1
00:00:09,669 --> 00:00:06,710
well good morning my name is duane brown

2
00:00:11,430 --> 00:00:09,679
from nasa's office of communications and

3
00:00:13,030 --> 00:00:11,440
nasa headquarters in washington thanks

4
00:00:15,350 --> 00:00:13,040
for joining us

5
00:00:17,109 --> 00:00:15,360
in this last briefing for today

6
00:00:19,349 --> 00:00:17,119
nasa's senior leadership

7
00:00:21,429 --> 00:00:19,359
will give their views and comments on

8
00:00:23,590 --> 00:00:21,439
how maven and other

9
00:00:25,910 --> 00:00:23,600
nasa mission and activities in the

10
00:00:27,509 --> 00:00:25,920
agency's exploration portfolio are

11
00:00:30,150 --> 00:00:27,519
paving the path

12
00:00:32,069 --> 00:00:30,160
toward a human mission to mars in the

13
00:00:33,510 --> 00:00:32,079

2030s

14
00:00:35,750 --> 00:00:33,520
we'll have brief presentations and

15
00:00:37,910 --> 00:00:35,760
remarks from our participants then we'll

16
00:00:39,590 --> 00:00:37,920
open it up for questions here at the

17
00:00:41,670 --> 00:00:39,600
kennedy space center

18
00:00:43,030 --> 00:00:41,680
as always you can

19
00:00:45,110 --> 00:00:43,040
get updates

20
00:00:47,990 --> 00:00:45,120
on the maven mission online at

21
00:00:49,029 --> 00:00:48,000
www.nasa.gov

22
00:00:50,709 --> 00:00:49,039
maven

23
00:00:52,790 --> 00:00:50,719
and of course join the conversation on

24
00:00:55,110 --> 00:00:52,800
social media and when it comes to mars

25
00:00:56,069 --> 00:00:55,120
there's always a lot of conversation on

26
00:00:57,510 --> 00:00:56,079
twitter

27
00:00:58,389 --> 00:00:57,520
facebook

28
00:01:01,029 --> 00:00:58,399
and other

29
00:01:02,389 --> 00:01:01,039
social media venues

30
00:01:03,750 --> 00:01:02,399
let me start by introducing our

31
00:01:05,990 --> 00:01:03,760
participants

32
00:01:08,149 --> 00:01:06,000
and i'll start here

33
00:01:10,149 --> 00:01:08,159
at the kennedy space center

34
00:01:12,390 --> 00:01:10,159
first to my left someone who's very

35
00:01:14,950 --> 00:01:12,400
familiar with the kennedy space center

36
00:01:16,870 --> 00:01:14,960
five-time flown space shuttle astronaut

37
00:01:18,550 --> 00:01:16,880
astrophysicist and associate

38
00:01:24,710 --> 00:01:18,560

administrator for national science

39
00:01:28,390 --> 00:01:26,149
the associate administrator for space

40
00:01:30,710 --> 00:01:28,400
technology mission directorate michael

41
00:01:32,310 --> 00:01:30,720
gazerick and a footnote here the agency

42
00:01:33,510 --> 00:01:32,320
realizing the importance of space

43
00:01:37,270 --> 00:01:33,520
technology

44
00:01:39,510 --> 00:01:37,280
into a new directorate

45
00:01:43,109 --> 00:01:39,520
in february of this year michael

46
00:01:45,270 --> 00:01:43,119
gazarick associate administrator

47
00:01:47,270 --> 00:01:45,280
and nasa's new chief scientist

48
00:01:48,469 --> 00:01:47,280
starting in a position august 25th ellen

49
00:01:50,230 --> 00:01:48,479
stofan

50
00:01:52,069 --> 00:01:50,240
the principal advisor on the agency

51
00:01:56,469 --> 00:01:52,079
science programs and science related

52
00:02:00,310 --> 00:01:57,830
and joining us

53
00:02:01,749 --> 00:02:00,320
from our nasa studio in washington dc at

54
00:02:03,830 --> 00:02:01,759
headquarters

55
00:02:06,389 --> 00:02:03,840
associate administrator for nasa's human

56
00:02:08,469 --> 00:02:06,399
exploration and operations directorate

57
00:02:11,990 --> 00:02:08,479
william gerstenmaier

58
00:02:15,030 --> 00:02:12,000
and with his portfolio with iss

59
00:02:16,630 --> 00:02:15,040
orion sls and commercial

60
00:02:18,869 --> 00:02:16,640
a lot of good things are happening on

61
00:02:20,949 --> 00:02:18,879
that front and to hear from him

62
00:02:24,150 --> 00:02:20,959
and the things and the synergy between

63
00:02:28,630 --> 00:02:24,160

science and humans i'll toss it to bill

64
00:02:35,190 --> 00:02:31,030
okay thank you duane can i have my first

65
00:02:41,750 --> 00:02:38,710
uh on this graphic we talk about uh kind

66
00:02:44,390 --> 00:02:41,760
of as we push humans uh beyond low earth

67
00:02:45,990 --> 00:02:44,400
orbit really out into deep space so

68
00:02:48,390 --> 00:02:46,000
you know where we are today with the

69
00:02:50,470 --> 00:02:48,400
international space station we have a

70
00:02:52,710 --> 00:02:50,480
crew of six on board the space station

71
00:02:54,390 --> 00:02:52,720
doing a lot of research that benefits us

72
00:02:55,990 --> 00:02:54,400
here on the earth but they're also doing

73
00:02:57,830 --> 00:02:56,000
a lot of activities that are really

74
00:02:59,670 --> 00:02:57,840
preparing us to go

75
00:03:01,190 --> 00:02:59,680
beyond low earth orbit you know just the

76
00:03:02,630 --> 00:03:01,200
fact that we have humans there for an

77
00:03:04,630 --> 00:03:02,640
extended period of time we're

78
00:03:06,949 --> 00:03:04,640
understanding how the human body reacts

79
00:03:09,430 --> 00:03:06,959
in the microgravity environment so on

80
00:03:11,350 --> 00:03:09,440
missions on the way to mars and of that

81
00:03:13,270 --> 00:03:11,360
duration we need to know how the human

82
00:03:15,270 --> 00:03:13,280
body actually

83
00:03:17,110 --> 00:03:15,280
adapts to that environment and are there

84
00:03:18,390 --> 00:03:17,120
any unique special needs that we need to

85
00:03:20,710 --> 00:03:18,400
take care of the crew so we're

86
00:03:22,790 --> 00:03:20,720
understanding how the crew operates and

87
00:03:25,030 --> 00:03:22,800
lives and works in that environment

88
00:03:26,949 --> 00:03:25,040

onboard space station we're also using

89
00:03:30,229 --> 00:03:26,959
the space station to develop technology

90
00:03:31,990 --> 00:03:30,239
that's needed to to last a long duration

91
00:03:34,229 --> 00:03:32,000
we need systems that are tremendously

92
00:03:37,030 --> 00:03:34,239
reliable require low maintenance and

93
00:03:38,949 --> 00:03:37,040
ready to to move to move those kind of

94
00:03:41,190 --> 00:03:38,959
distances we start breaking the tie with

95
00:03:42,470 --> 00:03:41,200
the home planet in that middle region we

96
00:03:44,149 --> 00:03:42,480
talk about

97
00:03:46,070 --> 00:03:44,159
kind of the proving ground and what that

98
00:03:48,470 --> 00:03:46,080
is is that's moving out into this lunar

99
00:03:49,750 --> 00:03:48,480
space it's the asteroid redirect mission

100
00:03:51,830 --> 00:03:49,760
it's those kind of activities where

101
00:03:53,990 --> 00:03:51,840
we're starting to break the tie from the

102
00:03:55,750 --> 00:03:54,000
from the home planet from earth but yet

103
00:03:57,190 --> 00:03:55,760
we still have the ability to get back in

104
00:03:59,030 --> 00:03:57,200
several days

105
00:04:01,030 --> 00:03:59,040
to the earth if something goes wrong or

106
00:04:02,789 --> 00:04:01,040
if we have equipment that needs some

107
00:04:04,550 --> 00:04:02,799
different activities we also need to

108
00:04:06,149 --> 00:04:04,560
operate or learn how to operate from an

109
00:04:08,309 --> 00:04:06,159
orbital mechanics standpoint in that

110
00:04:10,789 --> 00:04:08,319
region and then finally when we get out

111
00:04:12,630 --> 00:04:10,799
distances as far as mars we really need

112
00:04:14,550 --> 00:04:12,640
to break that tie back to earth so at

113
00:04:16,310 --> 00:04:14,560

that point we need to be independent

114
00:04:18,550 --> 00:04:16,320
from the earth we need to understand how

115
00:04:20,629 --> 00:04:18,560
to use the resources of the environment

116
00:04:22,790 --> 00:04:20,639
where we are where we're at we need to

117
00:04:24,390 --> 00:04:22,800
carry with us all the supplies we need

118
00:04:26,790 --> 00:04:24,400
from earth and the ability to

119
00:04:28,710 --> 00:04:26,800
essentially use in-situ resources or

120
00:04:30,310 --> 00:04:28,720
essentially live off the land in those

121
00:04:31,990 --> 00:04:30,320
remote locations

122
00:04:33,909 --> 00:04:32,000
the maven mission which we're all here

123
00:04:35,670 --> 00:04:33,919
for today or you're all there for today

124
00:04:37,510 --> 00:04:35,680
down at kennedy i wish i could be there

125
00:04:39,749 --> 00:04:37,520
with you but i'm not i'm here in

126
00:04:41,590 --> 00:04:39,759
washington but

127
00:04:42,790 --> 00:04:41,600
the maven mission will provide some

128
00:04:44,629 --> 00:04:42,800
interesting information for the

129
00:04:46,629 --> 00:04:44,639
scientists and john will talk about that

130
00:04:48,310 --> 00:04:46,639
but it's also good information for us

131
00:04:49,909 --> 00:04:48,320
kind of on the human space flight front

132
00:04:51,670 --> 00:04:49,919
to understand

133
00:04:53,430 --> 00:04:51,680
how the atmosphere of mars is put

134
00:04:55,990 --> 00:04:53,440
together what the upper atmosphere is

135
00:04:57,670 --> 00:04:56,000
like what the mid-level atmosphere is is

136
00:04:59,110 --> 00:04:57,680
like will be important as we look at

137
00:05:00,150 --> 00:04:59,120
entry descent and landing into the

138
00:05:02,230 --> 00:05:00,160

martian

139
00:05:03,830 --> 00:05:02,240
atmosphere with the larger spacecraft

140
00:05:05,350 --> 00:05:03,840
than we've done before the this kind of

141
