41:30,880
orbiter alone because when you see the

1023
00:41:34,829 --> 00:41:33,099
magnetic field changing and in orbit er

1024
00:41:36,240 --> 00:41:34,839
you have a hard time telling the

1025
00:41:38,220 --> 00:41:36,250
difference between a field that's

1026
00:41:39,660 --> 00:41:38,230
changing with time or you're just flying

1027
00:41:41,370 --> 00:41:39,670
through different places that have

1028
00:41:43,829 --> 00:41:41,380
different magnetic fields and so insight

1029
00:41:46,140 --> 00:41:43,839
will help help maven to be able to kind

1030
00:41:49,260 --> 00:41:46,150
of unravel you know that that ambiguity

1031
00:41:49,920 --> 00:41:49,270
and with those two measurements we can

1032
00:41:53,790 --> 00:41:49,930
actually use it

1033
00:41:55,380 --> 00:41:53,800
magnetic field variations to do another

1034
00:41:58,079 --> 00:41:55,390
kind of probe deep into Mars we can

1035
00:41:59,849 --> 00:41:58,089
actually by looking at the difference in

1036
00:42:02,960 --> 00:41:59,859
the change in the magnetic field at

1037
00:42:07,230 --> 00:42:02,970
altitude and at the surface we can

1038
00:42:09,000 --> 00:42:07,240

figure out what the resistivity of the

1039
00:42:11,400 --> 00:42:09,010
electrical resistivity of the the

1040
00:42:13,980 --> 00:42:11,410
material is as a function of death and

1041
00:42:15,150 --> 00:42:13,990
you don't think of roxas as as having

1042
00:42:18,260 --> 00:42:15,160
current in them and having a resistance

1043
00:42:20,640 --> 00:42:18,270
but they do and that resistance is

1044
00:42:22,500 --> 00:42:20,650
related to their temperature so this is

1045
00:42:26,339 --> 00:42:22,510
the one other way that we can actually

1046
00:42:27,900 --> 00:42:26,349
do a probe of the temperature variation

1047
00:42:30,240 --> 00:42:27,910
with depth in the planet and so this is

1048
00:42:32,760 --> 00:42:30,250
something that we can combine with our

1049
00:42:34,700 --> 00:42:32,770
measurement from the heat flow probe in

1050
00:42:37,640 --> 00:42:34,710
order to better understand the

1051
00:42:40,230 --> 00:42:37,650
temperature variations inside the planet

1052
00:42:41,549 --> 00:42:40,240
all right we're gonna take oh sorry

1053
00:42:44,819 --> 00:42:41,559
we're going to take another question one

1054
00:42:46,589 --> 00:42:44,829
question on social media oh man only one

1055
00:42:48,210 --> 00:42:46,599
there are quite a few questions out

1056
00:42:49,559 --> 00:42:48,220
there and everybody who's watching the

1057
00:42:51,359 --> 00:42:49,569
livestream and submitting ask NASA

1058
00:42:52,950 --> 00:42:51,369
questions know that we will be hopping

1059
00:42:54,750 --> 00:42:52,960
online and answering more with our

1060
00:42:58,410 --> 00:42:54,760
subject matter experts after the live

1061
00:43:01,109 --> 00:42:58,420
show but I've got a bring out inventor

1062
00:43:02,970 --> 00:43:01,119
of stuff who asks what is the best

1063
00:43:06,510 --> 00:43:02,980

outcome a result you would hope to

1064
00:43:08,190 --> 00:43:06,520
receive from insights well I'll tell you

1065
00:43:10,140 --> 00:43:08,200
you know the first time we get a Mars

1066
00:43:11,940 --> 00:43:10,150
quake down on the surface I think you

1067
00:43:13,650 --> 00:43:11,950
know I'm gonna be dancing around the

1068
00:43:15,630 --> 00:43:13,660
dancing around the room because this is

1069
00:43:18,569 --> 00:43:15,640
something when I was a graduate student

1070
00:43:21,329 --> 00:43:18,579
