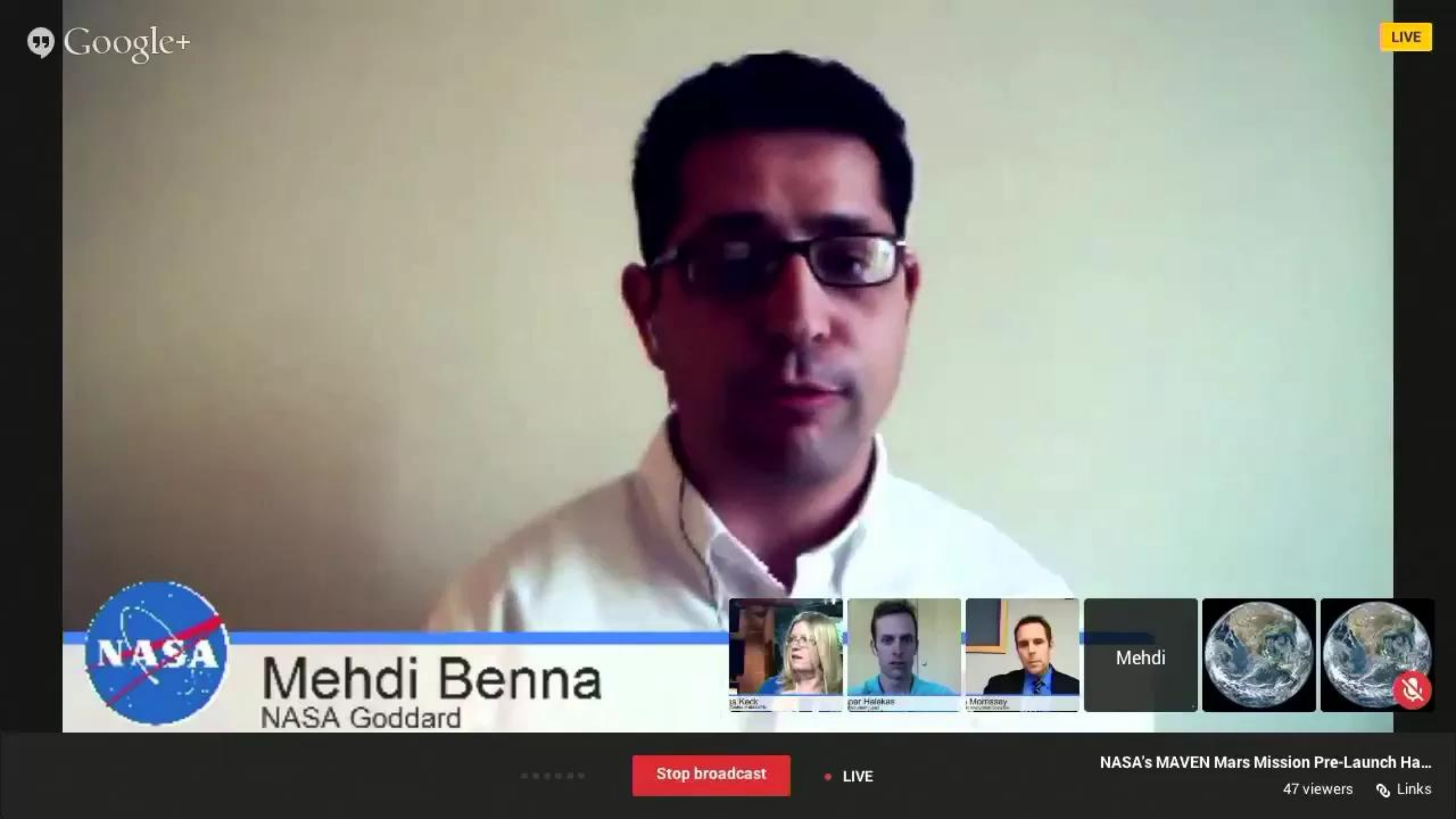
Google+
LIVE
Mehdi Benna
NASA Goddard
Mehdi
Stop broadcast
LIVE
NASA's MAVEN Mars Mission Pre-Launch Ha...
47 viewers
Links