00:05:07,590 --> 00:05:05,360
spacecraft that will be needed for human

142
00:05:08,950 --> 00:05:07,600
missions we'll also understand what

143
00:05:11,189 --> 00:05:08,960
resources are available in the

144
00:05:13,909 --> 00:05:11,199
atmosphere and can some of those

145
00:05:16,710 --> 00:05:13,919
those resources be used as as a tool for

146
00:05:19,029 --> 00:05:16,720
human exploration so so again science is

147
00:05:21,189 --> 00:05:19,039
is kind of proving the way or are

148
00:05:23,830 --> 00:05:21,199
pushing the way forward i will take the

149
00:05:25,909 --> 00:05:23,840
data from the scientific investigations

150
00:05:27,830 --> 00:05:25,919
use those on the human side as well as

151
00:05:29,270 --> 00:05:27,840
understanding the basic science

152
00:05:31,830 --> 00:05:29,280
activities that are occurring around

153
00:05:33,670 --> 00:05:31,840
mars so again i think i'm looking very

154
00:05:35,270 --> 00:05:33,680
forward to this maven mission the data

155
00:05:36,950 --> 00:05:35,280
will be important to us on human space

156
00:05:39,510 --> 00:05:36,960
flight and it also fits well with the

157
00:05:41,189 --> 00:05:39,520
science activities going forward so with

158
00:05:42,550 --> 00:05:41,199
that i'll turn it over to john down at

159
00:05:44,310 --> 00:05:42,560
the kennedy space center and he'll

160
00:05:47,670 --> 00:05:44,320
continue on with the discussion of the

161
00:05:49,510 --> 00:05:47,680
maven and the science activities john

162
00:05:52,230 --> 00:05:49,520
thanks bill so of course we're here for

163
00:05:54,469 --> 00:05:52,240

the maven launch and i'm excited to see

164
00:05:55,749 --> 00:05:54,479
it go off tomorrow hopefully not any

165
00:05:58,790 --> 00:05:55,759
later than that

166
00:06:01,189 --> 00:05:58,800
and you know maven is a science mission

167
00:06:02,710 --> 00:06:01,199
but none of our missions are really just

168
00:06:03,670 --> 00:06:02,720
can be characterized as just science

169
00:06:06,790 --> 00:06:03,680
missions

170
00:06:08,150 --> 00:06:06,800
in the sense that you know it's the

171
00:06:10,790 --> 00:06:08,160
science teams that are going to be

172
00:06:11,909 --> 00:06:10,800
analyzing the data and you know if you

173
00:06:14,710 --> 00:06:11,919
ask uh

174
00:06:16,710 --> 00:06:14,720
you know bruce or or any of the team

175
00:06:18,870 --> 00:06:16,720
they're going to mars tomorrow and i'm

176
00:06:21,670 --> 00:06:18,880
very excited about that as a human space

177
00:06:23,749 --> 00:06:21,680
flight flyer uh i would love to be on

178
00:06:25,590 --> 00:06:23,759
board with maven in fact i drove by

179
00:06:27,830 --> 00:06:25,600
complex 41 to see if there's any way i

180
00:06:30,550 --> 00:06:27,840
could sneak aboard but

181
00:06:32,309 --> 00:06:30,560
they have it all blocked off now so we

182
00:06:34,550 --> 00:06:32,319
we don't just launch science missions to

183
00:06:38,150 --> 00:06:34,560
mars one at a time we have an integrated

184
00:06:40,790 --> 00:06:38,160
program of mars exploration

185
00:06:42,469 --> 00:06:40,800
we've been following a path of looking

186
00:06:44,150 --> 00:06:42,479
for water on mars of course we've known

187
00:06:45,510 --> 00:06:44,160
for decades there's water on mars but

188
00:06:47,510 --> 00:06:45,520

looking for

189
00:06:48,710 --> 00:06:47,520
current water past water

190
00:06:51,110 --> 00:06:48,720
now we're

191
00:06:53,430 --> 00:06:51,120
con we've confirmed that mars once was a

192
00:06:56,950 --> 00:06:53,440
warm wet planet had flowing water

193
00:06:58,870 --> 00:06:56,960
curiosity uh warm salty seas opportunity

194
00:07:01,510 --> 00:06:58,880
phoenix which landed on a glacier an

195
00:07:03,749 --> 00:07:01,520
active uh you know block of ice water

196
00:07:06,469 --> 00:07:03,759
ice and so we're transitioning into the

197
00:07:08,469 --> 00:07:06,479
search for biosignatures of past uh

198
00:07:10,469 --> 00:07:08,479
evidence that life could have started on

199
00:07:12,629 --> 00:07:10,479
mars and we don't have that answer yet

200
00:07:14,309 --> 00:07:12,639
and that's all part of our quest for you

201
00:07:15,909 --> 00:07:14,319
know trying to answer are we alone in

202
00:07:18,150 --> 00:07:15,919
the universe in a much broader sense i

203
00:07:20,309 --> 00:07:18,160
think ellen will touch on that later

204
00:07:21,909 --> 00:07:20,319
so maven's not just one of a kind it's

205
00:07:23,029 --> 00:07:21,919
part of an integrated portfolio and i

206
00:07:24,629 --> 00:07:23,039
have a short

207
00:07:26,710 --> 00:07:24,639
video that i'd like to show that just

208
00:07:28,950 --> 00:07:26,720
kind of lays all of that out so that you

209
00:07:31,029 --> 00:07:28,960
have some perspective

210
00:07:33,189 --> 00:07:31,039
so we have the mars odyssey spacecraft

211
00:07:34,870 --> 00:07:33,199
we have the mars reconnaissance orbiter

212
00:07:37,510 --> 00:07:34,880
uh the opportunity

213
00:07:40,550 --> 00:07:37,520

uh phoenix and of course the amazing

214
00:07:42,270 --> 00:07:40,560
mars science laboratory curiosity rover

215
00:07:45,110 --> 00:07:42,280
maven in

216
00:07:46,869 --> 00:07:45,120
2016 will launch the insight mission

217
00:07:48,950 --> 00:07:46,879
which will be a geophysical monitoring

218
00:07:51,110 --> 00:07:48,960
station to the surface of mars we've

219
00:07:53,029 --> 00:07:51,120
looked at the atm we will have looked at

220
00:07:55,350 --> 00:07:53,039
the atmosphere with maven the surface

221
00:07:57,110 --> 00:07:55,360
with the rovers and the orbiters but we

222
00:07:59,189 --> 00:07:57,120
won't have looked into the planet so

223
00:08:02,469 --> 00:07:59,199
that's what insight will do

224
00:08:05,430 --> 00:08:02,479
in 2020 we have the mars

225
00:08:07,670 --> 00:08:05,440
follow-on rover which will not only have

226
00:08:09,749 --> 00:08:07,680
science but for the first time we'll

227
00:08:11,589 --> 00:08:09,759
have a major payload that will be both a

228
00:08:14,070 --> 00:08:11,599
technology and a human space flight in

229
00:08:16,150 --> 00:08:14,080
situ resource utilization

230
00:08:17,909 --> 00:08:16,160
experiment

231
00:08:20,790 --> 00:08:17,919
and i look forward to a time when we can

232
00:08:24,550 --> 00:08:20,800
have humans on the surface the odometer

233
00:08:26,950 --> 00:08:24,560
on curiosity reads around 420 meters or

234
00:08:31,670 --> 00:08:26,960
so probably a little bit more

235
00:08:33,190 --> 00:08:31,680
sorry 4.2 kilometers 4.2 kilometers

236
00:08:35,670 --> 00:08:33,200
i think john grotzinger could probably

237
00:08:38,550 --> 00:08:35,680
do that in about a day

238
00:08:40,310 --> 00:08:38,560

maybe not quite all of the analysis but

239
00:08:42,389 --> 00:08:40,320
you know he'd be going to the hot spots

240
00:08:44,389 --> 00:08:42,399
and collecting samples and bringing them

241
00:08:47,590 --> 00:08:44,399
in

242
00:08:50,150 --> 00:08:47,600
need a lot of technology

243
00:08:52,710 --> 00:08:50,160
and as i said the mars 2020 announcement

244
00:08:55,269 --> 00:08:52,720
of opportunity just went out recently

245
00:08:56,630 --> 00:08:55,279
and it's a joint

246
00:08:58,470 --> 00:08:56,640
announcement of opportunity for

247
00:09:00,870 --> 00:08:58,480
experiments and experiment packages

248
00:09:03,190 --> 00:09:00,880
between human space flight science and

249
00:09:05,430 --> 00:09:03,200
technology there's no question that to

250
00:09:07,910 --> 00:09:05,440
get those women and men on the surface

251
00:09:09,990 --> 00:09:07,920
of mars the astrobiologists the

252
00:09:12,389 --> 00:09:10,000
planetary scientists there's a lot of

253
00:09:13,509 --> 00:09:12,399
technology that we still need to develop

254
00:09:15,430 --> 00:09:13,519
to mature

255
00:09:16,790 --> 00:09:15,440
so that we can get humans to mars i'm

256
00:09:18,310 --> 00:09:16,800
looking forward to that day

257
00:09:20,070 --> 00:09:18,320
unfortunately it turns out

258
00:09:21,590 --> 00:09:20,080
we didn't get there fast enough for me

259
00:09:23,110 --> 00:09:21,600
but mike gazerick's working on the

260
00:09:25,430 --> 00:09:23,120
technology to enable our future

261
00:09:27,269 --> 00:09:25,440
explorers to get there mike

262
00:09:29,829 --> 00:09:27,279
thanks john well again it's great to be

263
00:09:31,750 --> 00:09:29,839

here um really excited about tomorrow's

264
00:09:33,910 --> 00:09:31,760
event um

265
00:09:36,230 --> 00:09:33,920
well i could never be qualified to climb

266
00:09:38,230 --> 00:09:36,240
in it i i as an engineer i would love to

267
00:09:39,910 --> 00:09:38,240
have hardware in it and uh well we don't

268
00:09:41,750 --> 00:09:39,920
have hardware on this on this particular

269
00:09:43,590 --> 00:09:41,760
mission on maven from a space tech

270
00:09:45,509 --> 00:09:43,600
perspective in my years in engineering i

271
00:09:47,350 --> 00:09:45,519
certainly have uh i can really relate to

272
00:09:49,430 --> 00:09:47,360
those teams having hardware on the mars

273
00:09:51,430 --> 00:09:49,440
science laboratory and having hardware

274
00:09:54,230 --> 00:09:51,440
on the international space station used

275
00:09:56,710 --> 00:09:54,240
by by astronauts uh i i remember that at