you know as watching watching Viking and

1071
00:43:23,099 --> 00:43:21,339
there was a seismometer on Viking and as

1072
00:43:25,559 --> 00:43:23,109
a geophysics graduate student that was

1073
00:43:27,150 --> 00:43:25,569
like you know the cool thing to do and

1074
00:43:29,309 --> 00:43:27,160
it was such a disappointment that we

1075
00:43:31,740 --> 00:43:29,319
never got any seismic data down and and

1076
00:43:33,359 --> 00:43:31,750
you know over the my career I there was

1077
00:43:35,490 --> 00:43:33,369
all these questions I had about Mars

1078
00:43:37,289 --> 00:43:35,500
that could only really be answered with

1079
00:43:40,410 --> 00:43:37,299
a seismometer and so when we see that

1080
00:43:44,609 --> 00:43:40,420
first quake that's the the the the final

1081
00:43:46,559 --> 00:43:44,619
you know underline you know bold type

1082
00:43:48,660 --> 00:43:46,569
this is actually gonna work and we're

1083
00:43:50,849 --> 00:43:48,670
gonna start getting the kind of detailed

1084
00:43:53,039 --> 00:43:50,859
information about the inside of Mars

1085
00:43:56,370 --> 00:43:53,049
that that you know we've been waiting

1086
00:44:00,089 --> 00:43:56,380
for for 4050 years I'm not sure how I

1087
00:44:02,390 --> 00:44:00,099
feel about you dancing I've seen you

1088
00:44:04,920 --> 00:44:02,400

dance before

1089
00:44:06,360 --> 00:44:04,930
all right we're gonna go back to the

1090
00:44:07,530 --> 00:44:06,370
phones and the reporters on there but we

1091
00:44:10,200 --> 00:44:07,540
will take some more social media

1092
00:44:12,330 --> 00:44:10,210
questions afterwards so okay we are

1093
00:44:16,140 --> 00:44:12,340
going to go to Elizabeth Powell of

1094
00:44:18,150 --> 00:44:16,150
Seeker hi thanks for taking my question

1095
00:44:19,290 --> 00:44:18,160
I was wondering if for many other

1096
00:44:21,240 --> 00:44:19,300
results that you'll be getting from

1097
00:44:23,280 --> 00:44:21,250
insight if you can extrapolate anything

1098
00:44:27,540 --> 00:44:23,290
about possible past or present Martian

1099
00:44:30,480 --> 00:44:27,550
volcanism yes certainly I mean because

1100
00:44:32,880 --> 00:44:30,490
the volcanism on a planet is is tied to

1101
00:44:36,690 --> 00:44:32,890
its its thermal history and it's also

1102
00:44:37,980 --> 00:44:36,700
tied in many ways to the the details of

1103
00:44:41,280 --> 00:44:37,990
the interior structure and so for

1104
00:44:46,050 --> 00:44:41,290
example the size of the core will

1105
00:44:47,460 --> 00:44:46,060
determine well there there's a way the

1106
00:44:49,020 --> 00:44:47,470
heat gets out of the planet and they

1107
00:44:51,120 --> 00:44:49,030
give you either get come out through

1108
00:44:52,470 --> 00:44:51,130
conduction which is pretty slow or it

1109
00:44:55,530 --> 00:44:52,480
can come out through convection where

1110
00:44:58,050 --> 00:44:55,540
the rocky material actually hot stuff

1111
00:45:00,380 --> 00:44:58,060
Rises cold stuff sinks and pumps the

1112
00:45:03,360 --> 00:45:00,390
heat out and if the core is small enough

1113
00:45:04,650 --> 00:45:03,370

there's a boundary that appears in the

1114
00:45:06,270 --> 00:45:04,660
lower mantle that keeps the heat from

1115
00:45:08,790 --> 00:45:06,280
coming out and so that would be

1116
00:45:10,920 --> 00:45:08,800
something that would would inhibit the

1117
00:45:13,470 --> 00:45:10,930
development of all qanitin' so we want

1118
00:45:16,500 --> 00:45:13,480