1
00:00:05,430 --> 00:00:02,470
hello and welcome to this uh nasa

2
00:00:08,470 --> 00:00:05,440
goddard uh google plus hangout all about

3
00:00:10,950 --> 00:00:08,480
the nes next mars mission it's called

4
00:00:12,470 --> 00:00:10,960
maven um i'm joining you here at nasa

5
00:00:13,669 --> 00:00:12,480
goddard and we have a variety of

6
00:00:15,829 --> 00:00:13,679
scientists who are joining us from

7
00:00:17,990 --> 00:00:15,839
around the country as they travel to the

8
00:00:20,870 --> 00:00:18,000
launch site of maven um it's going to be

9
00:00:22,790 --> 00:00:20,880
launching from florida on monday out of

10
00:00:25,189 --> 00:00:22,800
cape canaveral joining us for this

11
00:00:27,349 --> 00:00:25,199
hangout is jim morrissey he's the

12
00:00:29,830 --> 00:00:27,359
instrument system manager for nasa

13
00:00:31,750 --> 00:00:29,840

goddard meri bena he's the

14
00:00:33,910 --> 00:00:31,760
instrument scientist for the neutral gas

15
00:00:35,590 --> 00:00:33,920
and ion mass spectrometer at nasa

16
00:00:38,069 --> 00:00:35,600
goddard many will be joining us in just

17
00:00:40,310 --> 00:00:38,079
a few minutes dave brain he's the maven

18
00:00:42,470 --> 00:00:40,320
co-investigator for the laboratory of

19
00:00:45,029 --> 00:00:42,480
atmospheric and space physics out at the

20
00:00:47,110 --> 00:00:45,039
university of colorado in boulder and

21
00:00:50,069 --> 00:00:47,120
jasper hallicus he is the instrument

22
00:00:51,830 --> 00:00:50,079
leader for the solar wind ion analyzer

23
00:00:54,150 --> 00:00:51,840
at the university of california in

24
00:00:55,510 --> 00:00:54,160
berkeley i'm mary's keck here at nasa

25
00:00:57,590 --> 00:00:55,520
goddard and we're going to be answering

26
00:00:59,590 --> 00:00:57,600
your questions please either put them in

27
00:01:01,910 --> 00:00:59,600
the youtube chat box put them here in

28
00:01:03,830 --> 00:01:01,920
google plus go ahead on twitter using

29
00:01:06,630 --> 00:01:03,840
the hashtag maven and we'll be tracking

30
00:01:08,070 --> 00:01:06,640
them as we go along and you can also uh

31
00:01:09,510 --> 00:01:08,080
ask us questions on facebook we have a

32
00:01:12,149 --> 00:01:09,520
variety of people watching all these

33
00:01:13,670 --> 00:01:12,159
different channels for this um we're

34
00:01:15,749 --> 00:01:13,680
going to go right to one of the very

35
00:01:19,109 --> 00:01:15,759
first questions probably the very first

36
00:01:21,670 --> 00:01:19,119
most obvious question for this and that

37
00:01:23,030 --> 00:01:21,680
is what is maven and what does maven

38
00:01:25,510 --> 00:01:23,040

stand for

39
00:01:27,990 --> 00:01:25,520
as we see if we can lock in dave brain

40
00:01:30,149 --> 00:01:28,000
i'm gonna go ahead and put uh

41
00:01:32,390 --> 00:01:30,159
jim morrissey on the spot and have jim

42
00:01:35,030 --> 00:01:32,400
tell us about maven

43
00:01:37,190 --> 00:01:35,040
hi aries um even is uh it's garden's

44
00:01:40,230 --> 00:01:37,200
first planetary mission uh we're gonna

45
00:01:41,830 --> 00:01:40,240
be launching on monday november 18th

46
00:01:44,710 --> 00:01:41,840
um

47
00:01:46,950 --> 00:01:44,720
this is uh ammar's mission to go and

48
00:01:49,350 --> 00:01:46,960
study the upper atmosphere at mars

49
00:01:51,510 --> 00:01:49,360
um we have i can see

50
00:01:53,590 --> 00:01:51,520
now we have all our we have several of

51
00:01:55,749 --> 00:01:53,600
our key instrument instrumenters on and

52
00:01:57,109 --> 00:01:55,759
uh

53
00:02:00,630 --> 00:01:57,119
these guys are ready to answer questions

54
00:02:04,149 --> 00:02:02,310
thank you so much and i see now that we

55
00:02:05,270 --> 00:02:04,159
have maddie bennett has joined us and

56
00:02:07,590 --> 00:02:05,280
dave

57
00:02:09,910 --> 00:02:07,600
um i'm wondering jake can you let us

58
00:02:11,830 --> 00:02:09,920
know a little bit more about what maven

59
00:02:13,350 --> 00:02:11,840
stands for about the mission itself and

60
00:02:14,790 --> 00:02:13,360
i want to remind um all of our

61
00:02:19,990 --> 00:02:14,800
participants if you're not speaking put

62
00:02:20,000 --> 00:02:24,630
so dave can you hear us

63
00:02:24,640 --> 00:02:29,110

how about mehdi can you hear us

64
00:02:32,550 --> 00:02:30,390
hello aries i can go ahead and answer

65
00:02:34,949 --> 00:02:32,560
the question thank you thank you so much

66
00:02:37,589 --> 00:02:34,959
maven stands for the mars atmosphere and

67
00:02:38,710 --> 00:02:37,599
volatile evolution mission

68
00:02:41,110 --> 00:02:38,720
um

69
00:02:41,910 --> 00:02:41,120
the the purpose of the mission is to

70
00:02:44,150 --> 00:02:41,920
uh

71
00:02:46,790 --> 00:02:44,160
is to orbit mars in a

72
00:02:48,550 --> 00:02:46,800
highly eccentric orbit uh where we'll

73
00:02:50,390 --> 00:02:48,560
what we'll be studying the composition

74
00:02:52,470 --> 00:02:50,400
of the atmosphere taking measurements in

75
00:02:54,630 --> 00:02:52,480
situ measurements of the atmosphere near

76
00:02:56,550 --> 00:02:54,640
the surface and then

77
00:02:58,790 --> 00:02:56,560
during the times when we're uh we're

78
00:03:02,149 --> 00:02:58,800
higher above the planet at our apple

79
00:03:04,470 --> 00:03:02,159
apps point we'll be taking images of the

80
00:03:07,509 --> 00:03:04,480
planet spectral images to to determine

81
00:03:09,430 --> 00:03:07,519
the composition of the atmosphere um

82
00:03:10,390 --> 00:03:09,440
at the same time

83
00:03:13,990 --> 00:03:10,400
we

84
00:03:16,790 --> 00:03:14,000
the sun

85
00:03:18,309 --> 00:03:16,800
in order to understand how that energy

86
00:03:20,309 --> 00:03:18,319
affects the composition of the

87
00:03:22,390 --> 00:03:20,319
atmosphere and ultimately all this

88
00:03:25,110 --> 00:03:22,400

information that we that we collect goes

89
00:03:26,949 --> 00:03:25,120
into models that that can uh models of

90
00:03:28,789 --> 00:03:26,959
the atmosphere that we can run forwards

91
00:03:31,110 --> 00:03:28,799
or backwards to understand

92
00:03:32,869 --> 00:03:31,120
what the uh what the atmosphere used to

93
00:03:34,229 --> 00:03:32,879
look like

94
00:03:35,270 --> 00:03:34,239
hundreds of millions of years ago and

95
00:03:36,229 --> 00:03:35,280
what it's going to look like in the

96
00:03:37,670 --> 00:03:36,239
future

97
00:03:39,030 --> 00:03:37,680
uh and one of the interesting things

98
00:03:41,830 --> 00:03:39,040
about that is that

99
00:03:44,149 --> 00:03:41,840
uh other missions have shown uh

100
00:03:45,110 --> 00:03:44,159
surface missions and

101
00:03:47,509 --> 00:03:45,120
emissions that have gone out and

102
00:03:49,830 --> 00:03:47,519
photographing which have shown that

103
00:03:52,149 --> 00:03:49,840
there is evidence uh that there was

104
00:03:53,990 --> 00:03:52,159
flowing mar flowing water on the surface

105
00:03:57,110 --> 00:03:54,000
of mars at one point

106
00:03:59,030 --> 00:03:57,120
uh which is a precursor to life so we

107
00:04:00,470 --> 00:03:59,040
need to unders what maven will do is

108
00:04:03,110 --> 00:04:00,480
help us understand

109
00:04:04,390 --> 00:04:03,120
uh the habitability of mars and in the

110
00:04:06,949 --> 00:04:04,400
past and

111
00:04:11,910 --> 00:04:06,959
uh and was it once capable of supporting

112
00:04:15,110 --> 00:04:13,750
wonderful and i would love to see uh

113
00:04:17,509 --> 00:04:15,120

maddie now that you've we've got you

114
00:04:19,030 --> 00:04:17,519
back in the hangout um can you talk a

115
00:04:21,270 --> 00:04:19,040
little bit about the instrument that you

116
00:04:23,430 --> 00:04:21,280
have helped design for maven and why

117
00:04:25,350 --> 00:04:23,440
that instrument ends up telling us all

118
00:04:27,430 --> 00:04:25,360
kinds of solutions or answers about the

119
00:04:30,150 --> 00:04:27,440
martian atmosphere

120
00:04:32,469 --> 00:04:30,160
uh thank you so the instrument

121
00:04:35,110 --> 00:04:32,479
we have designed at nasa goddard is the

122
00:04:36,870 --> 00:04:35,120
neutral gas and ion mass spectrometer

123
00:04:39,670 --> 00:04:36,880
it's an instrument that allows us to

124
00:04:42,390 --> 00:04:39,680
measure the composition and isotopes of

125
00:04:45,670 --> 00:04:42,400
neutral gases and ions

126
00:04:46,629 --> 00:04:45,680
of the upper atmosphere of mars

127
00:04:48,870 --> 00:04:46,639
so

128
00:04:52,150 --> 00:04:48,880
this instruments basically

129
00:04:53,189 --> 00:04:52,160
look at neutral particles and turn them

130
00:04:55,189 --> 00:04:53,199
into

131
00:04:57,749 --> 00:04:55,199
charged particles by bombarding them by

132
00:04:59,510 --> 00:04:57,759
electrons and then we take them through

133
00:05:02,390 --> 00:04:59,520
a mass analyzer

134
00:05:05,189 --> 00:05:02,400
that allow us to not only separate the

135
00:05:08,070 --> 00:05:05,199
species per their mass or their weight

136
00:05:09,749 --> 00:05:08,080
how heavy they are but also to look how

137
00:05:10,950 --> 00:05:09,759
many

138
00:05:13,029 --> 00:05:10,960

of them

139
00:05:15,430 --> 00:05:13,039
we have in that gas so

140
00:05:17,430 --> 00:05:15,440
um this instrument is key for maven

141
00:05:20,150 --> 00:05:17,440
because this is the

142
00:05:21,029 --> 00:05:20,160
only instrument on board that allow us

143
00:05:21,990 --> 00:05:21,039
to

144
00:05:25,990 --> 00:05:22,000
see

145
00:05:28,710 --> 00:05:26,000
um uh the to analyze the neutral gas in

146
00:05:31,189 --> 00:05:28,720
situ we have another instrument is the

147
00:05:33,749 --> 00:05:31,199
ultraviolet mass spectr uh ultraviolet

148
00:05:37,110 --> 00:05:33,759
spectrometer that allow us to look at

149
00:05:39,990 --> 00:05:37,120
the same gas but by remote sensing so

150
00:05:42,550 --> 00:05:40,000
using the both to the

151
00:05:43,670 --> 00:05:42,560
uh both of the the two instruments we

152
00:05:46,390 --> 00:05:43,680
can actually

153
00:05:48,629 --> 00:05:46,400
analyze what's what's what's uh what's

154
00:05:50,629 --> 00:05:48,639
local and also look ahead of the

155
00:05:53,749 --> 00:05:50,639
spacecraft and analyze the gas at

156
00:05:58,710 --> 00:05:56,790
maddie thank you so much um

157
00:06:01,110 --> 00:05:58,720
jasper i wanted to ask you to talk a

158
00:06:03,749 --> 00:06:01,120
little bit um about what your instrument

159
00:06:06,469 --> 00:06:03,759
on maven is going to do once it goes

160
00:06:08,710 --> 00:06:06,479
into orbit around mars

161
00:06:10,629 --> 00:06:08,720
yeah i'd love to um so my instrument is

162
00:06:12,390 --> 00:06:10,639
the solar wind ion analyzer it's a it's

163
00:06:15,029 --> 00:06:12,400

a very descriptively named instrument

164
00:06:16,870 --> 00:06:15,039
because it measures solar wind ions um

165
00:06:19,350 --> 00:06:16,880
what are those they're basically this

166
00:06:21,270 --> 00:06:19,360
beam of very very fast

167
00:06:23,830 --> 00:06:21,280
protons fully ionized hydrogen that's

168
00:06:25,990 --> 00:06:23,840
coming out of the sun at 400 kilometers

169
00:06:27,350 --> 00:06:26,000
per second to put that into units that

170
00:06:29,590 --> 00:06:27,360
might mean a little bit more to you

171
00:06:31,350 --> 00:06:29,600
that's about a million miles an hour

172
00:06:32,390 --> 00:06:31,360
so my instrument is tailored to measure

173
00:06:33,990 --> 00:06:32,400
that

174
00:06:35,909 --> 00:06:34,000
the instruments on the maven payload

175
00:06:37,510 --> 00:06:35,919
kind of fall into two or three different

176
00:06:39,350 --> 00:06:37,520
categories depending on how you like to

177
00:06:40,790 --> 00:06:39,360
think about it there's the instruments

178
00:06:42,870 --> 00:06:40,800
like mehdi's instrument that he just

179
00:06:45,510 --> 00:06:42,880
described that measure what's going on

180
00:06:47,110 --> 00:06:45,520
right in the atmosphere of mars um then

181
00:06:49,510 --> 00:06:47,120
there are instruments which measure

182
00:06:51,749 --> 00:06:49,520
what's coming at mars from the sun and

183
00:06:52,950 --> 00:06:51,759
my instrument falls into that camp

184
00:06:54,469 --> 00:06:52,960
and then there's a third set of

185
00:06:56,309 --> 00:06:54,479
instruments which measures things which

186
00:06:57,670 --> 00:06:56,319
are escaping from the atmosphere of mars

187
00:06:59,830 --> 00:06:57,680
and of course that's the ultimate goal

188
00:07:01,589 --> 00:06:59,840

of the maven mission is to understand

189
00:07:03,670 --> 00:07:01,599
how those escaping things from the

190
00:07:05,350 --> 00:07:03,680
atmosphere relate to what's coming at

191
00:07:06,790 --> 00:07:05,360
mars from the sun

192
00:07:09,990 --> 00:07:06,800
so that's that's kind of it in a

193
00:07:15,029 --> 00:07:12,870
excellent and now when it comes to the

194
00:07:16,629 --> 00:07:15,039
total number of instruments on maven

195
00:07:18,790 --> 00:07:16,639
itself i was wondering many can you

196
00:07:20,790 --> 00:07:18,800
describe a little bit more about

197
00:07:29,350 --> 00:07:20,800
how they all how how many of them there

198
00:07:33,430 --> 00:07:31,510
oh and quick reminder matty you may have

199
00:07:35,510 --> 00:07:33,440
muted your microphone

200
00:07:38,469 --> 00:07:35,520
yes i'm sorry so it really depends how

201
00:07:39,589 --> 00:07:38,479
you look at it we actually have uh four

202
00:07:42,390 --> 00:07:39,599
packages

203
00:07:44,390 --> 00:07:42,400
uh uh on board um

204
00:07:47,589 --> 00:07:44,400
we have the uh

205
00:07:49,510 --> 00:07:47,599
the plasma package that allows to plasma

206
00:07:52,629 --> 00:07:49,520
and fields package that's composed of

207
00:07:55,189 --> 00:07:52,639
multiple sensors that allows to look at

208
00:07:58,550 --> 00:07:55,199