276
00:09:57,829 --> 00:09:56,720
that acceleration right when when i was

277
00:09:59,269 --> 00:09:57,839
actually pierce sellers yesterday

278
00:10:00,870 --> 00:09:59,279
turning on the camera for the first time

279
00:10:01,829 --> 00:10:00,880
would it work would it not in mission

280
00:10:03,670 --> 00:10:01,839
control

281
00:10:06,790 --> 00:10:03,680
i remember the excitement at the on the

282
00:10:08,630 --> 00:10:06,800
landing of curiosity uh leading the

283
00:10:10,069 --> 00:10:08,640
project to put instrumentation in the

284
00:10:11,990 --> 00:10:10,079
heat shield as we learned how to fly

285
00:10:13,990 --> 00:10:12,000
through that martian atmosphere and as

286
00:10:15,750 --> 00:10:14,000
the one who advocated in essence to put

287
00:10:17,269 --> 00:10:15,760
holes in that heat shield i i can tell

288
00:10:18,949 --> 00:10:17,279

you i was as nervous as anybody that

289
00:10:20,310 --> 00:10:18,959
night and and i really relate to to the

290
00:10:22,150 --> 00:10:20,320
great uh folks at maven and

291
00:10:24,069 --> 00:10:22,160
congratulations to that team and the

292
00:10:25,829 --> 00:10:24,079
hard work it takes you know these these

293
00:10:27,430 --> 00:10:25,839
high energy events all that years of

294
00:10:29,430 --> 00:10:27,440
work really comes down to these very

295
00:10:30,310 --> 00:10:29,440
black and white events you know will

296
00:10:31,269 --> 00:10:30,320
work

297
00:10:32,630 --> 00:10:31,279
will it

298
00:10:34,069 --> 00:10:32,640
successfully get off and we know it will

299
00:10:35,190 --> 00:10:34,079
tomorrow and we're really excited about

300
00:10:35,990 --> 00:10:35,200
that

301
00:10:37,110 --> 00:10:36,000
um

302
00:10:39,030 --> 00:10:37,120
i want to talk a little bit about

303
00:10:41,350 --> 00:10:39,040
technology as john mentioned you know

304
00:10:43,030 --> 00:10:41,360
it's a big part of our exploration in

305
00:10:45,110 --> 00:10:43,040
the universe you know we don't want to

306
00:10:46,949 --> 00:10:45,120
just survive in the solar system we want

307
00:10:48,230 --> 00:10:46,959
to thrive in it and and to do that we

308
00:10:49,990 --> 00:10:48,240
know we need a number of things you know

309
00:10:52,389 --> 00:10:50,000
we bill mentioned the heavy lift launch

310
00:10:53,509 --> 00:10:52,399
vehicle and a human-rated capsule but

311
00:10:55,509 --> 00:10:53,519
there's also a whole host of

312
00:10:56,949 --> 00:10:55,519
technologies that we know we need to get

313
00:10:58,870 --> 00:10:56,959

to mars

314
00:11:01,030 --> 00:10:58,880
do we know we need to allow humans and

315
00:11:02,069 --> 00:11:01,040
other future robotics missions to get to

316
00:11:03,750 --> 00:11:02,079
mars

317
00:11:05,190 --> 00:11:03,760
and we know this for a number of reasons

318
00:11:07,590 --> 00:11:05,200
um we've had a lot of studies over the

319
00:11:09,350 --> 00:11:07,600
years yeah in my office uh our alone are

320
00:11:11,030 --> 00:11:09,360
40 reports that have been done over 20

321
00:11:12,630 --> 00:11:11,040
years all laying out what are the things

322
00:11:14,230 --> 00:11:12,640
we need to do to get to mars and so

323
00:11:15,670 --> 00:11:14,240
finally in space tech we're we're not

324
00:11:17,750 --> 00:11:15,680
studying as much as we're really getting

325
00:11:19,590 --> 00:11:17,760
to it and uh to kind of take you through

326
00:11:21,670 --> 00:11:19,600
that i i have a short uh two minute

327
00:11:23,509 --> 00:11:21,680
movie on this now i will warn you it's a

328
00:11:25,110 --> 00:11:23,519
it's a quick movie i i showed it to my

329
00:11:27,030 --> 00:11:25,120
wife and she thought it was very very

330
00:11:28,310 --> 00:11:27,040
very quick i showed it to my children

331
00:11:30,389 --> 00:11:28,320
and they thought they was they loved it

332
00:11:31,829 --> 00:11:30,399
so uh you can judge yourself and your

333
00:11:33,030 --> 00:11:31,839
generation on whether or not you think

334
00:11:35,030 --> 00:11:33,040
it's kind of quick or not but if we

335
00:11:36,550 --> 00:11:35,040
could we could roll that video uh i'll

336
00:11:38,069 --> 00:11:36,560
i'll kind of take you through it and and

337
00:11:40,949 --> 00:11:38,079
talk a little bit about the technology

338
00:11:43,430 --> 00:11:40,959

by the mid 2030s i believe we can send

339
00:11:45,030 --> 00:11:43,440
humans to orbit mars and return them

340
00:11:48,710 --> 00:11:45,040
safely to earth

341
00:11:50,470 --> 00:11:48,720
and a landing on mars will follow

342
00:11:52,150 --> 00:11:50,480
so just a quick historical perspective

343
00:11:55,269 --> 00:11:52,160
and not to go through it all but back

344
00:11:57,190 --> 00:11:55,279
it's starting in 1964 with mariner 4 and

345
00:11:59,190 --> 00:11:57,200
some of our first imagery up close of

346
00:12:02,629 --> 00:11:59,200
mars the great viking missions in the

347
00:12:04,550 --> 00:12:02,639
70s uh uh both two spacecraft landing on

348
00:12:06,310 --> 00:12:04,560
the surface of mars and then of course

349
00:12:08,150 --> 00:12:06,320
curiosity landed you know a little over

350
00:12:10,389 --> 00:12:08,160
a year ago august and the incredible

351
00:12:12,230 --> 00:12:10,399
results were getting a metric ton on the

352
00:12:13,670 --> 00:12:12,240
surface of mars but here are some of the

353
00:12:15,430 --> 00:12:13,680
challenges and the questions if we're

354
00:12:17,670 --> 00:12:15,440
going to go there in earnest more than a

355
00:12:19,829 --> 00:12:17,680
metric ton right more with humans more

356
00:12:21,990 --> 00:12:19,839
with the spacecraft and the cargo that

357
00:12:24,389 --> 00:12:22,000
we need and and how about a place to

358
00:12:26,550 --> 00:12:24,399
live in a habitat to live so those are

359
00:12:27,590 --> 00:12:26,560
just some of the challenges and you know

360
00:12:29,670 --> 00:12:27,600
what we're going to what we're going to

361
00:12:31,829 --> 00:12:29,680
talk to you about now is some of the

362
00:12:33,509 --> 00:12:31,839
things we're working on to get us there

363
00:12:35,590 --> 00:12:33,519

and we're working and flying and testing

364
00:12:37,590 --> 00:12:35,600
those technologies today

365
00:12:39,590 --> 00:12:37,600
so here are eight quick areas that we

366
00:12:41,430 --> 00:12:39,600
look at from a technology perspective

367
00:12:42,790 --> 00:12:41,440
about getting to mars and we'll just

368
00:12:44,230 --> 00:12:42,800
kind of walk through quickly and show

369
00:12:46,389 --> 00:12:44,240
you some of the hardware and the folks

370
00:12:48,230 --> 00:12:46,399
that are working on each of these areas

371
00:12:49,990 --> 00:12:48,240
communications and navigation optical

372
00:12:53,269 --> 00:12:50,000
calm we just demonstrated coming off the

373
00:12:55,030 --> 00:12:53,279
moon and lady 622 megabits per second

374
00:12:56,949 --> 00:12:55,040
most of the images we take of mars

375
00:12:58,389 --> 00:12:56,959
remain on mars we need to have that

376
00:12:59,509 --> 00:12:58,399
optical pipeline to get them back to

377
00:13:01,430 --> 00:12:59,519
earth

378
00:13:03,030 --> 00:13:01,440
it's all about transportation how fast

379
00:13:04,710 --> 00:13:03,040
can we get there and the use of

380
00:13:06,629 --> 00:13:04,720
cryogenic propellant the ability to

381
00:13:09,269 --> 00:13:06,639
store that propellant high power solar

382
00:13:10,470 --> 00:13:09,279
electric power are all keys to getting

383
00:13:15,430 --> 00:13:10,480
to mars

384
00:13:17,590 --> 00:13:15,440
down can we get 20 metric tons safely

385
00:13:19,269 --> 00:13:17,600
through coming in at 11 kilometers a

386
00:13:22,150 --> 00:13:19,279
second and have seven minutes to get to

387
00:13:24,389 --> 00:13:22,160
zero can we land on the surface

388
00:13:26,710 --> 00:13:24,399

we all know uh it's about humans and

389
00:13:28,389 --> 00:13:26,720
robotics we already have r2 on station

390
00:13:30,150 --> 00:13:28,399
we already did the first tele-robotic

391
00:13:32,710 --> 00:13:30,160
operation from the international space

392
00:13:34,310 --> 00:13:32,720
station it's humans and robotics

393
00:13:35,910 --> 00:13:34,320
the radiation uh challenge is

394
00:13:37,910 --> 00:13:35,920
significant for humans we're looking at

395
00:13:40,230 --> 00:13:37,920
a number of ways to protect the crew as

396
00:13:41,430 --> 00:13:40,240
they go to uh to and from the surface of

397
00:13:43,750 --> 00:13:41,440
mars

398
00:13:46,310 --> 00:13:43,760
life support we have to enable high

399
00:13:47,990 --> 00:13:46,320
reliable life support even apollo 13 it

400
00:13:49,670 --> 00:13:48,000
was 84 hours that they had to be able to

401
00:13:51,590 --> 00:13:49,680
survive well we need to turn that into

402
00:13:53,750 --> 00:13:51,600
into days into weeks

403
00:13:55,430 --> 00:13:53,760
to be able to ensure the crew

404
00:13:57,829 --> 00:13:55,440
remains safe

405
00:13:59,509 --> 00:13:57,839
once we get to the surface we need power

406
00:14:01,509 --> 00:13:59,519
whether that be from nuclear or high

407
00:14:03,590 --> 00:14:01,519
power solar electric to be able to

408
00:14:05,269 --> 00:14:03,600
operate and thrive on the surface and

409
00:14:07,430 --> 00:14:05,279