to understand that another thing that

1119
00:45:18,150 --> 00:45:16,510
that that there's key to volcanism is

1120
00:45:20,340 --> 00:45:18,160
the amount of heat that's that's

1121
00:45:22,350 --> 00:45:20,350
generated in the crust as opposed to the

1122
00:45:24,780 --> 00:45:22,360
mantle and that depends on the

1123
00:45:27,750 --> 00:45:24,790
partitioning of radioactive materials

1124
00:45:29,780 --> 00:45:27,760
thorium uranium and so forth and that

1125
00:45:32,310 --> 00:45:29,790
partitioning happens in this

1126
00:45:35,250 --> 00:45:32,320
differentiation process that I referred

1127
00:45:37,380 --> 00:45:35,260
to and so instead of having these

1128
00:45:39,120 --> 00:45:37,390
radioactive materials distributed all

1129
00:45:41,220 --> 00:45:39,130
the way through the planet they tend to

1130
00:45:42,510 --> 00:45:41,230
be pulled out into the crust and there

1131
00:45:46,350 --> 00:45:42,520
if they're pulled out into the crust

1132
00:45:48,680 --> 00:45:46,360
they deposit their heat as they decay in

1133
00:45:51,960 --> 00:45:48,690
the crust and that will affect the the

1134
00:45:55,290 --> 00:45:51,970
onset and the persistence of Volta nism

1135
00:45:58,050 --> 00:45:55,300
as well and so it is just a knowing sort

1136
00:45:59,970 --> 00:45:58,060
of the the basic amount of heat coming

1137
00:46:02,490 --> 00:45:59,980
out of the planet which is which is

1138
00:46:04,850 --> 00:46:02,500

which can be tied to magma formation and

1139
00:46:07,710 --> 00:46:04,860
so forth some of these more detailed

1140
00:46:10,100 --> 00:46:07,720
structural issues that we want to

1141
00:46:12,210 --> 00:46:10,110
address also will affect our

1142
00:46:14,390 --> 00:46:12,220
understanding of the volcanic history of

1143
00:46:16,460 --> 00:46:14,400
Mars

1144
00:46:19,580 --> 00:46:16,470
we've got another question over the

1145
00:46:22,730 --> 00:46:19,590
phone line Ken Kramer of rocket stem

1146
00:46:24,740 --> 00:46:22,740
please go ahead hi thanks for taking my

1147
00:46:27,620 --> 00:46:24,750
question and good luck um some questions

1148
00:46:30,050 --> 00:46:27,630
if I can please one is talked about a

1149
00:46:32,540 --> 00:46:30,060
little bit more detail about why you

1150
00:46:35,510 --> 00:46:32,550
picked this particular location

1151
00:46:38,720 --> 00:46:35,520
besides minimizing rocks are there some

1152
00:46:41,330 --> 00:46:38,730
science criteria that that that that

1153
00:46:43,550 --> 00:46:41,340
made you decide one site was better for

1154
00:46:45,650 --> 00:46:43,560
collecting the site of the data than

1155
00:46:47,720 --> 00:46:45,660
another and the other you mentioned you

1156
00:46:49,910 --> 00:46:47,730
have two cameras can you talk a little

1157
00:46:52,550 --> 00:46:49,920
bit more about when we will get pictures

1158
00:46:55,220 --> 00:46:52,560
from each of those cameras and will you

1159
00:46:57,500 --> 00:46:55,230
be collecting any descent imagery thank

1160
00:46:59,540 --> 00:46:57,510
you I'll take the first question let Tom

1161
00:47:02,000 --> 00:46:59,550
take the second one and so in terms of

1162
00:47:04,340 --> 00:47:02,010
our landing site this is kind of a

1163
00:47:06,500 --> 00:47:04,350

unique mission in terms of Mars missions

1164
00:47:09,560 --> 00:47:06,510
because usually when you come to picking

1165
00:47:11,300 --> 00:47:09,570
the landing site for a Mars Lander you

1166
00:47:13,460 --> 00:47:11,310
you sort it's sort of a cage match with