the uh look at the charged particles

209
00:08:00,710 --> 00:07:58,560
look at the magnetic field and and

210
00:08:03,830 --> 00:08:00,720
jasper talked a little bit about that we

211
00:08:06,710 --> 00:08:03,840
have the ultraviolet uh spectrometer

212
00:08:08,230 --> 00:08:06,720
that allows to do a remote sensing and

213
00:08:09,189 --> 00:08:08,240

we have the

214
00:08:11,110 --> 00:08:09,199
uh

215
00:08:13,830 --> 00:08:11,120
neutral gas and ion mass spectrometer

216
00:08:16,150 --> 00:08:13,840
which is a a separate instrument by

217
00:08:18,790 --> 00:08:16,160
itself that allows us to do in situ so

218
00:08:21,029 --> 00:08:18,800
actually the three big packages when you

219
00:08:22,710 --> 00:08:21,039
count the number of sensors uh

220
00:08:24,550 --> 00:08:22,720
my colleagues may correct me but i think

221
00:08:29,350 --> 00:08:24,560
we have about eight or nine sensors on

222
00:08:33,589 --> 00:08:31,749
okay thank you so much maddie um i'm

223
00:08:34,949 --> 00:08:33,599
wondering dave let's give it a shot i

224
00:08:36,149 --> 00:08:34,959
think we've had dave go popping in and

225
00:08:37,829 --> 00:08:36,159
out of this hangout as we've been going

226
00:08:39,269 --> 00:08:37,839
along this is part of the charm of using

227
00:08:40,709 --> 00:08:39,279
the google plus hangouts we've got these

228
00:08:42,550 --> 00:08:40,719
scientists in their offices while

229
00:08:44,310 --> 00:08:42,560
they're getting ready for a launch so we

230
00:08:46,470 --> 00:08:44,320
have them in all kinds of locations on

231
00:08:47,829 --> 00:08:46,480
all kinds of different wi-fi networks um

232
00:08:50,070 --> 00:08:47,839
but let's see if this works with dave

233
00:08:52,790 --> 00:08:50,080
brain um dave tell us a little bit about

234
00:08:54,470 --> 00:08:52,800
the orbit of maven and when it actually

235
00:08:56,870 --> 00:08:54,480
will arrive at mars we've already said

236
00:08:59,430 --> 00:08:56,880
that it's going to launch this monday uh

237
00:09:01,829 --> 00:08:59,440
knockwood from cape canaveral in florida

238
00:09:04,070 --> 00:09:01,839

how long will it take maven to make it

239
00:09:08,790 --> 00:09:04,080
to the red planet and what kind of orbit

240
00:09:14,550 --> 00:09:11,829
and that was for dave brain we may still

241
00:09:17,829 --> 00:09:14,560
have him being held up there

242
00:09:21,990 --> 00:09:19,509
how about jim morrissey would you mind

243
00:09:23,430 --> 00:09:22,000
go ahead and jump in on that question

244
00:09:25,509 --> 00:09:23,440
sure um

245
00:09:27,670 --> 00:09:25,519
we're launching on monday uh it takes us

246
00:09:29,750 --> 00:09:27,680
about 10 months to get there so we

247
00:09:34,070 --> 00:09:29,760
launch on monday we'll be arriving in

248
00:09:36,790 --> 00:09:34,080
september of 2004. um

249
00:09:39,190 --> 00:09:36,800
after we get there we um uh

250
00:09:42,230 --> 00:09:39,200
we perform a mars insertion or uh uh

251
00:09:44,230 --> 00:09:42,240
mars insertion uh maneuver which um

252
00:09:46,150 --> 00:09:44,240
which uh decelerates us so we're

253
00:09:48,870 --> 00:09:46,160
capturing tomorrow's orbit uh we're

254
00:09:51,829 --> 00:09:48,880
captured into a uh an elliptical orbit

255
00:09:55,030 --> 00:09:51,839
that um that we afterwards trim down to

256
00:09:59,990 --> 00:09:57,750
our mission will last for uh our nominal

257
00:10:02,790 --> 00:10:00,000
mission is for one year we have the

258
00:10:06,550 --> 00:10:02,800
capability to extend that

259
00:10:08,790 --> 00:10:06,560
to up to about two more years if needed

260
00:10:11,269 --> 00:10:08,800
uh after that

261
00:10:15,990 --> 00:10:11,279
after that two year period we um

262
00:10:18,949 --> 00:10:16,000
um we we transitioned into a um into a

263
00:10:20,310 --> 00:10:18,959

into a relay mode where we have a

264
00:10:23,590 --> 00:10:20,320
electra

265
00:10:25,509 --> 00:10:23,600
transmitter on board which is a uhf

266
00:10:27,430 --> 00:10:25,519
transmitter that's capable of

267
00:10:29,190 --> 00:10:27,440
communicating with the rovers on the

268
00:10:31,110 --> 00:10:29,200
ground so

269
00:10:32,389 --> 00:10:31,120
so after our primary mission we will

270
00:10:35,030 --> 00:10:32,399
serve as a

271
00:10:35,910 --> 00:10:35,040
uh as a relay for those rovers and

272
00:10:38,550 --> 00:10:35,920
future

273
00:10:41,750 --> 00:10:38,560
mars uh rovers that that need to

274
00:10:43,590 --> 00:10:41,760
communicate through us by terror

275
00:10:45,430 --> 00:10:43,600
thank you so much jim

276
00:10:46,870 --> 00:10:45,440
um we have a question that's coming now

277
00:10:48,550 --> 00:10:46,880
on google plus and i want to remind

278
00:10:49,670 --> 00:10:48,560
everybody that uh we're having a little

279
00:10:51,030 --> 00:10:49,680
technical issues with some of the

280
00:10:52,389 --> 00:10:51,040
participants dropping in and out during

281
00:10:53,990 --> 00:10:52,399
this hangout it's because we're reaching

282
00:10:55,670 --> 00:10:54,000
all these scientists as they travel to

283
00:10:57,350 --> 00:10:55,680
get ready for the launch of maven which

284
00:10:59,350 --> 00:10:57,360
is going to be this coming monday or

285
00:11:01,030 --> 00:10:59,360
it's expected to be this monday um we do

286
00:11:02,550 --> 00:11:01,040
have a question from google plus you can

287
00:11:04,870 --> 00:11:02,560
ask questions on twitter using the

288
00:11:07,030 --> 00:11:04,880

hashtag maven in the youtube google

289
00:11:08,069 --> 00:11:07,040
hangouts comments box or on google plus

290
00:11:09,750 --> 00:11:08,079
and i'm going to

291
00:11:10,870 --> 00:11:09,760
look over somebody's shoulder here on

292
00:11:13,030 --> 00:11:10,880
google plus

293
00:11:15,829 --> 00:11:13,040
anders harndahl sorry if i butchered

294
00:11:18,630 --> 00:11:15,839
your last name he asked to what extent

295
00:11:21,509 --> 00:11:18,640
would mars's strong local magnetic

296
00:11:23,910 --> 00:11:21,519
fields offer protection from solar and

297
00:11:25,509 --> 00:11:23,920
cosmic radiation mehdi would you mind

298
00:11:27,990 --> 00:11:25,519
commenting on that

299
00:11:30,310 --> 00:11:28,000
how are mars is a strong local magnetic

300
00:11:32,949 --> 00:11:30,320
fields in any way protecting that planet

301
00:11:34,870 --> 00:11:32,959
from both solar and cosmic radiation

302
00:11:38,069 --> 00:11:34,880
yeah so uh mars a

303
00:11:42,069 --> 00:11:38,079
really peculiar uh uh of the uh

304
00:11:43,030 --> 00:11:42,079
uh uh four f uh planets close to the sun

305
00:11:44,310 --> 00:11:43,040
mars

306
00:11:46,230 --> 00:11:44,320
uh

307
00:11:48,790 --> 00:11:46,240
has what we call a remnant magnetic

308
00:11:51,910 --> 00:11:48,800
field so it used to be have a magnetic

309
00:11:54,150 --> 00:11:51,920
field like earth and it lost it somehow

310
00:11:56,470 --> 00:11:54,160
and what we see today is a remnant of a

311
00:11:58,790 --> 00:11:56,480
magnetic field so the magnetic field

312
00:12:00,069 --> 00:11:58,800
while it's still strong

313
00:12:01,509 --> 00:12:00,079

to uh

314
00:12:04,870 --> 00:12:01,519
shield the planet

315
00:12:07,590 --> 00:12:04,880
uh from some of the solar wind and the

316
00:12:10,310 --> 00:12:07,600
cosmic radiations it's actually not

317
00:12:12,470 --> 00:12:10,320
efficient enough to ultimately shield

318
00:12:15,590 --> 00:12:12,480
the planet and avoid its loss of

319
00:12:17,030 --> 00:12:15,600
atmosphere so um and and that's where

320
00:12:18,790 --> 00:12:17,040
where the uh

321
00:12:21,110 --> 00:12:18,800
maven mission comes to play because we

322
00:12:22,710 --> 00:12:21,120
will be looking at the magnetic field

323
00:12:24,870 --> 00:12:22,720
measuring the magnet local magnetic

324
00:12:27,750 --> 00:12:24,880
field of the planet but also look at how

325
00:12:30,150 --> 00:12:27,760
charged particles uh coming from the sun

326
00:12:32,069 --> 00:12:30,160
uh interact with this magnetic field

327
00:12:34,790 --> 00:12:32,079
what get lost and how the energy is

328
00:12:37,590 --> 00:12:34,800
transferred between the two

329
00:12:40,470 --> 00:12:37,600
and many how does can you compare what

330
00:12:42,790 --> 00:12:40,480
mars's magnetic field is like now versus

331
00:12:44,069 --> 00:12:42,800
what earth's is like um it's kind of

332
00:12:45,509 --> 00:12:44,079
common knowledge here at nasa but

333
00:12:47,110 --> 00:12:45,519
probably not common knowledge everywhere

334
00:12:48,949 --> 00:12:47,120
that earth has a real strong magnetic

335
00:12:50,870 --> 00:12:48,959
field that manages to protect our planet

336
00:12:53,509 --> 00:12:50,880
in some ways

337
00:12:56,069 --> 00:12:53,519
yes so so the the core of the earth has

338
00:12:59,590 --> 00:12:56,079

a has a dynamo that basically is a big

339
00:13:03,110 --> 00:12:59,600
magnet and that maintains a strong

340
00:13:06,790 --> 00:13:03,120
magnetic field around earth uh mars you

341
00:13:08,790 --> 00:13:06,800
we think mars used to have that the same

342
00:13:10,310 --> 00:13:08,800
structure around it the same magnetic

343
00:13:12,389 --> 00:13:10,320
field structure and lost it with time so

344
00:13:14,629 --> 00:13:12,399
what we see today is just that magnetic

345
00:13:17,430 --> 00:13:14,639
remnant field that's still embedded in

346
00:13:20,470 --> 00:13:17,440
the rocks and they still have the

347
00:13:23,030 --> 00:13:20,480
little magnetic field left and and and

348
00:13:25,030 --> 00:13:23,040
shield the planet and on some some of

349
00:13:28,150 --> 00:13:25,040
its surface from the solar wind if we

350
00:13:30,550 --> 00:13:28,160
have to compare uh i mean uh uh let

351
00:13:33,509 --> 00:13:30,560
maybe jasper give you an accurate number

352
00:13:35,670 --> 00:13:33,519
but there is a factor of a thousand uh

353
00:13:40,150 --> 00:13:35,680
smaller field than than on what we see

354
00:13:44,230 --> 00:13:42,069
thank you so much mehdi and um we have a

355
00:13:46,150 --> 00:13:44,240
bunch of questions coming in now um on

356
00:13:48,710 --> 00:13:46,160
twitter if you're asking questions on

357
00:13:51,430 --> 00:13:48,720
twitter please use the hashtag maven

358
00:13:53,509 --> 00:13:51,440
it's hashtag m-a-v-e-n

359
00:13:55,590 --> 00:13:53,519
and um

360
00:13:57,430 --> 00:13:55,600
william bum asks a question that we sort

361
00:13:58,790 --> 00:13:57,440
of may have answered a little bit but

362
00:14:00,310 --> 00:13:58,800
i'd like to throw to jim morrissey to

363
00:14:03,269 --> 00:14:00,320

see if he can expand on this a little

364
00:14:05,269 --> 00:14:03,279
bit um william's question is what kind

365
00:14:07,910 --> 00:14:05,279
of extended science missions will maven

366
00:14:09,590 --> 00:14:07,920
perform while serving as the relay now i

367
00:14:11,430 --> 00:14:09,600
think we've william asked that question

368
00:14:12,550 --> 00:14:11,440
before we went into exactly what maven's

369
00:14:15,030 --> 00:14:12,560
going to be

370
00:14:17,030 --> 00:14:15,040
tracking but i'd love to see jim if you

371
00:14:18,389 --> 00:14:17,040
could talk a little bit more about how

372
00:14:21,110 --> 00:14:18,399
long each one of those instruments are

373
00:14:23,030 --> 00:14:21,120
expected to run once maven is in orbit

374
00:14:25,829 --> 00:14:23,040
around mars

375
00:14:26,710 --> 00:14:25,839
sure um well the uh

376
00:14:32,550 --> 00:14:26,720
the

377
00:14:34,949 --> 00:14:32,560
mission would be um would be just a

378
00:14:36,389 --> 00:14:34,959
continuation of what we're doing uh over

379
00:14:38,069 --> 00:14:36,399
the first year

380
00:14:45,110 --> 00:14:38,079
um

381
00:14:47,829 --> 00:14:45,120
we come fairly we dip down well our

382
00:14:49,269 --> 00:14:47,839
periapsis is about is about 150

383
00:14:51,750 --> 00:14:49,279
kilometers above the surface of the

384
00:14:53,430 --> 00:14:51,760
planet and that even at that altitude

385
00:14:55,430 --> 00:14:53,440
the small atmosphere that mars has

386
00:14:58,550 --> 00:14:55,440
perturbates our orbit to some extent so

387
00:15:00,870 --> 00:14:58,560
we have to uh we have to perform uh trim

388
00:15:02,389 --> 00:15:00,880

maneuvers to to maintain our orbit so

389
00:15:04,790 --> 00:15:02,399
what we do when we get into the relay

390
00:15:07,189 --> 00:15:04,800
mode is that we raise that periaps

391
00:15:09,269 --> 00:15:07,199
altitude to a point where we can we can

392
00:15:11,110 --> 00:15:09,279
continue on indefinitely doing

393
00:15:13,110 --> 00:15:11,120
operations but one of the one of the

394
00:15:15,509 --> 00:15:13,120
drawbacks of that is that we no longer

395
00:15:17,750 --> 00:15:15,519
are able to take those uh in-situ

396
00:15:19,829 --> 00:15:17,760
measurements that maybe talked about uh

397
00:15:22,230 --> 00:15:19,839
close down into the atmosphere but that

398
00:15:24,230 --> 00:15:22,240
doesn't mean we can't do any science uh

399
00:15:26,710 --> 00:15:24,240
we could still uh we could still take

400
00:15:29,189 --> 00:15:26,720
solar measurements we can still do some

401
00:15:30,470 --> 00:15:29,199
of the remote sensing

402
00:15:32,069 --> 00:15:30,480
imaging with our ultraviolet

403
00:15:35,910 --> 00:15:32,079
spectrometer

404
00:15:38,790 --> 00:15:35,920
but mostly during that during that post

405
00:15:41,030 --> 00:15:38,800
science part of our mission we will we

406
00:15:42,790 --> 00:15:41,040
will be there serving as a relay

407
00:15:44,150 --> 00:15:42,800
um but there you know there is

408
00:15:50,230 --> 00:15:44,160
possibility to do science during that

409
00:15:53,189 --> 00:15:51,829
and jasper you had something to add to

410
00:15:54,949 --> 00:15:53,199
that

411
00:15:56,230 --> 00:15:54,959