then finally can we live off the surface

410
00:14:09,590 --> 00:14:07,440
and for on mars 2020 will be the one of

411
00:14:12,230 --> 00:14:09,600
our first demonstrations on the 2020

412
00:14:14,389 --> 00:14:12,240
rover converting carbon dioxide to

413
00:14:17,430 --> 00:14:14,399

oxygen and kind of pave the way then for

414
00:14:19,110 --> 00:14:17,440
using the resources that mars offers

415
00:14:20,629 --> 00:14:19,120
so that's really the technology a quick

416
00:14:22,069 --> 00:14:20,639
snapshot of some of the technologies

417
00:14:24,389 --> 00:14:22,079
we're working on and you know just

418
00:14:26,150 --> 00:14:24,399
behind like like behind maven it's it's

419
00:14:27,590 --> 00:14:26,160
really the people that are behind it and

420
00:14:29,670 --> 00:14:27,600
the people doing the work and are out in

421
00:14:31,350 --> 00:14:29,680
the field today developing and flying

422
00:14:32,870 --> 00:14:31,360
the technologies we need to get to mars

423
00:14:34,470 --> 00:14:32,880
and that's really key for us the

424
00:14:36,230 --> 00:14:34,480
technologies we have by the way are

425
00:14:38,069 --> 00:14:36,240
relevant to mars as well as any really

426
00:14:39,670 --> 00:14:38,079
destination in the solar system it

427
00:14:41,829 --> 00:14:39,680
includes more than mars it's our ability

428
00:14:43,269 --> 00:14:41,839
to thrive in deep space

429
00:14:45,030 --> 00:14:43,279
and so that's a quick summary of some of

430
00:14:46,389 --> 00:14:45,040
the technologies in mars

431
00:14:47,910 --> 00:14:46,399
ellen and i was going to talk a little

432
00:14:49,670 --> 00:14:47,920
bit about some of the other

433
00:14:50,949 --> 00:14:49,680
surfaces and planetary destinations

434
00:14:52,790 --> 00:14:50,959
again that these technologies will

435
00:14:54,310 --> 00:14:52,800
enable ellen

436
00:14:56,629 --> 00:14:54,320
well john talked about the overall

437
00:14:58,389 --> 00:14:56,639
integrated program of mars exploration

438
00:15:00,870 --> 00:14:58,399

but really all of the science that we do

439
00:15:03,030 --> 00:15:00,880
at nasa is interconnected um really

440
00:15:04,949 --> 00:15:03,040
around the fundamental question of how

441
00:15:07,430 --> 00:15:04,959
did we how did we get here what are the

442
00:15:09,829 --> 00:15:07,440
origins how is the solar system our own

443
00:15:12,150 --> 00:15:09,839
planet how is it changing and evolving

444
00:15:13,590 --> 00:15:12,160
and ultimately this big question of are

445
00:15:15,350 --> 00:15:13,600
we alone

446
00:15:17,350 --> 00:15:15,360
from everything that we're doing at nasa

447
00:15:19,910 --> 00:15:17,360
from within the solar system we have our

448
00:15:21,750 --> 00:15:19,920
mercury mission messenger to the cassini

449
00:15:23,590 --> 00:15:21,760
mission at saturn those missions are

450
00:15:25,750 --> 00:15:23,600
really getting at how did how do planets

451
00:15:28,470 --> 00:15:25,760
form how do they evolve

452
00:15:30,230 --> 00:15:28,480
we have earth measurements at nasa where

453
00:15:31,990 --> 00:15:30,240
we're studying our changing climate and

454
00:15:34,710 --> 00:15:32,000
trying to understand better how fast

455
00:15:35,749 --> 00:15:34,720
it's changing and how it's changing

456
00:15:37,189 --> 00:15:35,759
we have

457
00:15:39,269 --> 00:15:37,199
missions that are not just thinking

458
00:15:41,749 --> 00:15:39,279
about planets in this solar system we've

459
00:15:43,350 --> 00:15:41,759
had in the last few weeks these amazing

460
00:15:46,069 --> 00:15:43,360
results from the kepler mission where

461
00:15:48,389 --> 00:15:46,079
we've now at up over 3 500 planets that

462
00:15:49,990 --> 00:15:48,399
we've found

463
00:15:52,389 --> 00:15:50,000

some of them in that habitable size

464
00:15:54,150 --> 00:15:52,399
range that we're so interested in and

465
00:15:56,389 --> 00:15:54,160
those results from kepler have really

466
00:15:58,870 --> 00:15:56,399
literally rewritten the textbooks on how

467
00:16:00,389 --> 00:15:58,880
we think solar systems form and you know

468
00:16:01,829 --> 00:16:00,399
keep your seatbelt fastened because i

469
00:16:04,710 --> 00:16:01,839
think the discoveries still coming out

470
00:16:06,470 --> 00:16:04,720
of kepler are are really exciting

471
00:16:08,310 --> 00:16:06,480
and then you look beyond that to what

472
00:16:10,069 --> 00:16:08,320
we're doing in planetary from the juno

473
00:16:12,389 --> 00:16:10,079
mission which is on its way uh to

474
00:16:15,509 --> 00:16:12,399
jupiter uh we have the new horizons

475
00:16:17,350 --> 00:16:15,519
mission on it on its way uh to pluto

476
00:16:19,670 --> 00:16:17,360
and osiris-rex which is going to go

477
00:16:21,910 --> 00:16:19,680
after an asteroid so we have an exciting

478
00:16:23,590 --> 00:16:21,920
range of missions coming up and while

479
00:16:25,829 --> 00:16:23,600
again they may seem like discrete

480
00:16:27,590 --> 00:16:25,839
measurements asking discrete questions

481
00:16:30,230 --> 00:16:27,600
they're really getting back to this

482
00:16:32,069 --> 00:16:30,240
fundamental issue of how did our solar

483
00:16:34,629 --> 00:16:32,079
system form and evolve

484
00:16:36,949 --> 00:16:34,639
and are we alone and i think that was

485
00:16:38,550 --> 00:16:36,959
really poignantly brought out just this

486
00:16:39,990 --> 00:16:38,560
week we released

487
00:16:42,550 --> 00:16:40,000
which i'm sure a lot of you have seen

488
00:16:43,749 --> 00:16:42,560

this amazing image from cassini

489
00:16:46,629 --> 00:16:43,759
that was taken

490
00:16:48,629 --> 00:16:46,639
looking back at earth showing this pale

491
00:16:51,430 --> 00:16:48,639
blue dot that carl sagan spoke so

492
00:16:52,949 --> 00:16:51,440
eloquently about really getting at again

493
00:16:54,310 --> 00:16:52,959
this question of where this fragile

494
00:16:57,269 --> 00:16:54,320
little planet out there in this big

495
00:16:58,790 --> 00:16:57,279
solar system and yet we have the tools

496
00:17:02,069 --> 00:16:58,800
we have things that we're developing

497
00:17:04,630 --> 00:17:02,079
like jwst that are actually going to be

498
00:17:07,029 --> 00:17:04,640
looking at the atmospheres of planets

499
00:17:09,029 --> 00:17:07,039
around other stars and then we can even

500
00:17:11,909 --> 00:17:09,039
use that tool to look into our own solar

501
00:17:14,069 --> 00:17:11,919
system to study uranus and neptune

502
00:17:16,309 --> 00:17:14,079
we're doing exciting things at nasa and

503
00:17:18,150 --> 00:17:16,319
they're truly interconnected as we we

504
00:17:20,230 --> 00:17:18,160
try to understand the answers to these

505
00:17:22,069 --> 00:17:20,240
basic questions

506
00:17:24,230 --> 00:17:22,079
like everybody else so excited to be

507
00:17:25,669 --> 00:17:24,240
here for maven i was realizing when mike

508
00:17:27,510 --> 00:17:25,679
showed that video the last time i was

509
00:17:31,270 --> 00:17:27,520
here for a mars launch was viking so i'm

510
00:17:34,470 --> 00:17:32,870
yeah i was i was two i think you know

511
00:17:35,990 --> 00:17:34,480
i'm just kidding it's a lot older than

512
00:17:37,830 --> 00:17:36,000
that um

513
00:17:40,070 --> 00:17:37,840

but maven is really getting as john

514
00:17:41,990 --> 00:17:40,080
talked about it this issue of of how do

515
00:17:44,070 --> 00:17:42,000
we follow the water you know

516
00:17:46,470 --> 00:17:44,080
how did mars evolve differently from the

517
00:17:47,830 --> 00:17:46,480
earth and did life evolve on on the

518
00:17:49,750 --> 00:17:47,840
surface

519
00:17:51,190 --> 00:17:49,760
maven is really a critical puzzle piece

520
00:17:52,549 --> 00:17:51,200
in answering that question trying to

521
00:17:53,830 --> 00:17:52,559
understand those processes that are

522
00:17:55,190 --> 00:17:53,840
taking place at the top of the

523
00:17:57,029 --> 00:17:55,200
atmosphere

524
00:17:59,190 --> 00:17:57,039
but again it's very integrated in

525
00:18:01,270 --> 00:17:59,200
everything that we're doing i'm i'm a

526
00:18:03,750 --> 00:18:01,280
geologist and i've spent most of my my

527
00:18:06,310 --> 00:18:03,760
career out in the field picking up rocks

528
00:18:08,310 --> 00:18:06,320
and so i have this incredible bias that

529
00:18:11,470 --> 00:18:08,320
it is really going to take

530
00:18:14,310 --> 00:18:11,480
future astronauts uh field geologists

531
00:18:16,549 --> 00:18:14,320
astrobiologists at mars picking up those

532
00:18:18,710 --> 00:18:16,559
rocks doing the field surveys that

533
00:18:21,350 --> 00:18:18,720
geologists do here on earth taking our

534
00:18:23,750 --> 00:18:21,360
science not just from being doing remote

535
00:18:25,669 --> 00:18:23,760
science like we do now but doing science

536
00:18:28,470 --> 00:18:25,679
on the ground that's really going to

537
00:18:29,430 --> 00:18:28,480
help us get at this question of are we

538
00:18:32,310 --> 00:18:29,440

alone

539
00:18:34,070 --> 00:18:32,320
so i'm excited about looking forward

540
00:18:35,350 --> 00:18:34,080
looking towards that human exploration

541
00:18:37,029 --> 00:18:35,360
of mars because i think it's really

542
00:18:38,070 --> 00:18:37,039
going to revolutionize our science in