1167
00:47:15,650 --> 00:47:13,470
all all the Mars scientists in the world

1168
00:47:17,840 --> 00:47:15,660
because you if you're after something

1169
00:47:20,510 --> 00:47:17,850
what to do with the geology that's the

1170
00:47:22,220 --> 00:47:20,520
place that you go is key to figuring out

1171
00:47:25,370 --> 00:47:22,230
what the problems that you can address

1172
00:47:27,110 --> 00:47:25,380
are and and and what kinds of methods

1173
00:47:29,120 --> 00:47:27,120
you can use for it so you know you want

1174
00:47:31,880 --> 00:47:29,130
to go to a lake bottom do you want to go

1175
00:47:33,860 --> 00:47:31,890
to a volcanic flow and and so there

1176
00:47:36,200 --> 00:47:33,870
there's always a long drawn-out process

1177
00:47:39,350 --> 00:47:36,210
where you know you winnow down the sites

1178
00:47:41,960 --> 00:47:39,360
for insight we have exactly the opposite

1179
00:47:44,960 --> 00:47:41,970
situation where we're we're interested

1180
00:47:47,330 --> 00:47:44,970
in the the deep structure of the planet

1181
00:47:48,800 --> 00:47:47,340
and anywhere you go on the planet you're

1182
00:47:51,260 --> 00:47:48,810
gonna have the deep structure under your

1183
00:47:53,060 --> 00:47:51,270
feet and so it really doesn't matter and

1184
00:47:55,250 --> 00:47:53,070
you might think well you want to go to a

1185
00:47:57,050 --> 00:47:55,260
place with more Mars quakes but that's

1186
00:47:59,090 --> 00:47:57,060
not even true either because what you

1187
00:48:01,280 --> 00:47:59,100
want are marsquakes that are relatively

1188
00:48:02,870 --> 00:48:01,290

far away that that shoot the rays

1189
00:48:04,340 --> 00:48:02,880
through the planet and go deep into the

1190
00:48:05,960 --> 00:48:04,350
planet before they get to you so if

1191
00:48:08,710 --> 00:48:05,970
they're very close to you you don't

1192
00:48:12,500 --> 00:48:08,720
really find out very much about it so

1193
00:48:14,630 --> 00:48:12,510
what we did when we put together the

1194
00:48:17,000 --> 00:48:14,640
concept for this mission is is I went to

1195
00:48:20,240 --> 00:48:17,010
the the engineers who were designing the

1196
00:48:22,760 --> 00:48:20,250
the landing system and the the systems

1197
00:48:25,820 --> 00:48:22,770
for for surviving on the surface as I

1198
00:48:27,569 --> 00:48:25,830
said you guys have a blank slate you can

1199
00:48:29,910 --> 00:48:27,579
go to the safest easiest

1200
00:48:32,130 --> 00:48:29,920
but on the planet you can find and I'll

1201
00:48:34,559 --> 00:48:32,140
do my science so just find a spot that's

1202
00:48:37,829 --> 00:48:34,569
easy for you to land on and I put easy

1203
00:48:39,719 --> 00:48:37,839
in quotes here and a place that you can

1204
00:48:42,329 --> 00:48:39,729
make sure that this thing's gonna last

1205
00:48:44,279 --> 00:48:42,339
or at least Amar's here because I need

1206
00:48:46,380 --> 00:48:44,289
to be able to do my science I need to be

1207
00:48:48,749 --> 00:48:46,390
able to sit there and accumulate data

1208
00:48:51,900 --> 00:48:48,759
over a long period of time and so go to

1209
00:48:55,109 --> 00:48:51,910
someplace that's safe to land and go to

1210
00:48:57,299 --> 00:48:55,119
someplace that is easy living and that's

1211
00:48:59,069 --> 00:48:57,309
that's what I want and so they went

1212
00:49:01,799 --> 00:48:59,079
through the process and it turns out

1213
00:49:03,779 --> 00:49:01,809

that with all the constraints from the

1214