oh yeah um just to follow up on the

412
00:15:58,629 --> 00:15:56,240
question about the crystal magnetic

413
00:16:00,870 --> 00:15:58,639

field and their strength um i wanted to

414
00:16:03,030 --> 00:16:00,880
point out that actually those fields are

415
00:16:04,470 --> 00:16:03,040
are quite strong in very localized

416
00:16:06,310 --> 00:16:04,480
regions they just don't happen to be

417
00:16:08,550 --> 00:16:06,320
nearly as widespread as the earth's

418
00:16:10,949 --> 00:16:08,560
field so in the earth's field right now

419
00:16:13,990 --> 00:16:10,959
most of us are sitting in around 50 000

420
00:16:15,670 --> 00:16:14,000
nano teslas or so to use canonical units

421
00:16:17,430 --> 00:16:15,680
there actually are fields on the surface

422
00:16:19,749 --> 00:16:17,440
of mars that probably reach up into the

423
00:16:21,670 --> 00:16:19,759
tens of thousands of nanotesla

424
00:16:23,430 --> 00:16:21,680
but they just aren't very widespread

425
00:16:25,509 --> 00:16:23,440
they only extend for you know a thousand

426
00:16:27,829 --> 00:16:25,519
kilometers or so so when you look at

427
00:16:29,590 --> 00:16:27,839
mars from a distance it's effect it's

428
00:16:31,509 --> 00:16:29,600
effectively unmagnetized but then when

429
00:16:33,590 --> 00:16:31,519
you get up very very close in one of

430
00:16:36,310 --> 00:16:33,600
these magnetic regions um the fields

431
00:16:38,069 --> 00:16:36,320
could actually be quite strong there and

432
00:16:39,670 --> 00:16:38,079
as these fields rotate around of course

433
00:16:41,430 --> 00:16:39,680
mars is presenting a different face to

434
00:16:42,389 --> 00:16:41,440
the solar wind and to the sun at all

435
00:16:43,670 --> 00:16:42,399
times

436
00:16:45,590 --> 00:16:43,680
you can imagine that there will be some

437
00:16:47,590 --> 00:16:45,600
very dynamic effects as these strong

438
00:16:51,590 --> 00:16:47,600

localized field regions rotate around

439
00:16:53,910 --> 00:16:51,600
and present different faces to the sun

440
00:16:55,269 --> 00:16:53,920
and we have a number of videos and

441
00:16:58,710 --> 00:16:55,279
animations that we're going to be able

442
00:17:00,870 --> 00:16:58,720
to show if you go to nasa.gov maven

443
00:17:02,629 --> 00:17:00,880
you'll see many of these animations a

444
00:17:03,749 --> 00:17:02,639
few of them that explains what jasper

445
00:17:05,270 --> 00:17:03,759
was doing with his hands just there

446
00:17:07,270 --> 00:17:05,280
which is how the solar wings whack and

447
00:17:09,510 --> 00:17:07,280
the the magnetic field help complete

448
00:17:11,429 --> 00:17:09,520
cover mars um we've got a bunch of

449
00:17:13,189 --> 00:17:11,439
questions that are that bring up

450
00:17:14,470 --> 00:17:13,199
probably something that must uh drive

451
00:17:15,909 --> 00:17:14,480
you a little crazy and that a lot of

452
00:17:18,710 --> 00:17:15,919
people are asking all about this new

453
00:17:20,870 --> 00:17:18,720
rover that we're putting up on mars uh

454
00:17:22,870 --> 00:17:20,880
called maven and i'm wondering uh jim

455
00:17:24,630 --> 00:17:22,880
can you talk a little bit about

456
00:17:26,309 --> 00:17:24,640
that underscore that maven is not a

457
00:17:27,909 --> 00:17:26,319
rover but instead will orbit the red

458
00:17:29,029 --> 00:17:27,919
planet but then exactly you talked a

459
00:17:31,029 --> 00:17:29,039
little bit how it's going to serve as a

460
00:17:33,190 --> 00:17:31,039
relay but is curiosity going to be able

461
00:17:36,470 --> 00:17:33,200
to lean its head back and see maven as

462
00:17:37,270 --> 00:17:36,480
it once it gets into orbit around mars

463
00:17:38,789 --> 00:17:37,280

um

464
00:17:41,110 --> 00:17:38,799
well that's that that's a good question

465
00:17:43,750 --> 00:17:41,120
yeah and you're correct uh maven is is

466
00:17:45,110 --> 00:17:43,760
not a rover maven is a uh it is a

467
00:17:47,350 --> 00:17:45,120
satellite it will be orbiting the

468
00:17:48,870 --> 00:17:47,360
climate um

469
00:17:50,870 --> 00:17:48,880
just to go back just a little bit on

470
00:17:53,430 --> 00:17:50,880
definitions i was i was referring to the

471
00:17:55,590 --> 00:17:53,440
periapse and the apple apps and uh just

472
00:17:56,870 --> 00:17:55,600
so everyone knows that the periapse is

473
00:17:58,710 --> 00:17:56,880
the uh

474
00:18:01,510 --> 00:17:58,720
that that's the the perips is the point

475
00:18:03,270 --> 00:18:01,520
in the orbit where the spacecraft is at

476
00:18:04,789 --> 00:18:03,280
its lowest altitude relative to the

477
00:18:07,350 --> 00:18:04,799
surface of the planet

478
00:18:09,110 --> 00:18:07,360
uh and the apple apps uh is the opposite

479
00:18:11,669 --> 00:18:09,120
that's that's where we're furthest away

480
00:18:14,470 --> 00:18:11,679
from the planet um but just getting back

481
00:18:15,909 --> 00:18:14,480
to the question the um

482
00:18:18,549 --> 00:18:15,919
the

483
00:18:21,350 --> 00:18:18,559
spacecraft in its orbit will actually be

484
00:18:23,750 --> 00:18:21,360
too small for uh for curiosity to to

485
00:18:25,909 --> 00:18:23,760
actually take an image of from from the

486
00:18:28,789 --> 00:18:25,919
surface of the planet

487
00:18:30,789 --> 00:18:28,799
but uh we do uh you know we will have

488
00:18:33,830 --> 00:18:30,799

this capability of communicating with

489
00:18:37,029 --> 00:18:33,840
curiosity if if need if we need to

490
00:18:39,510 --> 00:18:37,039
um and any information that uh curiosity

491
00:18:41,190 --> 00:18:39,520
sends us where we sort of relay directly

492
00:18:44,470 --> 00:18:41,200
back to earth so that's that's one of

493
00:18:46,390 --> 00:18:44,480
our secondary functions of this mission

494
00:18:48,710 --> 00:18:46,400
thank you so much jim

495
00:18:50,470 --> 00:18:48,720
um just to remind everyone um i'm this

496
00:18:52,870 --> 00:18:50,480
is i'm aries keck here at nasa goddard

497
00:18:55,029 --> 00:18:52,880
and this is a google plus live hangout

498
00:18:57,190 --> 00:18:55,039
about the maven mission to mars um it's

499
00:18:58,630 --> 00:18:57,200
scheduled to launch this coming monday

500
00:19:00,549 --> 00:18:58,640
if you're watching this hangout as it's

501
00:19:01,909 --> 00:19:00,559
archived continue to ask us questions

502
00:19:04,630 --> 00:19:01,919
using the hashtag

503
00:19:07,110 --> 00:19:04,640
maven on twitter or um at any of the

504
00:19:08,710 --> 00:19:07,120
nasa channels or the maven missions if

505
00:19:10,470 --> 00:19:08,720
you're watching it live now go ahead and

506
00:19:12,870 --> 00:19:10,480
ask some questions on youtube or in

507
00:19:14,230 --> 00:19:12,880
google plus or again using the hashtag

508
00:19:16,390 --> 00:19:14,240
maven

509
00:19:18,549 --> 00:19:16,400
many of the scientists joining us are

510
00:19:20,150 --> 00:19:18,559
traveling for the launch on

511
00:19:21,669 --> 00:19:20,160
on monday which is why we have some

512
00:19:23,830 --> 00:19:21,679
interesting wi-fi issues and things

513
00:19:26,950 --> 00:19:23,840

happening but we do have midi benda here

514
00:19:28,789 --> 00:19:26,960
manny benna here and he uh not only

515
00:19:31,590 --> 00:19:28,799
works with the maven mission but helped

516
00:19:34,390 --> 00:19:31,600
work with the mars science laboratory

517
00:19:36,230 --> 00:19:34,400
the msl that is up on curiosity medi can

518
00:19:37,669 --> 00:19:36,240
you talk a little bit about that and

519
00:19:39,590 --> 00:19:37,679
about how the maven science works

520
00:19:42,470 --> 00:19:39,600
together

521
00:19:44,630 --> 00:19:42,480
yeah so the currently the curiosity

522
00:19:45,750 --> 00:19:44,640
rover on the surface of mars is doing an

523
00:19:48,630 --> 00:19:45,760
amazing

524
00:19:49,990 --> 00:19:48,640
work on uh analyzing rocks but a lot of

525
00:19:53,830 --> 00:19:50,000
people don't know that

526
00:19:56,549 --> 00:19:53,840
msl the curiosity rover also regularly

527
00:19:59,029 --> 00:19:56,559
perform analysis on the atmosphere of

528
00:20:01,190 --> 00:19:59,039
mars so we have the rover

529
00:20:04,870 --> 00:20:01,200
looking at the composition of the lower

530
00:20:09,830 --> 00:20:06,390
on the surface of mars

531
00:20:12,710 --> 00:20:09,840
and we will have maven uh flying over

532
00:20:14,470 --> 00:20:12,720
and uh analyzing the upper atmosphere of

533
00:20:16,710 --> 00:20:14,480
mars so we

534
00:20:20,630 --> 00:20:16,720
allow us actually to do great science

535
00:20:22,789 --> 00:20:20,640
where we can uh constrain uh the the

536
00:20:24,070 --> 00:20:22,799
processes that affect in the atmosphere

537
00:20:27,430 --> 00:20:24,080
not only by looking at the upper

538
00:20:29,190 --> 00:20:27,440

atmosphere but also looking at uh at

539
00:20:30,549 --> 00:20:29,200
what's happening at the surface and when

540
00:20:33,190 --> 00:20:30,559
you merge the two

541
00:20:35,590 --> 00:20:33,200
science uh the two data sets from both

542
00:20:38,630 --> 00:20:35,600
missions together you can really put a

543
00:20:42,630 --> 00:20:38,640
very nice story of how the atmosphere

544
00:20:45,590 --> 00:20:42,640
evolves uh over geological times uh and

545
00:20:46,710 --> 00:20:45,600
how the atmosphere escaped and got lost

546
00:20:49,830 --> 00:20:46,720
to space

547
00:20:51,590 --> 00:20:49,840
for the last few billion years

548
00:20:54,310 --> 00:20:51,600
thank you so much we've got a question

549
00:20:57,590 --> 00:20:54,320
coming in from google plus and um it

550
00:20:59,669 --> 00:20:57,600
comes from james lunbat and jim wants

551
00:21:01,909 --> 00:20:59,679
james wants to know how do you learn to

552
00:21:03,990 --> 00:21:01,919
design a spacecraft instrument and are

553
00:21:06,070 --> 00:21:04,000
there graduate courses in space physics

554
00:21:07,590 --> 00:21:06,080
instrument design i'm going to throw

555
00:21:10,149 --> 00:21:07,600
that over to

556
00:21:12,070 --> 00:21:10,159
jasper to take that one

557
00:21:13,270 --> 00:21:12,080
because how how was if someone's

558
00:21:14,470 --> 00:21:13,280
watching this and what they really want

559
00:21:16,230 --> 00:21:14,480
to do is learn how to design a

560
00:21:17,430 --> 00:21:16,240
spacecraft instrument where do they go

561
00:21:19,830 --> 00:21:17,440
how did they sign up to get those

562
00:21:21,510 --> 00:21:19,840
classes what's your first step

563
00:21:23,510 --> 00:21:21,520

well that's a fantastic question and

564
00:21:25,110 --> 00:21:23,520
it's uh it's particularly apt for me

565
00:21:26,950 --> 00:21:25,120
because i think i'm the youngest and

566
00:21:29,350 --> 00:21:26,960
most inexperienced instrument lead on

567
00:21:30,789 --> 00:21:29,360
maven so uh i learned a lot actually in

568
00:21:33,830 --> 00:21:30,799
the course of this project kind of the

569
00:21:35,830 --> 00:21:33,840
school of hard knocks um my background

570
00:21:37,270 --> 00:21:35,840
personally i was a graduate student in

571
00:21:39,190 --> 00:21:37,280
the physics department here at uc

572
00:21:40,870 --> 00:21:39,200
berkeley and then i i started doing

573
00:21:42,789 --> 00:21:40,880
research here at the space sciences lab

574
00:21:45,190 --> 00:21:42,799
at uc berkeley which is uh

575
00:21:47,350 --> 00:21:45,200
one of the you know small handful of

576
00:21:49,590 --> 00:21:47,360
institutions uh across the country that

577
00:21:51,510 --> 00:21:49,600
has the capability to build these things

578
00:21:53,590 --> 00:21:51,520
and i think that's really ultimately the

579
00:21:54,870 --> 00:21:53,600
answer is that you have to go to a place

580
00:21:57,270 --> 00:21:54,880
that has the capability and the

581
00:21:59,029 --> 00:21:57,280
experience uh to have done these kind of

582
00:22:01,350 --> 00:21:59,039
uh of instruments and spacecraft

583
00:22:03,430 --> 00:22:01,360
missions before um because there's just

584
00:22:06,149 --> 00:22:03,440
uh really a lot of uh accumulated

585
00:22:08,470 --> 00:22:06,159
knowledge uh and best practices and

586
00:22:10,470 --> 00:22:08,480
engineering um you know not trade

587
00:22:12,310 --> 00:22:10,480
secrets necessarily but lore that's

588
00:22:14,070 --> 00:22:12,320

that's passed down from generation to

589
00:22:15,669 --> 00:22:14,080
generation of engineers and scientists

590
00:22:17,430 --> 00:22:15,679
that goes into designing these things

591
00:22:18,950 --> 00:22:17,440
and you know knowing how to build

592
00:22:21,110 --> 00:22:18,960
something that will actually survive the

593
00:22:23,669 --> 00:22:21,120
rigors of space where it can be

594
00:22:25,510 --> 00:22:23,679
you know 50 degrees below zero to 50

595
00:22:28,789 --> 00:22:25,520
degrees above zero in the blink of an

596
00:22:30,070 --> 00:22:28,799
eye where it's a hard hard vacuum

597
00:22:31,430 --> 00:22:30,080
building things that survive these

598
00:22:35,270 --> 00:22:31,440
things that

599
00:22:38,149 --> 00:22:36,950
thanks so much jasper i'm reminding

600
00:22:39,909 --> 00:22:38,159
everybody please keep your questions

601
00:22:41,909 --> 00:22:39,919
coming in use the hashtag maven or write

602
00:22:43,510 --> 00:22:41,919
it in the google plus hangout

603
00:22:46,870 --> 00:22:43,520
we're talking about the

604
00:22:48,950 --> 00:22:46,880
nasa's next mission to mars and we have

605
00:22:50,710 --> 00:22:48,960
a question here on twitter um

606
00:22:53,430 --> 00:22:50,720
from forgive me if i've mispronounced

607
00:22:54,950 --> 00:22:53,440
your name alazar tamrat and uh the

608
00:22:56,710 --> 00:22:54,960
question is why did you choose an

609
00:22:58,390 --> 00:22:56,720
eccentric orbit

610
00:23:00,390 --> 00:22:58,400
for the spacecraft jim could you comment