543
00:18:39,669 --> 00:18:38,080
the end

544
00:18:41,590 --> 00:18:39,679
and with that i will turn it back to

545
00:18:44,150 --> 00:18:41,600
dwayne thank you

546
00:18:47,029 --> 00:18:44,160
okay uh as always please wait for the

547
00:18:49,669 --> 00:18:47,039
mic and give you a name and affiliation

548
00:18:52,150 --> 00:18:49,679
please and let's see who we

549
00:18:53,990 --> 00:18:52,160
start here in the front

550
00:18:56,070 --> 00:18:54,000
hi kent kramer for rocket stamina

551
00:18:57,669 --> 00:18:56,080
universe today uh bill gerstenmaier i

552
00:18:59,029 --> 00:18:57,679
have a question for you and and maybe

553
00:19:00,950 --> 00:18:59,039
also for john

554
00:19:02,710 --> 00:19:00,960
uh i'd like to know about the iss

555
00:19:04,470 --> 00:19:02,720
they're talking about getting the humans

556
00:19:07,669 --> 00:19:04,480
to mars i'm wondering about the

557
00:19:10,310 --> 00:19:07,679
extension of the iss it's key to get

558
00:19:12,230 --> 00:19:10,320
these technologies uh developed can you

559
00:19:14,789 --> 00:19:12,240
have spoken i believe about getting a

560
00:19:17,190 --> 00:19:14,799
decision perhaps in 2014

561
00:19:20,630 --> 00:19:17,200
can you talk about that process how does

562
00:19:22,470 --> 00:19:20,640
it look and what would happen if the iss

563
00:19:25,590 --> 00:19:22,480

was not extended

564
00:19:29,510 --> 00:19:27,510
thanks uh you know we've been working

565
00:19:31,510 --> 00:19:29,520
with the administration and bringing

566
00:19:32,549 --> 00:19:31,520
forward our ideas on extending the space

567
00:19:34,549 --> 00:19:32,559
station

568
00:19:36,150 --> 00:19:34,559
you know we've laid out kind of in a

569
00:19:38,070 --> 00:19:36,160
matrix fashion

570
00:19:39,830 --> 00:19:38,080
what i talked at the beginning of my

571
00:19:41,590 --> 00:19:39,840
open remarks i talked about the things

572
00:19:43,830 --> 00:19:41,600
we need to understand how the human

573
00:19:45,270 --> 00:19:43,840
performs in a microgravity environment

574
00:19:46,950 --> 00:19:45,280
we can get a lot of those things

575
00:19:48,950 --> 00:19:46,960
completed through the lifetime of

576
00:19:50,710 --> 00:19:48,960
station through 2020 but some of those

577
00:19:51,510 --> 00:19:50,720
items we would really like to have some

578
00:19:53,909 --> 00:19:51,520
more

579
00:19:55,990 --> 00:19:53,919
activities beyond 2020 and we've made

580
00:19:57,750 --> 00:19:56,000
some cases for those also on the

581
00:19:59,430 --> 00:19:57,760
technology side there's some technology

582
00:20:01,590 --> 00:19:59,440
that we will have demonstrated to a

583
00:20:03,750 --> 00:20:01,600
certain level by 2020 but be going

584
00:20:05,750 --> 00:20:03,760
beyond 2020 we can really complete those

585
00:20:07,350 --> 00:20:05,760
more so i think we built a pretty

586
00:20:09,990 --> 00:20:07,360
compelling case from an expiration

587
00:20:11,830 --> 00:20:10,000
standpoint of of why station

588
00:20:13,110 --> 00:20:11,840

needs to be or should be extended and

589
00:20:15,430 --> 00:20:13,120
we'll continue to work that with the

590
00:20:17,190 --> 00:20:15,440
administration as we go forward you know

591
00:20:19,590 --> 00:20:17,200
we're looking pretty forward and pretty

592
00:20:21,270 --> 00:20:19,600
excited about the 2015 mission where

593
00:20:23,590 --> 00:20:21,280
we'll have a crew on board station for

594
00:20:25,430 --> 00:20:23,600
one full year and that's a chance to

595
00:20:27,270 --> 00:20:25,440
really see that is there anything that

596
00:20:29,909 --> 00:20:27,280
happens to the human body beyond the

597
00:20:32,470 --> 00:20:29,919
six-month period in microgravity that is

598
00:20:34,710 --> 00:20:32,480
really of consequences to us as we

599
00:20:36,390 --> 00:20:34,720
contemplate a mars journey and those

600
00:20:38,310 --> 00:20:36,400
kind of destinations and those kind of

601
00:20:40,230 --> 00:20:38,320
distances and time frames you know the

602
00:20:42,950 --> 00:20:40,240
russians have done it before they've had

603
00:20:44,870 --> 00:20:42,960
humans go beyond the six month period

604
00:20:46,710 --> 00:20:44,880
but we can we've got a lot of tools now

605
00:20:48,070 --> 00:20:46,720
we can really understand how the body

606
00:20:49,590 --> 00:20:48,080
really performs and how it's really

607
00:20:51,590 --> 00:20:49,600
changing to make sure that we really

608
00:20:52,789 --> 00:20:51,600
have we're really prepared to go do

609
00:20:55,029 --> 00:20:52,799
those kind of

610
00:21:02,390 --> 00:20:55,039
durations it'll take to take humans to

611
00:21:05,350 --> 00:21:03,990
i think from a from a space tech

612
00:21:06,950 --> 00:21:05,360
perspective as well the international

613
00:21:08,950 --> 00:21:06,960

space station is a great platform to

614
00:21:11,029 --> 00:21:08,960
test technologies uh not only that but

615
00:21:13,510 --> 00:21:11,039
the vehicles to get there uh you know we

616
00:21:14,950 --> 00:21:13,520
now have uh dragon we now have cygnus

617
00:21:16,310 --> 00:21:14,960
and you know we're looking at it as well

618
00:21:17,990 --> 00:21:16,320
can we leverage those vehicles to

619
00:21:20,149 --> 00:21:18,000
perform and demonstrate technology you

620
00:21:21,669 --> 00:21:20,159
know either to or from station uh both

621
00:21:24,070 --> 00:21:21,679
from a high entry entry descent landing

622
00:21:25,830 --> 00:21:24,080
perspective or or from a cryogenic

623
00:21:27,830 --> 00:21:25,840
propellant storage

624
00:21:29,590 --> 00:21:27,840
perspective can we do demonstrations you

625
00:21:31,510 --> 00:21:29,600
know in those vehicles and so i think

626
00:21:33,669 --> 00:21:31,520
that that's a great platform

627
00:21:34,950 --> 00:21:33,679
as well as you know we talked about uh

628
00:21:36,630 --> 00:21:34,960
in the opening remarks about the

629
00:21:38,070 --> 00:21:36,640
asteroid redirect mission and our

630
00:21:40,149 --> 00:21:38,080
ability to demonstrate the things we

631
00:21:41,590 --> 00:21:40,159
need to do you know in deep space a

632
00:21:43,750 --> 00:21:41,600
great again great examples for tying

633
00:21:44,870 --> 00:21:43,760
what we're doing together

634
00:21:46,710 --> 00:21:44,880
sir

635
00:21:48,310 --> 00:21:46,720
stephen clark with space flight now i

636
00:21:49,510 --> 00:21:48,320
think this question would be for john

637
00:21:50,549 --> 00:21:49,520
grunsfeld

638
00:21:54,390 --> 00:21:50,559

can you talk a little bit about the

639
00:21:56,310 --> 00:21:54,400
decision to stop production of the asrg

640
00:21:57,750 --> 00:21:56,320
flight unit and

641
00:21:59,669 --> 00:21:57,760
why you made that decision and what that

642
00:22:02,789 --> 00:21:59,679
means for future

643
00:22:04,870 --> 00:22:02,799
outer planets missions thanks

644
00:22:06,950 --> 00:22:04,880
sure the uh

645
00:22:09,029 --> 00:22:06,960
the asrgs were started quite a while ago

646
00:22:10,710 --> 00:22:09,039
and it was at a time when we

647
00:22:13,590 --> 00:22:10,720
had a very limited supply of

648
00:22:15,350 --> 00:22:13,600
plutonium-238 which powers

649
00:22:18,310 --> 00:22:15,360
the advanced sterling radioactive

650
00:22:21,190 --> 00:22:18,320
radioisotope generator balls also our

651
00:22:23,029 --> 00:22:21,200
mmrtg which is the thermocouple based

652
00:22:24,710 --> 00:22:23,039
system that's powering the curiosity

653
00:22:26,630 --> 00:22:24,720
rover now

654
00:22:28,310 --> 00:22:26,640
since then we've been directed to

655
00:22:30,149 --> 00:22:28,320
restart the production of plutonium

656
00:22:33,029 --> 00:22:30,159
working with the department of energy

657
00:22:35,510 --> 00:22:33,039
and uh we have more plutonium in our

658
00:22:37,990 --> 00:22:35,520
science stockpile than was anticipated

659
00:22:41,990 --> 00:22:38,000
such that we don't have the same need

660
00:22:42,950 --> 00:22:42,000
now they're not quite equal uh units um

661
00:22:44,710 --> 00:22:42,960
one

662
00:22:47,110 --> 00:22:44,720
uh provides a little bit more power but

663
00:22:48,630 --> 00:22:47,120

they're both in the 110 to 130 watt

664
00:22:50,390 --> 00:22:48,640
power range

665
00:22:51,830 --> 00:22:50,400
and then we also have to look at okay

666
00:22:54,470 --> 00:22:51,840
what are the missions that are queued up

667
00:22:56,310 --> 00:22:54,480
that need the technology and so we've

668
00:22:59,190 --> 00:22:56,320
made the decision

669
00:23:03,110 --> 00:22:59,200
based partly on on cost and budget and

670
00:23:04,549 --> 00:23:03,120
also on need to stick with the mmr tgs

671
00:23:07,350 --> 00:23:04,559
they need more plutonium but with the

672
00:23:10,070 --> 00:23:07,360
new supply we have that and then use our

673
00:23:12,870 --> 00:23:10,080
limited budget to fund missions uh going

674
00:23:14,950 --> 00:23:12,880
forward with the mmrtgs

675
00:23:16,310 --> 00:23:14,960
so as far as impacts on planetary

676
00:23:17,830 --> 00:23:16,320
missions it means you have to engineer

677
00:23:19,350 --> 00:23:17,840
your missions differently they may weigh

678
00:23:21,190 --> 00:23:19,360
a little bit more they may have a little

679
00:23:22,950 --> 00:23:21,200