00:49:05,699 --> 00:49:03,789
landing system that we inherited from

1215
00:49:08,549 --> 00:49:05,709
Phoenix and the constraints that we

1216
00:49:10,380 --> 00:49:08,559
needed to last a long time there were

1217
00:49:11,930 --> 00:49:10,390
very few places on Mars that met all

1218
00:49:14,609 --> 00:49:11,940
those engineering constraints and this

1219
00:49:18,799 --> 00:49:14,619
spot in Elysium Planitia turns out to be

1220
00:49:21,059 --> 00:49:18,809
just about perfect for our purposes I

1221
00:49:22,620 --> 00:49:21,069
said I think what you're saying is that

1222
00:49:24,779 --> 00:49:22,630
for at least for insight it's what's

1223
00:49:28,079 --> 00:49:24,789
inside that matters not what's on the

1224
00:49:31,499 --> 00:49:28,089
surface that's right beauty's not just

1225
00:49:33,420 --> 00:49:31,509
skin deep you yeah they just they add a

1226
00:49:35,219 --> 00:49:33,430
little bit to that is one of the strong

1227
00:49:38,579 --> 00:49:35,229
criterias we had is because we're the

1228
00:49:40,469 --> 00:49:38,589
very first lander on Mars stationary

1229
00:49:42,809 --> 00:49:40,479
Lander that's intended to last a full

1230
00:49:44,699 --> 00:49:42,819
Martian year 26 months

1231
00:49:46,529 --> 00:49:44,709
strictly with solar power we had to land

1232
00:49:48,329 --> 00:49:46,539
also close to the equator so it's

1233
00:49:50,670 --> 00:49:48,339
important for us to to be able to get

1234
00:49:52,410 --> 00:49:50,680
Sun all that all Martian years so that

1235
00:49:54,299 --> 00:49:52,420
also constrained where we could land as

1236
00:49:57,599 --> 00:49:54,309
well to answer the question about the

1237
00:49:59,519 --> 00:49:57,609
the images will on the very first day

1238
00:50:01,109 --> 00:49:59,529

that we land we'll take an image with

1239
00:50:03,569 --> 00:50:01,119
our context camera that was the one

1240
00:50:06,269 --> 00:50:03,579
that's mounted under the deck more or

1241
00:50:08,219 --> 00:50:06,279
less about here underneath the deck

1242
00:50:10,529 --> 00:50:08,229
that'll take a picture of the workspace

1243
00:50:13,349 --> 00:50:10,539
in front of the lander where we intend

1244
00:50:14,939 --> 00:50:13,359
to do the deployment of the instruments

1245
00:50:17,579 --> 00:50:14,949
so that'll give us an idea about how

1246
00:50:19,979 --> 00:50:17,589
easy or how difficult our jobs going to

1247
00:50:21,930 --> 00:50:19,989
be over the next few months and that'll

1248
00:50:24,839 --> 00:50:21,940
be available like I said probably the

1249
00:50:27,120 --> 00:50:24,849
very first day that we land very quickly

1250
00:50:29,640 --> 00:50:27,130
after that we'll be taking an image with

1251
00:50:33,059 --> 00:50:29,650
the camera that's located on the arm the

1252
00:50:34,769 --> 00:50:33,069
instrument deployment camera that first

1253
00:50:36,509 --> 00:50:34,779
picture will actually just be of like

1254
00:50:39,479 --> 00:50:36,519
the arm itself we need to check and make

1255
00:50:40,710 --> 00:50:39,489
sure that it looks okay eventually will

1256
00:50:42,660 --> 00:50:40,720
will

1257
00:50:45,150 --> 00:50:42,670
unstow the arm and start taking pictures

1258
00:50:47,579 --> 00:50:45,160
of the workspace in more detail and we

1259
00:50:49,950 --> 00:50:47,589
have a plan do a panorama of the area

1260
00:50:51,690 --> 00:50:49,960
that's around the lander don't know

1261
00:50:54,390 --> 00:50:51,700
exactly what Saul will do that that's

1262
00:50:55,740 --> 00:50:54,400