611
00:23:03,029 --> 00:23:00,400
a little bit why

612
00:23:04,390 --> 00:23:03,039
uh maven has the orbit it does

613
00:23:05,430 --> 00:23:04,400

sure um

614
00:23:07,909 --> 00:23:05,440
we uh

615
00:23:10,549 --> 00:23:07,919
the the idea is that well for one thing

616
00:23:13,110 --> 00:23:10,559
with the orbit that we have um

617
00:23:14,870 --> 00:23:13,120
um because the the the surface of the

618
00:23:16,950 --> 00:23:14,880
planet or the

619
00:23:18,710 --> 00:23:16,960
the planet is not a perfect sphere

620
00:23:22,149 --> 00:23:18,720
um the the

621
00:23:23,990 --> 00:23:22,159
eccentric orbit that we have will uh

622
00:23:26,390 --> 00:23:24,000
will move around will rotate around the

623
00:23:29,350 --> 00:23:26,400
planet so um

624
00:23:30,710 --> 00:23:29,360
uh when we're at our lower uh

625
00:23:31,750 --> 00:23:30,720
and the other reason we have it is

626
00:23:32,630 --> 00:23:31,760
because

627
00:23:34,390 --> 00:23:32,640
um

628
00:23:35,830 --> 00:23:34,400
at lower altitudes we are able to take

629
00:23:37,510 --> 00:23:35,840
the institute measurements and then we

630
00:23:39,750 --> 00:23:37,520
get higher up in altitude and we're able

631
00:23:44,230 --> 00:23:39,760
to look down on and see the entire

632
00:23:46,630 --> 00:23:44,240
planet uh from afar and take uh take um

633
00:23:47,590 --> 00:23:46,640
ultraviolet uh spectral images of the

634
00:23:49,909 --> 00:23:47,600
planet

635
00:23:51,430 --> 00:23:49,919
uh and with the um

636
00:23:52,789 --> 00:23:51,440
with the rotation of the orbit and the

637
00:23:56,070 --> 00:23:52,799
motion of the orbit around the planet

638
00:23:57,830 --> 00:23:56,080

we're able to do this uh across a large

639
00:24:00,549 --> 00:23:57,840
across almost the entire surface of the

640
00:24:02,830 --> 00:24:00,559
planet so we're able to to get a really

641
00:24:06,310 --> 00:24:02,840
good um sample

642
00:24:09,269 --> 00:24:06,320
of measurements throughout

643
00:24:11,110 --> 00:24:09,279
a wide range of longitudes and latitudes

644
00:24:13,750 --> 00:24:11,120
that's that's why we chose the orbit

645
00:24:16,950 --> 00:24:15,669
thanks so much jim um maddie i was

646
00:24:19,110 --> 00:24:16,960
wondering if you could talk a little bit

647
00:24:20,870 --> 00:24:19,120
more about the big question everybody

648
00:24:23,110 --> 00:24:20,880
wants to know is is

649
00:24:24,789 --> 00:24:23,120
is there life or was there life on mars

650
00:24:26,549 --> 00:24:24,799
what's the exact current state of

651
00:24:27,830 --> 00:24:26,559
science that what we know

652
00:24:32,070 --> 00:24:27,840
of

653
00:24:35,669 --> 00:24:32,080
organism on mars

654
00:24:40,789 --> 00:24:35,679
well it's it's really a quite uh

655
00:24:43,350 --> 00:24:42,070
nasa have been

656
00:24:44,789 --> 00:24:43,360
in the

657
00:24:47,110 --> 00:24:44,799
international science scientific

658
00:24:48,870 --> 00:24:47,120
community been trying to answer this

659
00:24:50,390 --> 00:24:48,880
question for the last i would say at

660
00:24:52,390 --> 00:24:50,400
least 50 years

661
00:24:54,710 --> 00:24:52,400
and uh

662
00:24:56,710 --> 00:24:54,720
we found out that the best way

663
00:24:59,110 --> 00:24:56,720

to answer this question is not actually

664
00:25:01,430 --> 00:24:59,120
to go and look for life it's but

665
00:25:03,350 --> 00:25:01,440
actually to go and look for

666
00:25:05,909 --> 00:25:03,360
uh uh

667
00:25:07,990 --> 00:25:05,919
precursors of life things that makes

668
00:25:09,590 --> 00:25:08,000
life possible what we call makes the

669
00:25:12,230 --> 00:25:09,600
planet habitable

670
00:25:14,149 --> 00:25:12,240
um and that's uh what nasa has been

671
00:25:16,710 --> 00:25:14,159
doing with all the missions since the

672
00:25:19,750 --> 00:25:16,720
mars uh the viking initially the viking

673
00:25:24,149 --> 00:25:19,760
missions in the 1970s that the mars

674
00:25:27,269 --> 00:25:24,159
uh uh pathfinder mission and then uh

675
00:25:30,870 --> 00:25:27,279
coming up to msl and uh that's what

676
00:25:34,630 --> 00:25:30,880
we're trying to do with uh with maven

677
00:25:37,190 --> 00:25:34,640
and the 2020 rover it's actually not try

678
00:25:40,149 --> 00:25:37,200
to directly tackle the question of is

679
00:25:43,590 --> 00:25:40,159
there actually life on mars but actually

680
00:25:46,870 --> 00:25:43,600
look at the at what makes life thrive uh

681
00:25:49,269 --> 00:25:46,880
um in the um and and are there a

682
00:25:50,950 --> 00:25:49,279
building uh building blocks on the on

683
00:25:52,870 --> 00:25:50,960
the surface in the atmosphere that

684
00:25:54,950 --> 00:25:52,880
allows life to emerge or that allowed

685
00:25:59,430 --> 00:25:54,960
life to

686
00:26:02,870 --> 00:25:59,440
years ago so

687
00:26:04,390 --> 00:26:02,880
it's really hard to uh tell uh directly

688
00:26:06,149 --> 00:26:04,400

and answer the question whether there is

689
00:26:09,110 --> 00:26:06,159
today life on mars but what we know

690
00:26:10,710 --> 00:26:09,120
today from the latest msl measurements

691
00:26:12,710 --> 00:26:10,720
is that

692
00:26:19,669 --> 00:26:12,720
there are

693
00:26:23,830 --> 00:26:21,750
allow life to exist

694
00:26:26,789 --> 00:26:23,840
there are other missions like

695
00:26:30,470 --> 00:26:26,799
the european mission mars express and

696
00:26:35,110 --> 00:26:30,480
looking for been looking for methane um

697
00:26:38,390 --> 00:26:35,120
this is another way to look for signs of

698
00:26:40,870 --> 00:26:38,400
present or past life but we really

699
00:26:42,789 --> 00:26:40,880
have not designed actually a mission

700
00:26:45,029 --> 00:26:42,799
that goes directly and target and try to

701
00:26:47,269 --> 00:26:45,039
find either living or remaining uh

702
00:26:49,510 --> 00:26:47,279
remains of uh past life on mars it's

703
00:26:51,669 --> 00:26:49,520
really really hard to do and the best

704
00:26:55,590 --> 00:26:51,679
way is just to look for these

705
00:26:59,110 --> 00:26:56,950
thank you so much maddie i just want to

706
00:27:00,870 --> 00:26:59,120
remind everybody that was medina he is

707
00:27:03,669 --> 00:27:00,880
the instrument scientist for the neutral

708
00:27:05,430 --> 00:27:03,679
gas and ion mass spectrometer he's from

709
00:27:08,470 --> 00:27:05,440
usually here at nasa goddard but he's on

710
00:27:10,390 --> 00:27:08,480
travel for the uh launch hopeful launch

711
00:27:12,710 --> 00:27:10,400
of maven this coming monday from cape

712
00:27:15,269 --> 00:27:12,720
canaveral also joining us for this han

713
00:27:17,430 --> 00:27:15,279

for this nasa hangout is jim morrissey

714
00:27:19,590 --> 00:27:17,440
he's the instrument system manager he's

715
00:27:22,230 --> 00:27:19,600
also based usually here at nasa goddard

716
00:27:23,990 --> 00:27:22,240
and then we also have jasper halicus he

717
00:27:26,470 --> 00:27:24,000
is the instrument leader for the solar

718
00:27:27,830 --> 00:27:26,480
wind ion analyzer and he's joining us

719
00:27:30,310 --> 00:27:27,840
from the university of

720
00:27:32,310 --> 00:27:30,320
california out at berkeley i'm aries

721
00:27:33,830 --> 00:27:32,320
keck here at nasa goddard and if you

722
00:27:35,590 --> 00:27:33,840
have questions for any of these

723
00:27:37,830 --> 00:27:35,600
scientists about the upcoming maven

724
00:27:39,190 --> 00:27:37,840
mission go ahead and give us a ring um

725
00:27:40,389 --> 00:27:39,200
we do have a few questions that have

726
00:27:42,789 --> 00:27:40,399
come through on youtube i'm going to

727
00:27:43,990 --> 00:27:42,799
summarize them all into one question

728
00:27:45,750 --> 00:27:44,000
there's questions that can be live

729
00:27:48,149 --> 00:27:45,760
stream it who's tweeting from the from

730
00:27:49,590 --> 00:27:48,159
the mission all that stuff i'm wondering

731
00:27:51,430 --> 00:27:49,600
and i'm going to throw this question to

732
00:27:53,350 --> 00:27:51,440
jim morrissey

733
00:27:55,510 --> 00:27:53,360
when it comes to getting the data in is

734
00:27:58,070 --> 00:27:55,520
the data publicly available can people

735
00:27:59,990 --> 00:27:58,080
dial in and see what maven has been

736
00:28:01,669 --> 00:28:00,000
sending us are they going to have any

737
00:28:03,510 --> 00:28:01,679
kind of visuals i know a lot of people

738
00:28:07,990 --> 00:28:03,520

like myself sat up really late that

739
00:28:12,310 --> 00:28:09,669
an open channel of what it's going to

740
00:28:14,310 --> 00:28:12,320
send back that people can see

741
00:28:16,870 --> 00:28:14,320
oh yeah that's that's a good question

742
00:28:19,269 --> 00:28:16,880
one of the things um about maven is that

743
00:28:21,110 --> 00:28:19,279
we don't actually take any um we don't

744
00:28:23,029 --> 00:28:21,120
take any photographs because that

745
00:28:24,870 --> 00:28:23,039
doesn't we we decided we didn't really

746
00:28:26,470 --> 00:28:24,880
need any choreographs and and all the

747
00:28:28,789 --> 00:28:26,480
great photographs from

748
00:28:30,789 --> 00:28:28,799
uh from the mars reconnaissance orbiter

749
00:28:33,590 --> 00:28:30,799
and odyssey and other and previous

750
00:28:35,510 --> 00:28:33,600
missions are out there and um

751
00:28:37,590 --> 00:28:35,520
we decided not to go there what we're

752
00:28:38,710 --> 00:28:37,600
doing is is uh

753
00:28:40,630 --> 00:28:38,720
is

754
00:28:42,630 --> 00:28:40,640
beside so

755
00:28:45,110 --> 00:28:42,640
the instruments that we have take

756
00:28:47,990 --> 00:28:45,120
science science data uh and

757
00:28:48,789 --> 00:28:48,000
the data doesn't always lend itself to

758
00:28:51,669 --> 00:28:48,799
um

759
00:28:54,310 --> 00:28:51,679
to a lot of uh to a lot of visuals uh

760
00:28:57,350 --> 00:28:54,320
but that being said um

761
00:28:59,590 --> 00:28:57,360
as things occur um and i'm going to

762
00:29:01,110 --> 00:28:59,600
throw this back to midi and jasper

763
00:29:03,029 --> 00:29:01,120

because they can talk more about this

764
00:29:06,310 --> 00:29:03,039
but you know there is a process where

765
00:29:08,149 --> 00:29:06,320
the information that we we take is is is

766
00:29:09,750 --> 00:29:08,159
disseminated out into the community so

767
00:29:12,870 --> 00:29:09,760
that people can see it

768
00:29:14,789 --> 00:29:12,880
um and then there's also the um

769
00:29:17,110 --> 00:29:14,799
you know the nasa websites will continue

770
00:29:19,029 --> 00:29:17,120
to update people on the progress of the

771
00:29:21,990 --> 00:29:19,039
mission but i want to have those guys

772
00:29:23,590 --> 00:29:22,000
answer that a little bit more too

773
00:29:25,029 --> 00:29:23,600
that sounds great jasper take it away

774
00:29:26,470 --> 00:29:25,039
when it comes to what's going to come

775
00:29:28,149 --> 00:29:26,480
down for the data for the instrument

776
00:29:29,510 --> 00:29:28,159
that you are involved in and how people

777
00:29:31,830 --> 00:29:29,520
or how other scientists are going to be

778
00:29:34,630 --> 00:29:31,840
able to access that and use it

779
00:29:37,110 --> 00:29:34,640
yeah definitely um let me break it down

780
00:29:38,630 --> 00:29:37,120
into a few portions because uh of course

781
00:29:39,590 --> 00:29:38,640
it takes us a while to actually get to

782
00:29:41,510 --> 00:29:39,600
mars

783
00:29:43,430 --> 00:29:41,520
we turn on the instruments um very

784
00:29:44,950 --> 00:29:43,440
shortly after we launch uh you know

785
00:29:46,470 --> 00:29:44,960
within a couple of weeks after we launch

786
00:29:47,830 --> 00:29:46,480
we turn on the instruments and we check

787
00:29:49,029 --> 00:29:47,840
them out and make sure that everything

788
00:29:51,029 --> 00:29:49,039

is working in the in the real

789
00:29:52,789 --> 00:29:51,039
environment of space which we've tried

790
00:29:54,630 --> 00:29:52,799
to simulate on earth as well as we can

791
00:29:56,310 --> 00:29:54,640
but which of course we can never

792
00:29:57,750 --> 00:29:56,320
simulate perfectly

793
00:29:59,430 --> 00:29:57,760
so that's going to be a really exciting

794
00:30:01,269 --> 00:29:59,440
time turning on the instruments making

795
00:30:02,950 --> 00:30:01,279
sure that they work

796
00:30:04,710 --> 00:30:02,960
most of the instruments however are not

797
00:30:06,710 --> 00:30:04,720
going to be operating full-time

798
00:30:09,029 --> 00:30:06,720
throughout crews or at least not in real

799
00:30:10,950 --> 00:30:09,039
their real mars mode some instruments

800
00:30:12,389 --> 00:30:10,960
are on booms that are still stowed other

801
00:30:13,909 --> 00:30:12,399
instruments um

802
00:30:16,070 --> 00:30:13,919
don't want to put all those operating

803
00:30:18,070 --> 00:30:16,080
hours on their instruments during cruise

804
00:30:19,590 --> 00:30:18,080
i fall into the ladder camp i want to

805
00:30:21,190 --> 00:30:19,600
make sure that my detectors are nice and

806
00:30:23,590 --> 00:30:21,200
pristine by the time i actually get to

807
00:30:25,110 --> 00:30:23,600
mars so most of the instruments are not

808
00:30:27,430 --> 00:30:25,120
really going to be in full operating

809
00:30:28,950 --> 00:30:27,440
mode until we get to mars

810
00:30:30,310 --> 00:30:28,960
also there's going to be unique things

811
00:30:32,230 --> 00:30:30,320
about the mars environment that we're

812
00:30:34,310 --> 00:30:32,240
going to have to learn once we get there

813
00:30:35,830 --> 00:30:34,320

so when we actually get into mars orbit

814
00:30:37,830 --> 00:30:35,840
there's going to be a very intense

815
00:30:39,110 --> 00:30:37,840
period of checking out the instruments

816
00:30:40,950 --> 00:30:39,120