bit higher mass but as far as power

680
00:23:25,029 --> 00:23:22,960
levels we should should be able in

681
00:23:26,390 --> 00:23:25,039
principle to support nearly all of the

682
00:23:28,070 --> 00:23:26,400
missions that we would have with the

683
00:23:29,190 --> 00:23:28,080
asrgs

684
00:23:31,110 --> 00:23:29,200
right

685
00:23:34,870 --> 00:23:31,120
this is frank mooring with aviation week

686
00:23:39,350 --> 00:23:37,510
you talked about getting a 20 metric ton

687
00:23:40,870 --> 00:23:39,360
lander down on mars which i think would

688
00:23:43,190 --> 00:23:40,880

probably involve

689
00:23:45,029 --> 00:23:43,200
uh retro rockets and supersonic speeds

690
00:23:46,070 --> 00:23:45,039
and that sort of thing can you discuss

691
00:23:48,149 --> 00:23:46,080
how

692
00:23:50,549 --> 00:23:48,159
what what the thinking is now

693
00:23:53,430 --> 00:23:50,559
as to how you would do that get that big

694
00:23:55,029 --> 00:23:53,440
payload down on the surface and what

695
00:23:57,190 --> 00:23:55,039
you might learn that you don't know now

696
00:23:58,710 --> 00:23:57,200
from maven that would help you

697
00:24:00,149 --> 00:23:58,720
move that along

698
00:24:02,310 --> 00:24:00,159
yeah

699
00:24:04,230 --> 00:24:02,320
so we've been uh largely for our

700
00:24:05,990 --> 00:24:04,240
successful landings on mars we've been

701
00:24:09,029 --> 00:24:06,000
relying on technology that was developed

702
00:24:11,269 --> 00:24:09,039
in the 1970s or earlier for viking um

703
00:24:13,830 --> 00:24:11,279
our ability to go in the seven minutes

704
00:24:15,669 --> 00:24:13,840
of terror to the surface of mars

705
00:24:17,430 --> 00:24:15,679
has got us to the point where we think

706
00:24:19,350 --> 00:24:17,440
we can well we have we demonstrated in

707
00:24:21,590 --> 00:24:19,360
msl we can get a metric ton to the

708
00:24:23,669 --> 00:24:21,600
surface of mars we can't land on all the

709
00:24:25,350 --> 00:24:23,679
surface we have to land on all the lower

710
00:24:26,390 --> 00:24:25,360
elevations we need every ounce of the

711
00:24:28,710 --> 00:24:26,400
very thin

712
00:24:30,310 --> 00:24:28,720
martian atmosphere that we can

713
00:24:31,830 --> 00:24:30,320

the surface of mars is equivalent to

714
00:24:33,669 --> 00:24:31,840
something like 100 000 feet here on

715
00:24:35,830 --> 00:24:33,679
earth so it's very thin

716
00:24:37,669 --> 00:24:35,840
so what we have is uh for the number of

717
00:24:39,269 --> 00:24:37,679
years have been some studies that have

718
00:24:41,269 --> 00:24:39,279
been done to say what can we do to

719
00:24:43,669 --> 00:24:41,279
improve our ability to slow down and

720
00:24:46,390 --> 00:24:43,679
they involve hypersonic decelerators

721
00:24:47,750 --> 00:24:46,400
these are inflatable uh hypersonic

722
00:24:50,230 --> 00:24:47,760
devices that

723
00:24:51,269 --> 00:24:50,240
were limited by the the the rocket uh

724
00:24:52,870 --> 00:24:51,279
shroud and

725
00:24:54,310 --> 00:24:52,880
the diameter of that so to get a bigger

726
00:24:56,070 --> 00:24:54,320
drag device right you need something

727
00:24:57,830 --> 00:24:56,080
that uh kind of fits in the rocket but

728
00:24:59,590 --> 00:24:57,840
then it then expands you know once you

729
00:25:01,510 --> 00:24:59,600
get to the martian once you get to the

730
00:25:03,110 --> 00:25:01,520
martian atmosphere so hypersonic

731
00:25:04,390 --> 00:25:03,120
inflatables are one technology area

732
00:25:07,510 --> 00:25:04,400
we're looking at and we demonstrated

733
00:25:09,029 --> 00:25:07,520
that last summer uh in space technology

734
00:25:10,870 --> 00:25:09,039
our first rocket launch where we

735
00:25:12,549 --> 00:25:10,880
inflated a three meter diameter

736
00:25:14,710 --> 00:25:12,559
hypersonic inflatable that came off a

737
00:25:17,029 --> 00:25:14,720
sounding rocket 300 miles above the

738
00:25:20,470 --> 00:25:17,039

atlantic ocean now we hit speeds of mach

739
00:25:23,029 --> 00:25:20,480
10 and experienced about 20 g's as we

740
00:25:24,390 --> 00:25:23,039
were able to show stable performance for

741
00:25:27,110 --> 00:25:24,400
deceleration

742
00:25:28,710 --> 00:25:27,120
we're also looking at at the supersonic

743
00:25:30,390 --> 00:25:28,720
speed so we think in a number of the

744
00:25:33,029 --> 00:25:30,400
architecture studies show that not only

745
00:25:34,390 --> 00:25:33,039
hypersonics deceleration supersonic

746
00:25:36,630 --> 00:25:34,400
deceleration

747
00:25:38,470 --> 00:25:36,640
the parachutes we have today are limited

748
00:25:40,149 --> 00:25:38,480
in what range we can open them and the

749
00:25:41,990 --> 00:25:40,159
mass and speed for which they can be

750
00:25:43,590 --> 00:25:42,000
used we're looking at different designs

751
00:25:45,190 --> 00:25:43,600
of supersonic speeds and we're testing

752
00:25:46,390 --> 00:25:45,200
that right now at the jet propulsion

753
00:25:48,549 --> 00:25:46,400
laboratory

754
00:25:51,350 --> 00:25:48,559
out in the desert of china lake off

755
00:25:53,590 --> 00:25:51,360
helicopters and rocket sleds

756
00:25:55,430 --> 00:25:53,600
a fascinating sequence of taking a

757
00:25:57,029 --> 00:25:55,440
parachute attaching it to a helicopter

758
00:25:58,870 --> 00:25:57,039
and then a kilometer cable to a rocket

759
00:26:00,149 --> 00:25:58,880
sled and then getting that sequence

760
00:26:01,830 --> 00:26:00,159
right where you cut it from the

761
00:26:03,029 --> 00:26:01,840
helicopter ignite the rocket sled and

762
00:26:03,750 --> 00:26:03,039
it's important to get that sequence

763
00:26:07,269 --> 00:26:03,760

right

764
00:26:08,710 --> 00:26:07,279
through the atmosphere incredible work

765
00:26:10,789 --> 00:26:08,720
we're going to take that then to show

766
00:26:12,390 --> 00:26:10,799
and do it off high altitude balloons and

767
00:26:14,149 --> 00:26:12,400
really building the test infrastructure

768
00:26:15,909 --> 00:26:14,159
we need to look at these advanced

769
00:26:18,070 --> 00:26:15,919
deceleration technologies again hasn't

770
00:26:20,149 --> 00:26:18,080
really been done since viking so with

771
00:26:22,549 --> 00:26:20,159
supersonic inflatables supersonic

772
00:26:24,149 --> 00:26:22,559
parachutes hypersonic inflatables and

773
00:26:26,710 --> 00:26:24,159
then also we're looking at the ability

774
00:26:28,950 --> 00:26:26,720
to turn on rockets at supersonic speeds

775
00:26:30,789 --> 00:26:28,960
it's called supersonic retro propulsion

776
00:26:32,310 --> 00:26:30,799
and so we're looking at our ability and

777
00:26:33,990 --> 00:26:32,320
looking at other companies who have

778
00:26:36,390 --> 00:26:34,000
looked at this as well

779
00:26:38,710 --> 00:26:36,400
notably uh spacex in her last flight did

780
00:26:40,390 --> 00:26:38,720
some flyback of their booster and you

781
00:26:42,390 --> 00:26:40,400
know so we're talking to them as well to

782
00:26:44,230 --> 00:26:42,400
see uh what they learned and what data

783
00:26:46,710 --> 00:26:44,240
they have so we're looking across the

784
00:26:48,470 --> 00:26:46,720
board at all the ways to better slow

785
00:26:50,950 --> 00:26:48,480
down uh and we're gonna advance those

786
00:26:53,269 --> 00:26:50,960
technologies as best we can and and this

787
00:26:54,710 --> 00:26:53,279
is where uh next demonstrations could

788
00:26:56,310 --> 00:26:54,720

include coming off the international

789
00:26:58,070 --> 00:26:56,320
space station coming off some of the

790
00:26:59,669 --> 00:26:58,080
vehicles like dragon and cygnus that

791
00:27:02,390 --> 00:26:59,679
would allow us to efficiently

792
00:27:05,190 --> 00:27:02,400
demonstrate uh these technologies

793
00:27:09,110 --> 00:27:07,110
so so maven itself is you know not not

794
00:27:10,789 --> 00:27:09,120
going to the surface but it is doing

795
00:27:12,549 --> 00:27:10,799
this incredible maneuver through the

796
00:27:14,549 --> 00:27:12,559
atmosphere and so the data that they

797
00:27:16,710 --> 00:27:14,559
learn as they fly through you know this

798
00:27:18,389 --> 00:27:16,720
this uh a very deep dips as they go

799
00:27:20,389 --> 00:27:18,399
through the atmosphere will provide

800
00:27:22,470 --> 00:27:20,399
great measurements and learning about

801
00:27:24,950 --> 00:27:22,480
the atmosphere of mars um again we have

802
00:27:26,549 --> 00:27:24,960
limited data uh in fact curiosity was

803
00:27:28,630 --> 00:27:26,559
the first time really we

804
00:27:30,630 --> 00:27:28,640
we measured comprehensively how do we

805
00:27:32,149 --> 00:27:30,640
fly through that atmosphere uh what was

806
00:27:34,070 --> 00:27:32,159
the heat rate through the atmosphere did

807
00:27:35,830 --> 00:27:34,080
we fly that vehicle like we predicted

808
00:27:39,909 --> 00:27:35,840
maven will also add to our ability to

809
00:27:43,990 --> 00:27:42,549
hi uh miriam kramer with space.com uh

810
00:27:45,269 --> 00:27:44,000
and i'm curious this is for anyone who'd

811
00:27:47,430 --> 00:27:45,279
like to answer

812
00:27:49,029 --> 00:27:47,440
i'm curious aside from the science that

813
00:27:51,350 --> 00:27:49,039

can be done on the surface by humans is

814
00:27:52,710 --> 00:27:51,360