not a priority science item but as soon

1263
00:50:57,300 --> 00:50:55,750

as those pictures are taken we're gonna

1264
00:51:00,210 --> 00:50:57,310
release them as quickly as we possibly

1265
00:51:01,500 --> 00:51:00,220
can okay we're gonna take one more

1266
00:51:03,270 --> 00:51:01,510
social media question and then we're

1267
00:51:04,829 --> 00:51:03,280
actually gonna go back and look at the

1268
00:51:08,490 --> 00:51:04,839
testbed and see what's happening there

1269
00:51:11,780 --> 00:51:08,500
so Stephanie all right so we have had

1270
00:51:15,660 --> 00:51:11,790
quite a bit of conversation about

1271
00:51:17,520 --> 00:51:15,670
potential humans to Mars a lot of a lot

1272
00:51:19,650 --> 00:51:17,530
of people sharing excitement and they

1273
00:51:21,990 --> 00:51:19,660
want to know how will insight help

1274
00:51:23,910 --> 00:51:22,000
inform potential future human

1275
00:51:25,559 --> 00:51:23,920
exploration or the Red Planet yes that's

1276
00:51:27,750 --> 00:51:25,569
it it's a good question it's one that we

1277
00:51:31,170 --> 00:51:27,760
often get what we didn't talk about

1278
00:51:33,690 --> 00:51:31,180
what's would is also on the lander is we

1279
00:51:35,940 --> 00:51:33,700
have a bunch of metrology meteorology

1280
00:51:40,020 --> 00:51:35,950
sorry experiment so we have a pressure

1281
00:51:41,880 --> 00:51:40,030
sensor wind sensor a magnetometer and

1282
00:51:43,829 --> 00:51:41,890
those are all actually there the main

1283
00:51:46,290 --> 00:51:43,839
reason is to support the size instrument

1284
00:51:47,940 --> 00:51:46,300
this ice is incredibly sensitive it's

1285
00:51:49,710 --> 00:51:47,950
good at detecting everything in the

1286
00:51:51,960 --> 00:51:49,720
environment as well as Mars quakes and

1287
00:51:53,520 --> 00:51:51,970
so we have those sensors really their 2d

1288
00:51:56,010 --> 00:51:53,530

correlate the noise from the environment

1289
00:51:57,180 --> 00:51:56,020
from our seismic measurements but

1290
00:51:59,730 --> 00:51:57,190
they're also going to give us very good

1291
00:52:02,490 --> 00:51:59,740
information about what the weather is on

1292
00:52:04,589 --> 00:52:02,500
Mars at that particular location also

1293
00:52:06,960 --> 00:52:04,599
understanding with the change in the

1294
00:52:09,089 --> 00:52:06,970
magnetic field and the atmosphere is

1295
00:52:11,700 --> 00:52:09,099
important to understand for future

1296
00:52:14,160 --> 00:52:11,710
people that might go to Mars so I think

1297
00:52:17,780 --> 00:52:14,170
basically understanding the weather on

1298
00:52:20,579 --> 00:52:17,790
Mars is probably the best tie in there

1299
00:52:22,109 --> 00:52:20,589
so let's let's go back to the test bed

1300
00:52:25,079 --> 00:52:22,119
then Jamie can you tell us what's going

1301
00:52:26,760 --> 00:52:25,089
on there thanks Jerry yeah welcome back

1302
00:52:29,520 --> 00:52:26,770
everyone so we've successfully deployed

1303
00:52:30,329 --> 00:52:29,530
the heat flow probe instrument here to

1304
00:52:32,730 --> 00:52:30,339
the surface

1305
00:52:34,380 --> 00:52:32,740
so now you can have a better view of our

1306
00:52:37,260 --> 00:52:34,390
instrument deployment camera which is

1307
00:52:39,300 --> 00:52:37,270
right here on the robotic arm and also

1308
00:52:41,309 --> 00:52:39,310
you have better view of HP cubed and

1309
00:52:43,020 --> 00:52:41,319
it's engineering tether that's been

1310
00:52:45,829 --> 00:52:43,030