making sure that they're very well

817
00:30:42,630 --> 00:30:40,960
calibrated making sure that we

818
00:30:44,789 --> 00:30:42,640
understand all the science data that

819
00:30:46,789 --> 00:30:44,799
we're looking at before we consider

820
00:30:48,710 --> 00:30:46,799
releasing anything to the public

821
00:30:50,630 --> 00:30:48,720
so i think the the soonest that you're

822
00:30:52,149 --> 00:30:50,640
going to see a large amount of data

823
00:30:53,990 --> 00:30:52,159
released to the public

824
00:30:56,389 --> 00:30:54,000
is not until after we actually get to

825
00:30:57,990 --> 00:30:56,399
mars and probably not for you know at

826
00:30:59,430 --> 00:30:58,000
least a month or two after we get to

827
00:31:00,870 --> 00:30:59,440
mars until we're really sure that we

828
00:31:02,630 --> 00:31:00,880
understand what we're doing with these

829
00:31:04,070 --> 00:31:02,640
instruments

830
00:31:06,149 --> 00:31:04,080
after that time we're going to be

831
00:31:08,789 --> 00:31:06,159
releasing data to the public absolutely

832
00:31:11,029 --> 00:31:08,799
as fast as we can um we're contractually

833
00:31:13,190 --> 00:31:11,039
required to get it out within six months

834
00:31:14,870 --> 00:31:13,200
of getting to mars but um you know we

835
00:31:16,149 --> 00:31:14,880
certainly would like to get it out even

836
00:31:18,630 --> 00:31:16,159
faster than that if we can get

837
00:31:20,710 --> 00:31:18,640
everything really understood more

838
00:31:22,549 --> 00:31:20,720

quickly and all of the data is going to

839
00:31:25,350 --> 00:31:22,559
be available to the public it'll all be

840
00:31:27,029 --> 00:31:25,360
on the planetary data system and we

841
00:31:28,549 --> 00:31:27,039
absolutely hope the whole scientific

842
00:31:30,950 --> 00:31:28,559
community is going to look at this data

843
00:31:32,789 --> 00:31:30,960
set because uh you know our experience

844
00:31:34,470 --> 00:31:32,799
with these space missions is that the

845
00:31:36,389 --> 00:31:34,480
volume of data that you get back is such

846
00:31:38,070 --> 00:31:36,399
that uh you just can't have too many

847
00:31:44,470 --> 00:31:38,080
people working on it and

848
00:31:48,789 --> 00:31:46,310
thanks so much jasper um we have a

849
00:31:50,950 --> 00:31:48,799
question that has come in

850
00:31:53,669 --> 00:31:50,960
looks like it's from yes from youtube um

851
00:31:56,070 --> 00:31:53,679
a question from youtube that uh asked

852
00:31:58,950 --> 00:31:56,080
about those smog magnetic fields that

853
00:32:01,590 --> 00:31:58,960
are currently on mars the uh the person

854
00:32:02,710 --> 00:32:01,600
who asked want to know if you could

855
00:32:05,590 --> 00:32:02,720
build a

856
00:32:07,430 --> 00:32:05,600
station on the planet mars

857
00:32:09,430 --> 00:32:07,440
within that small magnetic field would

858
00:32:11,430 --> 00:32:09,440
it protect a space station could you use

859
00:32:13,430 --> 00:32:11,440
those little umbrella areas that we

860
00:32:15,750 --> 00:32:13,440
surmise are coming out from mars when it

861
00:32:17,750 --> 00:32:15,760
comes to its magnetic field and use that

862
00:32:20,310 --> 00:32:17,760
to build human settlements that would be

863
00:32:21,830 --> 00:32:20,320

protected by that magnetic field kind of

864
00:32:24,470 --> 00:32:21,840
in the same way how the entire earth is

865
00:32:26,230 --> 00:32:24,480
protected by a magnetic field here

866
00:32:27,509 --> 00:32:26,240
jasper i don't know if you can answer

867
00:32:29,269 --> 00:32:27,519
that i know it's asking take a lot of

868
00:32:31,190 --> 00:32:29,279
scientific leaps there about putting

869
00:32:33,430 --> 00:32:31,200
humans on mars building stuff on mars

870
00:32:36,389 --> 00:32:33,440
about magnetic fields so take it away

871
00:32:38,549 --> 00:32:36,399
sure absolutely um the answer is that

872
00:32:40,389 --> 00:32:38,559
those magnetic fields are not quite

873
00:32:42,149 --> 00:32:40,399
strong enough to really build a base

874
00:32:45,190 --> 00:32:42,159
under and consider yourself really

875
00:32:47,029 --> 00:32:45,200
protected from a lot of radiation um the

876
00:32:49,350 --> 00:32:47,039
the radiation that's really damaging to

877
00:32:51,750 --> 00:32:49,360
humans is actually at a very high energy

878
00:32:53,750 --> 00:32:51,760
you know it's up in the mini uh mega

879
00:32:55,750 --> 00:32:53,760
electron volts or giga electron volts to

880
00:32:57,509 --> 00:32:55,760
use the technical units

881
00:32:59,430 --> 00:32:57,519
never mind about how big that really is

882
00:33:01,029 --> 00:32:59,440
it's really big it's big enough that

883
00:33:03,590 --> 00:33:01,039
it's hard to deflect those particles

884
00:33:06,310 --> 00:33:03,600
with a magnetic field um now all that

885
00:33:07,669 --> 00:33:06,320
being said mars actually has a pretty

886
00:33:09,110 --> 00:33:07,679
decent atmosphere you know we don't

887
00:33:11,269 --> 00:33:09,120
think of mars as having much of an

888
00:33:13,110 --> 00:33:11,279

atmosphere but it does have enough of an

889
00:33:14,870 --> 00:33:13,120
atmosphere to provide some shielding

890
00:33:16,310 --> 00:33:14,880
against the nasty radiation that's out

891
00:33:18,070 --> 00:33:16,320
there so

892
00:33:19,750 --> 00:33:18,080
i wouldn't completely discount building

893
00:33:21,750 --> 00:33:19,760
a base on mars because of issues with

894
00:33:23,190 --> 00:33:21,760
radiation but i don't think you would

895
00:33:27,350 --> 00:33:23,200
gain a whole lot by being in these

896
00:33:31,029 --> 00:33:29,590
thank you so much for that jasper thanks

897
00:33:32,549 --> 00:33:31,039
so much for everyone watching as well

898
00:33:34,630 --> 00:33:32,559
keep those questions coming in both

899
00:33:37,669 --> 00:33:34,640
using the hashtag on twitter with maven

900
00:33:40,070 --> 00:33:37,679
and then also in google plus um james

901
00:33:42,470 --> 00:33:40,080
lumbatblad on google plus has a what he

902
00:33:44,950 --> 00:33:42,480
calls another geek question he says what

903
00:33:48,230 --> 00:33:44,960
do you use to control your instrument is

904
00:33:49,830 --> 00:33:48,240
it a microcontroller is it fp gas i'm

905
00:33:51,669 --> 00:33:49,840
going to add my own

906
00:33:53,909 --> 00:33:51,679
less geeky question to that is it a

907
00:33:55,430 --> 00:33:53,919
joystick is it a computer can you do it

908
00:33:58,070 --> 00:33:55,440
from an ipad like how do you actually

909
00:34:00,950 --> 00:33:58,080
control your instrument jasper

910
00:34:04,389 --> 00:34:00,960
yeah so um i i think what that question

911
00:34:06,230 --> 00:34:04,399
was referring to is an fpga which is a

912
00:34:08,869 --> 00:34:06,240
little little basically a little

913
00:34:11,589 --> 00:34:08,879

processor on a chip um and the answer is

914
00:34:13,669 --> 00:34:11,599
yes there are fpgas in the instrument um

915
00:34:15,829 --> 00:34:13,679
there's also uh for the particle and

916
00:34:18,310 --> 00:34:15,839
fields instruments at least there's a uh

917
00:34:21,349 --> 00:34:18,320
a data processing unit um that talks to

918
00:34:23,270 --> 00:34:21,359
all of the instruments and helps operate

919
00:34:25,270 --> 00:34:23,280
them and command them and process the

920
00:34:27,109 --> 00:34:25,280
data from them and that actually has a

921
00:34:29,669 --> 00:34:27,119
little microprocessor

922
00:34:32,310 --> 00:34:29,679
that runs on an fpga but actually the

923
00:34:33,829 --> 00:34:32,320
the software is written in c so it's

924
00:34:36,230 --> 00:34:33,839
something that should be very familiar

925
00:34:38,550 --> 00:34:36,240
to any computer science geeks out there

926
00:34:40,389 --> 00:34:38,560
and it really is it's a little computer

927
00:34:42,149 --> 00:34:40,399
that you know talks to the spacecraft

928
00:34:45,030 --> 00:34:42,159
talks to all the instruments sends

929
00:34:46,550 --> 00:34:45,040
commands gets the data back um it's not

930
00:34:48,310 --> 00:34:46,560
a super powerful computer you know it's

931
00:34:50,230 --> 00:34:48,320
probably not as even as powerful as your

932
00:34:53,030 --> 00:34:50,240
laptop but uh it's enough to get the job

933
00:34:57,990 --> 00:34:55,109
thank you so much jasper and a follow-up

934
00:34:59,349 --> 00:34:58,000
on that for uh maddie i'm wondering uh

935
00:35:01,349 --> 00:34:59,359
and we've got a few people asking this

936
00:35:03,430 --> 00:35:01,359
as well we know that

937
00:35:04,790 --> 00:35:03,440
a lot of the instruments and things that

938
00:35:05,750 --> 00:35:04,800

have been developed for these space

939
00:35:07,030 --> 00:35:05,760
missions

940
00:35:10,470 --> 00:35:07,040
their

941
00:35:12,230 --> 00:35:10,480
design was begun years ago and now it's

942
00:35:13,990 --> 00:35:12,240
launching now i wonder if you could talk

943
00:35:15,750 --> 00:35:14,000
a little about how long it took to get

944
00:35:17,589 --> 00:35:15,760
the instruments to the point of launch

945
00:35:19,670 --> 00:35:17,599
and then does that mean that they're

946
00:35:21,190 --> 00:35:19,680
they're launched with technology that

947
00:35:23,190 --> 00:35:21,200
was actually cutting edge two or three

948
00:35:25,510 --> 00:35:23,200
years ago or are you able to incorporate

949
00:35:27,430 --> 00:35:25,520
brand new technology right before

950
00:35:30,390 --> 00:35:27,440
launching the instruments to mars

951
00:35:32,069 --> 00:35:30,400
a very good question actually most of

952
00:35:35,190 --> 00:35:32,079
the instruments we built

953
00:35:37,030 --> 00:35:35,200
uh we we built for uh space applications

954
00:35:39,270 --> 00:35:37,040
have some level of heritage to them we

955
00:35:41,910 --> 00:35:39,280
don't come up uh we don't build an

956
00:35:43,990 --> 00:35:41,920
instrument from scratch as a concept

957
00:35:46,230 --> 00:35:44,000
in the three year three or four years

958
00:35:48,069 --> 00:35:46,240
that it takes to uh to develop a mission

959
00:35:50,870 --> 00:35:48,079
actually when the mission is proposed

960
00:35:52,470 --> 00:35:50,880
initially we propose with it

961
00:35:55,030 --> 00:35:52,480
an instrument package that has some

962
00:35:56,829 --> 00:35:55,040
level of heritage and and it has some

963
00:35:57,990 --> 00:35:56,839

level of

964
00:35:59,430 --> 00:35:58,000
of uh

965
00:36:02,470 --> 00:35:59,440
uh uh

966
00:36:04,950 --> 00:36:02,480
technology uh maturation in it that we

967
00:36:06,630 --> 00:36:04,960
can bring to bear in this in the actual

968
00:36:09,589 --> 00:36:06,640
mission we're proposing in the case for

969
00:36:11,670 --> 00:36:09,599
example for uh the ingham's instrument

970
00:36:13,829 --> 00:36:11,680
it had the instrument has a very high

971
00:36:14,870 --> 00:36:13,839
heritage from past missions we have an

972
00:36:16,310 --> 00:36:14,880
analog

973
00:36:21,510 --> 00:36:16,320
uh

974
00:36:23,990 --> 00:36:21,520
flying right now on cassini the inmas

975
00:36:26,550 --> 00:36:24,000
mass spectrometer it's the grandfather

976
00:36:29,589 --> 00:36:26,560
of the ingham's instrument and then even

977
00:36:32,390 --> 00:36:29,599
prior to that we have uh uh

978
00:36:35,910 --> 00:36:32,400
uh in mms have a precursor which is the

979
00:36:38,470 --> 00:36:35,920
the mass spectrometer that flew on um on

980
00:36:40,630 --> 00:36:38,480
a pioneer venus orbiter so what we do is

981
00:36:42,310 --> 00:36:40,640
basically between missions is we take an

982
00:36:43,109 --> 00:36:42,320
instrument that works well in space and

983
00:36:45,030 --> 00:36:43,119
we

984
00:36:48,390 --> 00:36:45,040
do little increment

985
00:36:49,750 --> 00:36:48,400
uh incremental advance advances in in

986
00:36:51,510 --> 00:36:49,760
both the technology and the way we

987
00:36:53,750 --> 00:36:51,520
operate the instrument and then we

988
00:36:56,069 --> 00:36:53,760

propose that for the following mission

989
00:36:59,270 --> 00:36:56,079
that allow us to keep to have the

990
00:37:01,030 --> 00:36:59,280
confidence that we actually know uh

991
00:37:03,829 --> 00:37:01,040
making too big of a jumps in the

992
00:37:04,950 --> 00:37:03,839
technology that makes it unreliable

993
00:37:06,470 --> 00:37:04,960
um

994
00:37:08,630 --> 00:37:06,480
the the

995
00:37:10,470 --> 00:37:08,640
the level of uh

996
00:37:13,589 --> 00:37:10,480
of development we do for for a mission

997
00:37:16,230 --> 00:37:13,599
like maven uh it's actually not that big

998
00:37:17,589 --> 00:37:16,240
we take uh we take the the the heritage

999
00:37:19,910 --> 00:37:17,599
sensor we have or the heritage

1000
00:37:22,550 --> 00:37:19,920
instrument we have and we look what the

1001
00:37:25,109 --> 00:37:22,560
mission the pic the peculiar thing that

1002
00:37:27,109 --> 00:37:25,119
the mission need and we implement those

1003
00:37:29,990 --> 00:37:27,119
on on the new version of the instrument

1004
00:37:32,790 --> 00:37:30,000
but ultimately we're not really jumping

1005
00:37:34,870 --> 00:37:32,800
into a new development

1006
00:37:36,870 --> 00:37:34,880
thank you so much maddie um i have a

1007
00:37:39,270 --> 00:37:36,880
question to come in for jim i think is

1008
00:37:41,589 --> 00:37:39,280
ideal for jim uh and the question is if

1009
00:37:43,190 --> 00:37:41,599
you don't mind uh again i described that

1010
00:37:44,390 --> 00:37:43,200
we usually have a bunch of visuals and

1011
00:37:45,750 --> 00:37:44,400
things that we play in these hangouts

1012
00:37:48,230 --> 00:37:45,760
we're having some tech issues with

1013
00:37:49,829 --> 00:37:48,240

everybody all being all over for this as

1014
00:37:52,150 --> 00:37:49,839
everyone travels for this so there's a

1015
00:37:53,910 --> 00:37:52,160