there a benefit to possibly colonizing

815
00:27:54,310 --> 00:27:52,720
mars

816
00:27:56,149 --> 00:27:54,320
and also

817
00:27:58,950 --> 00:27:56,159
would the development of cis lunar space

818
00:28:00,789 --> 00:27:58,960
and even missions to the moon be a key

819
00:28:03,590 --> 00:28:00,799
aspect of all of this

820
00:28:05,350 --> 00:28:03,600
thanks

821
00:28:06,950 --> 00:28:05,360
well there's

822
00:28:08,950 --> 00:28:06,960
before you can colonize mars you have to

823
00:28:10,630 --> 00:28:08,960
be able to get there and hopefully come

824
00:28:12,789 --> 00:28:10,640
back although there are alternatives to

825
00:28:14,310 --> 00:28:12,799
that uh

826
00:28:16,310 --> 00:28:14,320
you know i'd i'd like to be able to go

827
00:28:17,430 --> 00:28:16,320
and come back at least for the for the

828
00:28:19,909 --> 00:28:17,440
first missions until you have a

829
00:28:21,190 --> 00:28:19,919
sufficient infrastructure uh and you

830
00:28:23,269 --> 00:28:21,200
know i mean it's the history of

831
00:28:25,510 --> 00:28:23,279
exploration uh you know folks have gone

832
00:28:27,750 --> 00:28:25,520
out uh you know long before we had an

833
00:28:29,350 --> 00:28:27,760
oregon trail with people you know

834
00:28:30,870 --> 00:28:29,360
essentially colonizing the west coast of

835
00:28:32,389 --> 00:28:30,880
course there were people there already

836
00:28:34,230 --> 00:28:32,399
but

837
00:28:37,669 --> 00:28:34,240
you know we we had you know scout

838
00:28:40,950 --> 00:28:38,950

it depends on what your long-term

839
00:28:41,990 --> 00:28:40,960
perspective is

840
00:28:43,990 --> 00:28:42,000
you know if you really want to think

841
00:28:45,669 --> 00:28:44,000
about the the long-term future of

842
00:28:47,830 --> 00:28:45,679
humanity

843
00:28:49,909 --> 00:28:47,840
you know i like to say we live in a in a

844
00:28:52,630 --> 00:28:49,919
wonderfully diverse solar system you

845
00:28:55,190 --> 00:28:52,640
know incredible uh in ranges of

846
00:28:57,510 --> 00:28:55,200
environments you know from from mercury

847
00:28:58,950 --> 00:28:57,520
uh to the the giant ice planets but

848
00:29:01,029 --> 00:28:58,960
there's really only two places in the

849
00:29:04,149 --> 00:29:01,039
solar system uh that offer an

850
00:29:05,830 --> 00:29:04,159
opportunity for relatively easy living

851
00:29:07,590 --> 00:29:05,840
one of which is earth and we're still

852
00:29:09,190 --> 00:29:07,600
learning how to do that

853
00:29:10,630 --> 00:29:09,200
and the other really is mars that has an

854
00:29:13,510 --> 00:29:10,640
atmosphere that has a surface with

855
00:29:15,510 --> 00:29:13,520
temperatures and and

856
00:29:16,950 --> 00:29:15,520
local resources we know mars has still

857
00:29:18,789 --> 00:29:16,960
has a lot of water even though much of

858
00:29:21,110 --> 00:29:18,799
it may have left

859
00:29:23,430 --> 00:29:21,120
to live on and so mars is is our real

860
00:29:25,750 --> 00:29:23,440
opportunity to colonize another planet

861
00:29:26,950 --> 00:29:25,760
that's self-sustaining

862
00:29:28,630 --> 00:29:26,960
you know there's kind of a theorem that

863
00:29:30,310 --> 00:29:28,640

i hope we don't prove which is single

864
00:29:31,750 --> 00:29:30,320
planet species don't survive and that's

865
00:29:33,750 --> 00:29:31,760
been around for a while

866
00:29:35,269 --> 00:29:33,760
i credit astronaut john young for that

867
00:29:37,990 --> 00:29:35,279
first time i heard it

868
00:29:40,389 --> 00:29:38,000
and so on very long time scales you know

869
00:29:42,070 --> 00:29:40,399
we do need to find another place to live

870
00:29:45,269 --> 00:29:42,080
and with the discovery of all of the

871
00:29:47,029 --> 00:29:45,279
these exoplanets the possibility that an

872
00:29:48,549 --> 00:29:47,039
earth-like planet around a nearby star

873
00:29:51,029 --> 00:29:48,559
exists you know that's then the next

874
00:29:52,389 --> 00:29:51,039
step but

875
00:29:54,710 --> 00:29:52,399
you know i like to think about what

876
00:29:55,830 --> 00:29:54,720
we're going to do tomorrow launch maven

877
00:29:58,710 --> 00:29:55,840
and maybe what we're going to do in the

878
00:30:00,870 --> 00:29:58,720
next five years 10 years 30 years uh and

879
00:30:03,269 --> 00:30:00,880
i'm excited as you saw on mike azarik's

880
00:30:04,950 --> 00:30:03,279
video you know the president's challenge

881
00:30:08,630 --> 00:30:04,960
that we send people around mars in the

882
00:30:10,230 --> 00:30:08,640
2030s and landing shortly thereafter

883
00:30:11,909 --> 00:30:10,240
yes sir

884
00:30:13,590 --> 00:30:11,919
james dean with florida today question

885
00:30:16,389 --> 00:30:13,600
for bill gerstenmaier

886
00:30:18,870 --> 00:30:16,399
um getting back to iss you've got the

887
00:30:20,070 --> 00:30:18,880
commercial crew rfp due out next week i

888
00:30:21,669 --> 00:30:20,080

wondered if you could just discuss the

889
00:30:23,590 --> 00:30:21,679
significance of that event and kind of

890
00:30:25,190 --> 00:30:23,600
entering this final phase

891
00:30:27,350 --> 00:30:25,200
of

892
00:30:29,110 --> 00:30:27,360
development uh leading up to contract

893
00:30:30,470 --> 00:30:29,120
awards for a commercial crew and

894
00:30:32,950 --> 00:30:30,480
secondly could you also please just

895
00:30:34,070 --> 00:30:32,960
address what is your plan for naming a

896
00:30:35,510 --> 00:30:34,080
permanent

897
00:30:37,669 --> 00:30:35,520
program manager

898
00:30:39,990 --> 00:30:37,679
for the commercial crew program and is

899
00:30:42,549 --> 00:30:40,000
there any question about whether that

900
00:30:46,470 --> 00:30:42,559
position will be based here at ksc or or

901
00:30:51,830 --> 00:30:49,190
okay thanks uh yeah we're in the process

902
00:30:53,669 --> 00:30:51,840
of getting together the uh the final uh

903
00:30:55,750 --> 00:30:53,679
rfp requester proposal for the

904
00:30:57,669 --> 00:30:55,760
commercial crew program uh here in

905
00:30:59,430 --> 00:30:57,679
washington we've still got a little bit

906
00:31:01,029 --> 00:30:59,440
of work to do a little bit of things to

907
00:31:03,269 --> 00:31:01,039
do from

908
00:31:04,710 --> 00:31:03,279
to get that rfp ready for release next

909
00:31:07,029 --> 00:31:04,720
week but it looks pretty much like it's

910
00:31:08,630 --> 00:31:07,039
on track you know as as you've seen

911
00:31:11,509 --> 00:31:08,640
throughout the year we've worked very

912
00:31:14,470 --> 00:31:11,519
closely with industry we've put out

913
00:31:17,350 --> 00:31:14,480

numerous draft rfps we got comments back

914
00:31:19,590 --> 00:31:17,360
from various providers we got comments

915
00:31:20,950 --> 00:31:19,600
from the aerospace safety panel we got

916
00:31:23,350 --> 00:31:20,960
comments from

917
00:31:24,789 --> 00:31:23,360
congressional folks on the rfp and we've

918
00:31:27,029 --> 00:31:24,799
tried to incorporate all those in the

919
00:31:29,110 --> 00:31:27,039
final version we've also dropped several

920
00:31:31,350 --> 00:31:29,120
preliminary versions along the way of

921
00:31:34,230 --> 00:31:31,360
the request for proposals so folks could

922
00:31:36,470 --> 00:31:34,240
take a look at it and get ready to go

923
00:31:38,789 --> 00:31:36,480
actually submit their final proposals

924
00:31:39,909 --> 00:31:38,799
back to nasa so again i think we're on

925
00:31:42,230 --> 00:31:39,919
track for that we've got a little bit

926
00:31:43,909 --> 00:31:42,240
more work to do we'll do that over

927
00:31:45,909 --> 00:31:43,919
tomorrow monday and then we'll get ready

928
00:31:48,389 --> 00:31:45,919
to release sometime on on tuesday and

929
00:31:50,549 --> 00:31:48,399
then again the responses from that

930
00:31:52,789 --> 00:31:50,559
request for proposal are due back in the

931
00:31:55,350 --> 00:31:52,799
end of january in terms of a program

932
00:31:56,950 --> 00:31:55,360
manager we're we're in the process of

933
00:31:58,549 --> 00:31:56,960
going through interviews and starting to

934
00:32:00,070 --> 00:31:58,559
talk to people about that we really

935
00:32:01,830 --> 00:32:00,080
haven't quite started the interview

936
00:32:03,590 --> 00:32:01,840
process but we'll do that and the

937
00:32:05,590 --> 00:32:03,600
position will definitely stay in florida

938
00:32:07,350 --> 00:32:05,600

there's no question that the kennedy

939
00:32:08,950 --> 00:32:07,360
space center has done a tremendous job

940
00:32:11,269 --> 00:32:08,960
of pulling all this stuff together

941
00:32:13,029 --> 00:32:11,279
they're the the lead activity or lead

942
00:32:15,110 --> 00:32:13,039
center for that activity they're

943
00:32:17,190 --> 00:32:15,120
supported extremely well by the johnson

944
00:32:19,029 --> 00:32:17,200
space center the the teaming between the

945
00:32:21,590 --> 00:32:19,039
two between johnson and kennedy has just

946
00:32:23,909 --> 00:32:21,600
been phenomenal uh to to get ready for

947
00:32:25,430 --> 00:32:23,919
this activity and release for this

948
00:32:27,430 --> 00:32:25,440
for this proposal this is about ready to

949
00:32:29,669 --> 00:32:27,440
come out so again i think that whole

950
00:32:31,430 --> 00:32:29,679
activity is going extremely well we're