pulled out across the land or duct here

1311
00:52:48,750 --> 00:52:45,839
so you can see HP cubed is still

1312
00:52:50,819 --> 00:52:48,760
grappled by the robotic arm but we're

1313
00:52:53,650 --> 00:52:50,829

gonna do on Mars is we're gonna look at

1314
00:52:56,530 --> 00:52:53,660
these pictures with both of our cameras

1315
00:52:58,210 --> 00:52:56,540
and see the HP cubed or ice or dubby

1316
00:53:00,190 --> 00:52:58,220
tests are safely on the ground and then

1317
00:53:00,940 --> 00:53:00,200
on the following day we'll release the

1318
00:53:07,900 --> 00:53:00,950
grapple

1319
00:53:09,610 --> 00:53:07,910
it heats up and then the fingers slowly

1320
00:53:11,080 --> 00:53:09,620
expand and then the arm comes up a

1321
00:53:13,600 --> 00:53:11,090
little bit and that's how we release it

1322
00:53:15,400 --> 00:53:13,610
and at that point then the heat flow

1323
00:53:17,590 --> 00:53:15,410
probe is on the surface and ready to

1324
00:53:20,050 --> 00:53:17,600
begin hammering we release the mole and

1325
00:53:25,780 --> 00:53:20,060
it'll hammer into the surface and start

1326
00:53:28,150 --> 00:53:25,790
at science that's all for the update

1327
00:53:30,400 --> 00:53:28,160
here you guys have any questions about

1328
00:53:30,910 --> 00:53:30,410
the testing let us know back to you

1329
00:53:33,970 --> 00:53:30,920
Gerry

1330
00:53:35,920 --> 00:53:33,980
all right thanks okay so we're gonna

1331
00:53:37,600 --> 00:53:35,930
start wrapping up here but I wanted to

1332
00:53:40,390 --> 00:53:37,610
let you guys know about ways to learn

1333
00:53:41,620 --> 00:53:40,400
more about insight so one thing that's

1334
00:53:45,340 --> 00:53:41,630
special about insight is that we

1335
00:53:46,900 --> 00:53:45,350
actually have a Mars Roadshow so people

1336
00:53:48,250 --> 00:53:46,910
can't actually get to Mars but for those

1337
00:53:51,160 --> 00:53:48,260
of you in California we're gonna try and

1338
00:53:52,570 --> 00:53:51,170

bring Mars to you so we are also going

1339
00:53:54,490 --> 00:53:52,580
to provide some details about how to

1340
00:53:56,320 --> 00:53:54,500
watch live in case you happen to be in

1341
00:53:58,330 --> 00:53:56,330
central California and hopefully it's

1342
00:53:59,650 --> 00:53:58,340
not a hot not a foggy day you can

1343
00:54:01,960 --> 00:53:59,660
actually see the launch we have some

1344
00:54:06,910 --> 00:54:01,970
details on that and the Rhode show at

1345
00:54:09,670 --> 00:54:06,920
Mars NASA gov flash insight we also have

1346
00:54:11,620 --> 00:54:09,680
all the news about the mission there as

1347
00:54:13,990 --> 00:54:11,630
well as a link to the press kit and

1348
00:54:15,330 --> 00:54:14,000
another website that you can go to for

1349
00:54:19,870 --> 00:54:15,340
more information about insight is

1350
00:54:21,910 --> 00:54:19,880
nasa.gov slash insight also of course

1351
00:54:24,160 --> 00:54:21,920
we've got social media so please follow

1352
00:54:27,060 --> 00:54:24,170
the mission and join the conversation at

1353
00:54:29,860 --> 00:54:27,070
NASA insight on Facebook and Twitter

1354
00:54:31,120 --> 00:54:29,870
also just following the conclusion of

1355
00:54:34,600 --> 00:54:31,130
this press conference we're going to be

1356
00:54:36,340 --> 00:54:34,610
replaying the images and videos so thank

1357
00:54:39,950 --> 00:54:36,350
you to everyone for coming to learn more

1358
00:55:23,610 --> 00:54:39,960
about insight and onward to Mars