lot of different animations and visuals

1016
00:37:56,630 --> 00:37:53,920
and pictures of the spacecraft and how

1017
00:37:58,790 --> 00:37:56,640
it gets there up at nasa.gov

1018
00:38:01,270 --> 00:37:58,800
maven um jim for the people watching

1019
00:38:04,230 --> 00:38:01,280
this hangout though can you describe how

1020
00:38:05,829 --> 00:38:04,240
large maven actually is does it have

1021
00:38:07,589 --> 00:38:05,839
solar wings like so many of the other

1022
00:38:09,510 --> 00:38:07,599
orbiting spacecraft we used to see does

1023
00:38:11,670 --> 00:38:09,520
it have anything different on it what

1024
00:38:13,190 --> 00:38:11,680
does it sort of look like and how big is

1025
00:38:15,430 --> 00:38:13,200
it

1026
00:38:17,510 --> 00:38:15,440
oh okay that's a great that's a great

1027
00:38:18,950 --> 00:38:17,520
great question and uh i'd also encourage

1028
00:38:21,190 --> 00:38:18,960
folks to look on the nasa site because

1029
00:38:23,670 --> 00:38:21,200
there is a lot of good stuff on there uh

1030
00:38:25,750 --> 00:38:23,680
and then also you um you know you can

1031
00:38:28,069 --> 00:38:25,760
see the spacecraft displaying on the

1032
00:38:29,670 --> 00:38:28,079
screens behind you there aries so

1033
00:38:33,030 --> 00:38:29,680
you get an idea of what the spacecraft

1034
00:38:33,910 --> 00:38:33,040
looks like and i'll say that when the um

1035
00:38:36,470 --> 00:38:33,920
uh

1036
00:38:37,910 --> 00:38:36,480
when the arrays are deployed the

1037
00:38:40,390 --> 00:38:37,920
spacecraft from

1038
00:38:42,230 --> 00:38:40,400

from tip of from the tip of one array to

1039
00:38:44,470 --> 00:38:42,240
the next is about the length of a school

1040
00:38:48,470 --> 00:38:44,480
bus of a large school you know standard

1041
00:38:50,150 --> 00:38:48,480
school bus that we see um the uh and

1042
00:38:52,230 --> 00:38:50,160
the spacecraft as a whole weighs about

1043
00:38:54,390 --> 00:38:52,240
as much as a uh a little bit more than

1044
00:38:56,150 --> 00:38:54,400
an suv

1045
00:38:58,390 --> 00:38:56,160
so it's it's a large spacecraft it's not

1046
00:38:59,829 --> 00:38:58,400
the largest out there but it's uh uh

1047
00:39:02,870 --> 00:38:59,839
it's it's a pretty good size especially

1048
00:39:05,190 --> 00:39:02,880
once it was a razor ride

1049
00:39:06,790 --> 00:39:05,200
and jim can you tell us a little bit

1050
00:39:08,950 --> 00:39:06,800
about sorry there we go there was the

1051
00:39:10,630 --> 00:39:08,960
reverb um tell us a little bit about how

1052
00:39:11,990 --> 00:39:10,640
we're getting maven to mars you're

1053
00:39:13,430 --> 00:39:12,000
saying it's the size of a small school

1054
00:39:15,589 --> 00:39:13,440
bus what kind of rocket is it going to

1055
00:39:17,349 --> 00:39:15,599
be attached to i imagine of course it's

1056
00:39:18,950 --> 00:39:17,359
probably folded up in some sort of nose

1057
00:39:20,710 --> 00:39:18,960
cone is that part of the 10 months it

1058
00:39:22,230 --> 00:39:20,720
takes to get there does it unfurl right

1059
00:39:24,870 --> 00:39:22,240
away or does it unfor a while it's on

1060
00:39:28,710 --> 00:39:26,950
sure the um you can see if you look at

1061
00:39:30,790 --> 00:39:28,720
the the pictures of the spacecraft there

1062
00:39:32,550 --> 00:39:30,800
you can see that the arrays have hinges

1063
00:39:34,069 --> 00:39:32,560

in them so

1064
00:39:35,670 --> 00:39:34,079
right now

1065
00:39:36,790 --> 00:39:35,680
spacecraft is here at the candy space

1066
00:39:38,230 --> 00:39:36,800
center

1067
00:39:41,349 --> 00:39:38,240
and it's folded up and it basically

1068
00:39:44,230 --> 00:39:41,359
looks like a box with the arrays

1069
00:39:45,670 --> 00:39:44,240
folded up against the sides and it is it

1070
00:39:48,310 --> 00:39:45,680
is inside

1071
00:39:50,150 --> 00:39:48,320
our launch vehicle is uh is an atlas v

1072
00:39:52,069 --> 00:39:50,160
uh 401

1073
00:39:53,750 --> 00:39:52,079
uh vehicle which

1074
00:39:55,190 --> 00:39:53,760
folks can look up online and see

1075
00:39:57,589 --> 00:39:55,200
pictures of

1076
00:39:59,750 --> 00:39:57,599
it's a two-stage rocket

1077
00:40:02,550 --> 00:39:59,760
it has a booster stage that gets us

1078
00:40:04,150 --> 00:40:02,560
um up and up into uh earth orbit and

1079
00:40:05,910 --> 00:40:04,160
then has a second stage which is called

1080
00:40:09,270 --> 00:40:05,920
the centaur

1081
00:40:11,750 --> 00:40:09,280
which carries the spacecraft

1082
00:40:14,230 --> 00:40:11,760
this and uh performs a second burn to

1083
00:40:16,790 --> 00:40:14,240
get us on a trajectory of out to mars

1084
00:40:19,430 --> 00:40:16,800
um as soon as that burn is complete

1085
00:40:20,950 --> 00:40:19,440
the spacecraft is uh separates from the

1086
00:40:23,349 --> 00:40:20,960
vehicle and is

1087
00:40:28,550 --> 00:40:26,069
on its own the uh very quickly after

1088
00:40:30,150 --> 00:40:28,560

that separation however the arrays do

1089
00:40:31,750 --> 00:40:30,160
deploy so that we're able to get the

1090
00:40:34,790 --> 00:40:31,760
solar energy we need to charge our

1091
00:40:37,109 --> 00:40:34,800
batteries um and then we're in our uh in

1092
00:40:39,109 --> 00:40:37,119
our cruise configuration and and on our

1093
00:40:40,630 --> 00:40:39,119
way to mars on that trajectory

1094
00:40:42,550 --> 00:40:40,640
um

1095
00:40:45,190 --> 00:40:42,560
and then uh you know ten months later

1096
00:40:49,910 --> 00:40:47,510
thanks so much jim um so maddie i wonder

1097
00:40:50,950 --> 00:40:49,920
if you could talk a little bit about

1098
00:40:53,109 --> 00:40:50,960
we've talked about all the different

1099
00:40:54,630 --> 00:40:53,119
instruments that are aboard maven

1100
00:40:55,750 --> 00:40:54,640
what kind of power requirements do they

1101
00:40:57,750 --> 00:40:55,760
have do you send them up through with

1102
00:40:59,829 --> 00:40:57,760
giant batteries do you rely on the solar

1103
00:41:03,349 --> 00:40:59,839
array keeping them charged how do you

1104
00:41:06,870 --> 00:41:03,359
keep them all powered up the entire time

1105
00:41:08,790 --> 00:41:06,880
so of all the instruments that usually

1106
00:41:10,950 --> 00:41:08,800
are qualified to fly in space one of the

1107
00:41:12,550 --> 00:41:10,960
constraints we have on them is to

1108
00:41:14,470 --> 00:41:12,560
consume the least amount of power

1109
00:41:16,550 --> 00:41:14,480
possible

1110
00:41:19,030 --> 00:41:16,560
whether the spacecraft have solar panels

1111
00:41:23,589 --> 00:41:19,040
or use

1112
00:41:26,390 --> 00:41:23,599
uh radio uh isotopic generator um

1113
00:41:28,550 --> 00:41:26,400

like the msr rover we still need to

1114
00:41:30,230 --> 00:41:28,560
conserve energy these uh these devices

1115
00:41:34,470 --> 00:41:30,240
don't produce uh

1116
00:41:36,390 --> 00:41:34,480
a big uh uh an infinite amount of energy

1117
00:41:39,510 --> 00:41:36,400
i think for the maven spacecraft we have

1118
00:41:42,390 --> 00:41:39,520
about 1000 watt hours uh 1000 watt

1119
00:41:44,150 --> 00:41:42,400
available uh at any time

1120
00:41:48,230 --> 00:41:44,160
for all the instrumentation and the

1121
00:41:51,829 --> 00:41:48,240
spacecraft itself so um we decide we try

1122
00:41:53,990 --> 00:41:51,839
to uh design these instrument with uh

1123
00:41:56,950 --> 00:41:54,000
the the consumption the energy

1124
00:42:00,150 --> 00:41:56,960
consumption in mind for example for the

1125
00:42:01,910 --> 00:42:00,160
the actually one of the most consuming

1126
00:42:04,390 --> 00:42:01,920
instrument on the spacecraft is the

1127
00:42:08,309 --> 00:42:04,400
ingame's mass spectrometer we consume

1128
00:42:09,990 --> 00:42:08,319
about uh we consume about 30 watts uh

1129
00:42:14,150 --> 00:42:10,000
that's that's a small

1130
00:42:16,630 --> 00:42:14,160
light bulb in in in any household and

1131
00:42:19,430 --> 00:42:16,640
and by even by that measure for space

1132
00:42:21,750 --> 00:42:19,440
application that's a lot of power uh uh

1133
00:42:24,150 --> 00:42:21,760
for an instrument so we try to keep all

1134
00:42:25,910 --> 00:42:24,160
these instruments to not consume more

1135
00:42:28,790 --> 00:42:25,920
than few hundreds of watts so the

1136
00:42:31,430 --> 00:42:28,800
spacecraft can actually in the case of

1137
00:42:33,190 --> 00:42:31,440
maven that relies on solar panels and

1138
00:42:35,430 --> 00:42:33,200

the energy coming from the sun that

1139
00:42:37,349 --> 00:42:35,440
keeps the spacecraft running whether

1140
00:42:41,829 --> 00:42:37,359
mars was closer to the sun or a little

1141
00:42:44,870 --> 00:42:43,589
thanks so much maddie um i have a

1142
00:42:47,030 --> 00:42:44,880
follow-up question to that that's

1143
00:42:48,230 --> 00:42:47,040
actually i i can imagine

1144
00:42:49,829 --> 00:42:48,240
free for

1145
00:42:52,550 --> 00:42:49,839
you gentlemen it's probably quite sad

1146
00:42:54,710 --> 00:42:52,560
but all space oh all spacecraft have a

1147
00:42:56,550 --> 00:42:54,720
life time and i know recently a

1148
00:42:58,550 --> 00:42:56,560
spacecraft that orbited earth just came

1149
00:43:00,069 --> 00:42:58,560
down uh safely

1150
00:43:01,430 --> 00:43:00,079
and did what it was supposed to do sort

1151
00:43:03,510 --> 00:43:01,440
of burned up mostly in the atmosphere

1152
00:43:04,390 --> 00:43:03,520
and then parts of if any landed in the

1153
00:43:05,270 --> 00:43:04,400
ocean

1154
00:43:07,589 --> 00:43:05,280
when

1155
00:43:10,790 --> 00:43:07,599
maven reaches the end of its hopefully

1156
00:43:12,470 --> 00:43:10,800
incredibly long lifetime what happens to

1157
00:43:14,069 --> 00:43:12,480
it where will it go from there mindy can

1158
00:43:18,150 --> 00:43:14,079
you comment on that

1159
00:43:20,710 --> 00:43:18,160
well unfortunately it's true most of uh

1160
00:43:23,109 --> 00:43:20,720
spacecrafts have a lifetime on them

1161
00:43:24,470 --> 00:43:23,119
at some point the electronic component

1162
00:43:27,270 --> 00:43:24,480
the mechanical

1163
00:43:30,470 --> 00:43:27,280

system will fail and the spacecraft will

1164
00:43:32,150 --> 00:43:30,480
uh will cease uh being an operation

1165
00:43:34,790 --> 00:43:32,160
depends what's the where where the

1166
00:43:37,670 --> 00:43:34,800
spacecraft is for a case of rover the

1167
00:43:39,589 --> 00:43:37,680
rover basically will stop moving or stop

1168
00:43:42,150 --> 00:43:39,599
uh uh

1169
00:43:44,309 --> 00:43:42,160
sending data that's the case for example

1170
00:43:46,870 --> 00:43:44,319
for uh one of the mars exploration

1171
00:43:47,750 --> 00:43:46,880
rovers the rover spirit

1172
00:43:50,390 --> 00:43:47,760
um

1173
00:43:52,150 --> 00:43:50,400
uh that's gonna happen also for the msr

1174
00:43:54,470 --> 00:43:52,160
rover at some point after a long long

1175
00:43:55,349 --> 00:43:54,480
time and a lot of science delivered to

1176
00:43:57,430 --> 00:43:55,359
to us

1177
00:43:59,349 --> 00:43:57,440
it also is going to happen to maven so

1178
00:44:01,510 --> 00:43:59,359
that's part of the strategy that jim was

1179
00:44:04,470 --> 00:44:01,520
talking about earlier after the nominal

1180
00:44:07,109 --> 00:44:04,480
science mission we will be a relay

1181
00:44:09,349 --> 00:44:07,119
we provide we will provide relay to the

1182
00:44:11,910 --> 00:44:09,359
surface assets and that allow us to

1183
00:44:13,990 --> 00:44:11,920
actually change our orbits and not have

1184
00:44:16,309 --> 00:44:14,000
to dip that deep in the atmosphere which

1185
00:44:19,270 --> 00:44:16,319
allow us to last a little longer and

1186
00:44:22,309 --> 00:44:19,280
conserve fuel but even with that at some

1187
00:44:24,309 --> 00:44:22,319
point um the the the either the

1188
00:44:26,069 --> 00:44:24,319

instruments will will cease uh

1189
00:44:27,510 --> 00:44:26,079
functioning or the spacecraft itself

1190
00:44:28,790 --> 00:44:27,520
will see is functioning though what will

1191
00:44:31,829 --> 00:44:28,800
happen to it

1192
00:44:33,829 --> 00:44:31,839
uh the orbit will slowly decay

1193
00:44:35,990 --> 00:44:33,839
and will get lower and lower and lower

1194
00:44:37,270 --> 00:44:36,000
at some point the spacecraft will start

1195
00:44:39,750 --> 00:44:37,280
feeling the

1196
00:44:42,870 --> 00:44:39,760
the the resistance of the upper

1197
00:44:45,349 --> 00:44:42,880
atmosphere of mars and it and and in one

1198
00:44:48,069 --> 00:44:45,359
of its orbit it will actually re-enter

1199
00:44:53,349 --> 00:44:48,079
uh will enter the atmosphere and will

1200
00:44:57,589 --> 00:44:55,430
let's hope it does that long after it

1201
00:44:59,510 --> 00:44:57,599
connects a tremendous amount of science

1202
00:45:01,030 --> 00:44:59,520
data and all of your instruments work

1203
00:45:02,309 --> 00:45:01,040
beautifully

1204
00:45:04,309 --> 00:45:02,319
i'd love to know

1205
00:45:05,430 --> 00:45:04,319
we have just a little bit longer to go

1206
00:45:07,349 --> 00:45:05,440
uh

1207
00:45:09,430 --> 00:45:07,359
jim i was wondering if you could

1208
00:45:11,910 --> 00:45:09,440
tell us two things one where you're

1209
00:45:15,190 --> 00:45:11,920
going to be on monday when hopefully

1210
00:45:16,390 --> 00:45:15,200
maven launches and um for you what's

1211
00:45:17,990 --> 00:45:16,400
going to be the

1212
00:45:19,349 --> 00:45:18,000
the first time that you stopped biting

1213
00:45:21,109 --> 00:45:19,359

your nails is that when you first see

1214
00:45:22,870 --> 00:45:21,119
data is it when the rocket leaves the

1215
00:45:24,150 --> 00:45:22,880
pad what is that where are you going to

1216
00:45:26,309 --> 00:45:24,160
be on monday and when do you actually

1217
00:45:28,230 --> 00:45:26,319
sort of relax and start uh enjoying the

1218
00:45:30,470 --> 00:45:28,240
mission

1219
00:45:32,630 --> 00:45:30,480
well um on monday i'll be here at

1220
00:45:35,750 --> 00:45:32,640
kennedy in the operations center

1221
00:45:37,589 --> 00:45:35,760
um watching the launch and and uh

1222
00:45:39,430 --> 00:45:37,599
um and yeah

1223
00:45:41,109 --> 00:45:39,440
and by there'll be a little bit of by

1224
00:45:43,270 --> 00:45:41,119
the nails um

1225
00:45:46,150 --> 00:45:43,280
it's a it's it's it's an exciting it's

1226
00:45:47,190 --> 00:45:46,160
an exciting thing to see the the mission

1227
00:45:50,790 --> 00:45:47,200
take off

1228
00:45:52,150 --> 00:45:50,800
the um as far as when i'll relax well uh

1229
00:45:53,589 --> 00:45:52,160
you know we

1230
00:45:55,510 --> 00:45:53,599
there's a couple of

1231
00:45:58,630 --> 00:45:55,520
times where you know we're gonna gonna

1232
00:46:00,470 --> 00:45:58,640
be very very busy and very uh

1233
00:46:02,230 --> 00:46:00,480
very focused on what we're you know very

1234
00:46:03,750 --> 00:46:02,240
focused and that's going to be you know

1235
00:46:05,109 --> 00:46:03,760
at separation when we separate the

1236
00:46:07,109 --> 00:46:05,119
spacecraft making sure that the

1237
00:46:09,109 --> 00:46:07,119
spacecraft is healthy that that the

1238
00:46:11,510 --> 00:46:09,119

propulsion system starts up correctly

1239
00:46:13,589 --> 00:46:11,520
that the arrays come out and then you

1240
00:46:15,270 --> 00:46:13,599
know we'll be and then you know later on

1241
00:46:17,349 --> 00:46:15,280
during while we're on our way to mars

1242
00:46:19,349 --> 00:46:17,359
i'll be working with jasper and eddie

1243
00:46:20,710 --> 00:46:19,359
and and many others to make sure that

1244
00:46:23,270 --> 00:46:20,720
the instruments are all operating

1245
00:46:25,190 --> 00:46:23,280
correctly uh but then the next big thing

1246
00:46:27,430 --> 00:46:25,200
that that is

1247
00:46:29,190 --> 00:46:27,440
that is a very intense operation will be

1248
00:46:32,390 --> 00:46:29,200
the mars orbit insertion and that's when

1249
00:46:35,190 --> 00:46:32,400
we fire our main engine um it's it's our

1250
00:46:38,630 --> 00:46:35,200
biggest maneuver and it's it's um

1251
00:46:41,030 --> 00:46:38,640
uh it's it's uh it's the most exciting

1252
00:46:43,030 --> 00:46:41,040
part of the mission getting up to into

1253
00:46:44,870 --> 00:46:43,040
orbit so it would be that mars orbital

1254
00:46:46,309 --> 00:46:44,880
insertion will also be a

1255
00:46:47,750 --> 00:46:46,319
big time and then after that we start

1256
00:46:49,990 --> 00:46:47,760
doing science and

1257
00:46:51,829 --> 00:46:50,000
um you know you know we all are

1258
00:46:53,190 --> 00:46:51,839
everything all our instruments will be

1259
00:46:54,550 --> 00:46:53,200
working properly

1260
00:46:57,430 --> 00:46:54,560
and that's probably when i'll relax in

1261
00:46:58,870 --> 00:46:57,440
about a year or so

1262
00:47:01,270 --> 00:46:58,880
and just people who may have missed this

1263
00:47:03,270 --> 00:47:01,280

a little bit earlier

1264
00:47:04,630 --> 00:47:03,280
how is it how is that controlled when it

1265
00:47:05,750 --> 00:47:04,640
is inserted into orbit is it something

1266
00:47:07,109 --> 00:47:05,760
that's automatically going to happen

1267
00:47:08,550 --> 00:47:07,119
that maven's going to do it on its own

1268
00:47:10,630 --> 00:47:08,560
or is someone here on the ground going

1269
00:47:12,710 --> 00:47:10,640
to be like fire the thrusters how does

1270
00:47:13,510 --> 00:47:12,720
that work

1271
00:47:17,670 --> 00:47:13,520
well

1272
00:47:19,430 --> 00:47:17,680
as as we as we get closer to mars um

1273
00:47:22,549 --> 00:47:19,440
we'll have that planned but because

1274
00:47:24,950 --> 00:47:22,559
there's a there's a

1275
00:47:26,710 --> 00:47:24,960
there's a up to an eight-minute delay

1276
00:47:28,230 --> 00:47:26,720
there's a significant time delay in our

1277
00:47:30,549 --> 00:47:28,240
communications because of the speed of

1278
00:47:33,430 --> 00:47:30,559
light because mars is so far away

1279
00:47:34,630 --> 00:47:33,440
um we have to we have to

1280
00:47:36,390 --> 00:47:34,640
load the

1281
00:47:38,790 --> 00:47:36,400
what we do is we load in the script into

1282
00:47:41,510 --> 00:47:38,800
the spacecraft's computer that executes

1283
00:47:43,829 --> 00:47:41,520
all the steps and ultimately the

1284
00:47:45,829 --> 00:47:43,839
the insertion burn and that's all done

1285
00:47:47,589 --> 00:47:45,839
autonomously on the spacecraft but

1286
00:47:49,589 --> 00:47:47,599
there's a lot there's also a lot of sort

1287
00:47:51,990 --> 00:47:49,599
of fail-safe things going on at the same

1288
00:47:53,589 --> 00:47:52,000

time to make sure that that even though

1289
00:47:54,630 --> 00:47:53,599
we're not sitting there controlling it

1290
00:47:57,430 --> 00:47:54,640
directly

1291
00:47:58,870 --> 00:47:57,440
uh and we do have this delayed in seeing

1292
00:48:01,589 --> 00:47:58,880
you know how things are going the

1293
00:48:04,790 --> 00:48:01,599
spacecraft has some smarts so it knows

1294
00:48:06,710 --> 00:48:04,800
it can do corrections and it could uh

1295
00:48:08,710 --> 00:48:06,720
if something isn't working right it can

1296
00:48:10,710 --> 00:48:08,720
it has sort of fail safes in it that

1297
00:48:15,670 --> 00:48:10,720
will that will keep the burn going and

1298
00:48:18,950 --> 00:48:17,270
thanks so much jim i know we only lived

1299
00:48:20,870 --> 00:48:18,960
a little bit longer i want to get to

1300
00:48:23,270 --> 00:48:20,880
jasper jasper where are you going to be

1301
00:48:25,109 --> 00:48:23,280
um when maven launches on monday

1302
00:48:26,549 --> 00:48:25,119
hopefully and then is it the same for

1303
00:48:28,470 --> 00:48:26,559
you do you have the same sort of long

1304
00:48:30,230 --> 00:48:28,480
delay of waiting and then years of work

1305
00:48:32,390 --> 00:48:30,240
ahead of you

1306
00:48:33,670 --> 00:48:32,400
yeah so um where am i going to be

1307
00:48:34,950 --> 00:48:33,680
watching the launch that's actually a

1308
00:48:37,349 --> 00:48:34,960
great question and i haven't quite

1309
00:48:39,030 --> 00:48:37,359
figured it out yet um the reason that is

1310
00:48:40,950 --> 00:48:39,040
i'm going to have a two-year-old with me

1311
00:48:43,190 --> 00:48:40,960
so i have to find some place where i can

1312
00:48:44,390 --> 00:48:43,200
both see the the launch and entertain a

1313
00:48:46,470 --> 00:48:44,400

two-year-old

1314
00:48:47,670 --> 00:48:46,480
so that's a somewhat conflicting set of

1315
00:48:50,710 --> 00:48:47,680
requirements that i'm going to have to

1316
00:48:52,549 --> 00:48:50,720
satisfy and i i think i have an idea of

1317
00:48:54,069 --> 00:48:52,559
where that's going to be but i'm not 100

1318
00:48:55,829 --> 00:48:54,079
sure yet i have to negotiate with my

1319
00:48:57,510 --> 00:48:55,839
wife and my parents and you know all my

1320
00:48:59,670 --> 00:48:57,520
family that's going to be there and and

1321
00:49:02,549 --> 00:48:59,680
figure this out to the satisfaction of

1322
00:49:05,510 --> 00:49:02,559
of them and my two-year-old um the

1323
00:49:07,589 --> 00:49:05,520
question of when i'm gonna relax boy um

1324
00:49:08,390 --> 00:49:07,599
i don't know never

1325
00:49:10,390 --> 00:49:08,400
uh

1326
00:49:12,309 --> 00:49:10,400
i mean my answer is about the same as

1327
00:49:13,990 --> 00:49:12,319
jim there's there's some big milestones

1328
00:49:15,109 --> 00:49:14,000
that are gonna be kind of nail biters

1329
00:49:16,549 --> 00:49:15,119
you know there's there's obviously

1330
00:49:18,150 --> 00:49:16,559
launch there's separation there's

1331
00:49:20,470 --> 00:49:18,160
turning on the instruments in space for

1332
00:49:22,790 --> 00:49:20,480
the first time there's getting into mars

1333
00:49:24,549 --> 00:49:22,800
orbit but even after that there will be

1334
00:49:26,710 --> 00:49:24,559
a couple of events that are going to be

1335
00:49:27,910 --> 00:49:26,720
pretty exciting and i'm not too scared

1336
00:49:29,589 --> 00:49:27,920
of them but i'll probably still be

1337
00:49:30,790 --> 00:49:29,599
biting my nails a bit

1338
00:49:33,190 --> 00:49:30,800

and i'll be biting my nails in

1339
00:49:35,670 --> 00:49:33,200
particular when we do these deep dips

1340
00:49:38,630 --> 00:49:35,680
um our nominal uh orbit goes down to

1341
00:49:40,230 --> 00:49:38,640
about 150 kilometers but um five times

1342
00:49:43,430 --> 00:49:40,240
during the mission we're going to lower

1343
00:49:45,990 --> 00:49:43,440
that uh closest approach down to 110 120

1344
00:49:47,829 --> 00:49:46,000
kilometers so we can kind of do a do a

1345
00:49:49,910 --> 00:49:47,839
toe dip down into the deep atmosphere

1346
00:49:51,190 --> 00:49:49,920
and and sniff it and look at what's

1347
00:49:53,190 --> 00:49:51,200
going on there

1348
00:49:55,430 --> 00:49:53,200
um and that's that's going to be a

1349
00:49:57,750 --> 00:49:55,440
little exciting and fun to watch too so

1350
00:50:01,910 --> 00:49:57,760
uh i probably won't completely relax

1351
00:50:06,710 --> 00:50:03,910
that sounds absolutely harrowing

1352
00:50:09,510 --> 00:50:06,720
and so many uh last question for you

1353
00:50:11,030 --> 00:50:09,520
where are you going to be on on monday i

1354
00:50:12,069 --> 00:50:11,040
know i know but tell our viewers where

1355
00:50:14,790 --> 00:50:12,079
you're going to be on monday for

1356
00:50:16,710 --> 00:50:14,800
watching the launch and then also uh at

1357
00:50:18,870 --> 00:50:16,720
what point do you do you go on vacation

1358
00:50:21,430 --> 00:50:18,880
then so the instruments kick on and then

1359
00:50:23,910 --> 00:50:21,440
what's the next step for you

1360
00:50:26,390 --> 00:50:23,920
um i will be at the kennedy space center

1361
00:50:28,549 --> 00:50:26,400
uh cape canaveral uh to watch the launch

1362
00:50:30,950 --> 00:50:28,559
and um it's it's obviously the

1363
00:50:33,109 --> 00:50:30,960

accumulation of many many years of work

1364
00:50:36,069 --> 00:50:33,119
but like uh jasper and jim said it's

1365
00:50:38,470 --> 00:50:36,079
just the start of a long mission so we

1366
00:50:43,510 --> 00:50:38,480
still have a lot of milestones to

1367
00:50:47,349 --> 00:50:45,670
really the the we're not going to be

1368
00:50:49,589 --> 00:50:47,359
able to take vacations right away

1369
00:50:51,430 --> 00:50:49,599
because as soon as a few weeks after

1370
00:50:53,270 --> 00:50:51,440
lunch we will have to turn on start

1371
00:50:55,910 --> 00:50:53,280
turning on the instruments making sure

1372
00:50:57,829 --> 00:50:55,920
that all survive the launch environment

1373
00:50:59,589 --> 00:50:57,839
and they're good to go for a long

1374
00:51:01,510 --> 00:50:59,599
mission and

1375
00:51:04,790 --> 00:51:01,520
maybe after that we'll will take a week

1376
00:51:10,390 --> 00:51:06,630
thank you all so much for joining us

1377
00:51:13,190 --> 00:51:10,400
this has been a uh obviously live google

1378
00:51:15,910 --> 00:51:13,200
plus hangout chat about the upcoming

1379
00:51:17,349 --> 00:51:15,920
mars mission maven um if you have been

1380
00:51:18,710 --> 00:51:17,359
watching this thank you so much if

1381
00:51:20,950 --> 00:51:18,720
you're watching us in the archive

1382
00:51:22,950 --> 00:51:20,960
version thank you as well and you also

1383
00:51:25,750 --> 00:51:22,960
get all kinds of additional animations

1384
00:51:27,990 --> 00:51:25,760
videos details about the mission um up

1385
00:51:31,430 --> 00:51:28,000
to and after monday if you go to

1386
00:51:37,430 --> 00:51:33,750
maven again that's nasa's website

1387
00:51:39,109 --> 00:51:37,440
nasa.gov and then go slash maven

1388
00:51:41,190 --> 00:51:39,119

i imagine that's going to be the top

1389
00:51:42,309 --> 00:51:41,200
thing on the nasa.gov page as well so

1390
00:51:44,390 --> 00:51:42,319
you may not have to worry about

1391
00:51:45,910 --> 00:51:44,400
negotiating around in there and i want

1392
00:51:47,750 --> 00:51:45,920
to thank the gentleman for joining us

1393
00:51:48,950 --> 00:51:47,760
and i'm very sorry that david brain

1394
00:51:51,190 --> 00:51:48,960
wasn't able to

1395
00:51:52,549 --> 00:51:51,200
stay in the hangout it was completely a

1396
00:51:54,230 --> 00:51:52,559
technical issue

1397
00:51:55,670 --> 00:51:54,240
and we'll have some information from

1398
00:51:58,870 --> 00:51:55,680
dave uh

1399
00:52:00,549 --> 00:51:58,880
both on the nasa.gov page and then also

1400
00:52:02,950 --> 00:52:00,559
along in this youtube hangout in the

1401
00:52:04,710 --> 00:52:02,960
comments and things like that uh dave is

1402
00:52:06,710 --> 00:52:04,720
was joining us from the laboratory for

1403
00:52:08,710 --> 00:52:06,720
atmospheric and space physics at the

1404
00:52:10,549 --> 00:52:08,720
university of colorado in boulder and

1405
00:52:12,870 --> 00:52:10,559
then also joining us from a university

1406
00:52:15,109 --> 00:52:12,880
is jasper helikes he's the instrument

1407
00:52:16,549 --> 00:52:15,119
leader for the solar wind ion analyzer

1408
00:52:19,190 --> 00:52:16,559
at the university of california in

1409
00:52:20,870 --> 00:52:19,200
berkeley thanks so much jasper also then

1410
00:52:23,030 --> 00:52:20,880
our two people from goddard has been

1411
00:52:24,950 --> 00:52:23,040
mety benna he's the instrument scientist

1412
00:52:27,510 --> 00:52:24,960
for the neutral gas and ion mass

1413
00:52:29,109 --> 00:52:27,520

spectrometer and then also jim morrissey

1414
00:52:30,710 --> 00:52:29,119
the instrument system manager at nasa