951
00:32:33,590 --> 00:32:31,440
looking forward to that

952
00:32:35,509 --> 00:32:33,600
it'll be nice to get a u.s capability to

953
00:32:37,509 --> 00:32:35,519
take crew to and from station as soon as

954
00:32:39,269 --> 00:32:37,519
we can get that

955
00:32:40,950 --> 00:32:39,279
okay we'll go here and then come up to

956
00:32:42,950 --> 00:32:40,960
the other side of the room

957
00:32:44,870 --> 00:32:42,960
barbara buckner nasa social media i'm a

958
00:32:47,269 --> 00:32:44,880
high school teacher my question is for

959
00:32:48,549 --> 00:32:47,279
ellen with the cassini mission

960
00:32:50,070 --> 00:32:48,559
several different teachers we stood out

961
00:32:52,470 --> 00:32:50,080
and waved at saturn in the picture that

962
00:32:54,630 --> 00:32:52,480
was released my question is is that the

963
00:32:57,269 --> 00:32:54,640

first picture which would include

964
00:32:59,029 --> 00:32:57,279
everyone since we've had people

965
00:33:00,789 --> 00:32:59,039
inhabiting the international space

966
00:33:02,549 --> 00:33:00,799
station in 2000 because that picture

967
00:33:04,630 --> 00:33:02,559
would include everyone and my next

968
00:33:06,230 --> 00:33:04,640
question kind of follow up to go along

969
00:33:08,070 --> 00:33:06,240
with that does that picture pretty much

970
00:33:10,230 --> 00:33:08,080
will encapsulate

971
00:33:12,070 --> 00:33:10,240
the majority of all nasa missions except

972
00:33:14,630 --> 00:33:12,080
for maybe voyager 1 voyager 2 within

973
00:33:19,110 --> 00:33:16,870
uh i'm actually not sure of the answer

974
00:33:21,269 --> 00:33:19,120
to that um jim i don't know if you can

975
00:33:24,230 --> 00:33:21,279
you can shout me a better answer i mean

976
00:33:25,750 --> 00:33:24,240
that that image to me is um so terrific

977
00:33:28,389 --> 00:33:25,760
and actually i just gave a talk a few

978
00:33:30,149 --> 00:33:28,399
days ago at a at a science meeting and i

979
00:33:32,230 --> 00:33:30,159
showed the picture of cassini looking

980
00:33:34,230 --> 00:33:32,240
back at the earth and then i put up that

981
00:33:36,470 --> 00:33:34,240
that image because to me

982
00:33:39,190 --> 00:33:36,480
the pair of those two images together is

983
00:33:41,830 --> 00:33:39,200
so powerful here we have this robotic

984
00:33:43,509 --> 00:33:41,840
spacecraft that we developed out just

985
00:33:45,590 --> 00:33:43,519
revealing the amazing things about the

986
00:33:47,430 --> 00:33:45,600
saturn system you know from the exotic

987
00:33:49,190 --> 00:33:47,440
worlds of enceladus and titan that i

988
00:33:50,789 --> 00:33:49,200

think are really going to teach us a lot

989
00:33:52,310 --> 00:33:50,799
and have been teaching us a lot of what

990
00:33:54,230 --> 00:33:52,320
are the potential limits of life in the

991
00:33:55,830 --> 00:33:54,240
solar system from our studies of

992
00:33:57,590 --> 00:33:55,840
saturn's rings which have all these

993
00:33:59,350 --> 00:33:57,600
dynamic processes to these cloud

994
00:34:01,350 --> 00:33:59,360
formations we've seen i mean i could i

995
00:34:03,990 --> 00:34:01,360
could keep going for hours um so i'll

996
00:34:06,870 --> 00:34:04,000
stop um on on what we've been learning

997
00:34:09,190 --> 00:34:06,880
from cassini so that image that has

998
00:34:10,790 --> 00:34:09,200
saturn in it and yet has the earth in it

999
00:34:13,909 --> 00:34:10,800
you know we have had the ability to

1000
00:34:15,270 --> 00:34:13,919
travel all that way that technology that

1001
00:34:17,990 --> 00:34:15,280
ability

1002
00:34:20,389 --> 00:34:18,000
and yet as um

1003
00:34:22,389 --> 00:34:20,399
john and mike both pointed out we do

1004
00:34:24,629 --> 00:34:22,399
that work here on earth

1005
00:34:26,149 --> 00:34:24,639
we study it on earth we inspire kids on

1006
00:34:28,389 --> 00:34:26,159
earth

1007
00:34:30,149 --> 00:34:28,399
we're we've involved teachers on cassini

1008
00:34:31,349 --> 00:34:30,159
which i think has been an amazing

1009
00:34:33,270 --> 00:34:31,359
program

1010
00:34:35,270 --> 00:34:33,280
that is all being taken back on earth so

1011
00:34:37,750 --> 00:34:35,280
to me those two images next to each

1012
00:34:39,829 --> 00:34:37,760
other of here's the world waving at

1013
00:34:40,710 --> 00:34:39,839

cassini and here's cassini looking back

1014
00:34:43,430 --> 00:34:40,720
at us

1015
00:34:44,950 --> 00:34:43,440
i i just think it blows my mind you know

1016
00:34:46,629 --> 00:34:44,960
i get all teared up i just think it's

1017
00:34:53,990 --> 00:34:46,639
amazing

1018
00:34:56,149 --> 00:34:54,000
it does nearly contain everything humans

1019
00:34:57,829 --> 00:34:56,159
have ever done except for a few

1020
00:34:58,950 --> 00:34:57,839
spacecraft

1021
00:35:01,910 --> 00:34:58,960
such as

1022
00:35:04,630 --> 00:35:01,920
new horizons which is now much further

1023
00:35:06,870 --> 00:35:04,640
beyond saturn and of course the voyagers

1024
00:35:09,030 --> 00:35:06,880
and the pioneers uh for which only the

1025
00:35:11,670 --> 00:35:09,040
voyagers are are still active

1026
00:35:13,910 --> 00:35:11,680
but um uh it really is a tremendously

1027
00:35:17,109 --> 00:35:13,920
inspirational picture and i agree with

1028
00:35:18,470 --> 00:35:17,119
you ellen just beautiful

1029
00:35:20,630 --> 00:35:18,480
it's amazing

1030
00:35:22,150 --> 00:35:20,640
what it contains but also

1031
00:35:23,990 --> 00:35:22,160
i mean since you asked what it doesn't

1032
00:35:25,270 --> 00:35:24,000
contain because we also have the dawn

1033
00:35:29,270 --> 00:35:25,280
spacecraft

1034
00:35:33,670 --> 00:35:29,280
which has left vesta on its way to ceres

1035
00:35:35,430 --> 00:35:33,680
and uh and juno and new horizons uh

1036
00:35:37,990 --> 00:35:35,440
of course the voyagers but it also

1037
00:35:39,829 --> 00:35:38,000
deliberately uh left out things like our

1038
00:35:41,750 --> 00:35:39,839

stereo spacecraft around the sun because

1039
00:35:42,630 --> 00:35:41,760
that's hidden behind

1040
00:35:47,910 --> 00:35:42,640
uh

1041
00:35:50,950 --> 00:35:47,920
out exploring the solar system with our

1042
00:35:53,270 --> 00:35:50,960
robotic probes and as i said earlier

1043
00:35:55,510 --> 00:35:53,280
uh you know humans are already exploring

1044
00:35:57,109 --> 00:35:55,520
mars because all of our spacecraft have

1045
00:35:59,349 --> 00:35:57,119
scientists and engineers who are running

1046
00:36:01,670 --> 00:35:59,359
them you know the folks who are working

1047
00:36:03,670 --> 00:36:01,680
the curiosity rover you know have been

1048
00:36:04,870 --> 00:36:03,680
doing it so long now for over a year

1049
00:36:06,150 --> 00:36:04,880
that they probably think they're

1050
00:36:07,990 --> 00:36:06,160
martians

1051
00:36:09,430 --> 00:36:08,000
especially operating on martian time

1052
00:36:11,750 --> 00:36:09,440
when they were doing that

1053
00:36:13,990 --> 00:36:11,760
but we have people out you know

1054
00:36:16,310 --> 00:36:14,000
exploring all over the solar system it's

1055
00:36:18,790 --> 00:36:16,320
really phenomenal and i think that that

1056
00:36:20,550 --> 00:36:18,800
picture really captures it well

1057
00:36:23,109 --> 00:36:20,560
and for our television artists i want to

1058
00:36:24,550 --> 00:36:23,119
identify dr jim green he is the director

1059
00:36:26,310 --> 00:36:24,560
of the planetary science division at

1060
00:36:27,829 --> 00:36:26,320
nasa headquarters so jim green and

1061
00:36:29,030 --> 00:36:27,839
audience okay we're going to take a few

1062
00:36:30,550 --> 00:36:29,040
more questions going on another side

1063
00:36:33,109 --> 00:36:30,560

here

1064
00:36:35,109 --> 00:36:33,119
hi uh chris haber with rocket stem and

1065
00:36:37,430 --> 00:36:35,119
space flight insider

1066
00:36:38,790 --> 00:36:37,440
this is open for anybody at all

1067
00:36:41,829 --> 00:36:38,800
could you talk a little bit about

1068
00:36:43,109 --> 00:36:41,839
medical technology advancement that's

1069
00:36:46,150 --> 00:36:43,119
necessary

1070
00:36:47,349 --> 00:36:46,160
for humans to reach mars and colonize

1071
00:36:49,910 --> 00:36:47,359
and

1072
00:36:51,750 --> 00:36:49,920
such as like the nanotechnology that has

1073
00:36:55,030 --> 00:36:51,760
the possibility of curing diabetes is

1074
00:36:56,150 --> 00:36:55,040
currently being done at johnson

1075
00:36:58,230 --> 00:36:56,160
things that are being done now and

1076
00:36:59,990 --> 00:36:58,240
things that you would like to see done

1077
00:37:01,829 --> 00:37:00,000
and how

1078
00:37:03,990 --> 00:37:01,839
that will impact

1079
00:37:06,230 --> 00:37:04,000
everybody else on earth

1080
00:37:07,910 --> 00:37:06,240
that's not going to mars

1081
00:37:09,349 --> 00:37:07,920
if i could just jump in one of the

1082
00:37:10,630 --> 00:37:09,359
things having been in this position for

1083
00:37:12,230 --> 00:37:10,640
two months one of the things i've really

1084
00:37:13,750 --> 00:37:12,240
been trying to get up to speed on is the

1085
00:37:16,390 --> 00:37:13,760
range of research that we're doing on

1086
00:37:19,190 --> 00:37:16,400
the iss from from the basic work of

1087
00:37:21,109 --> 00:37:19,200
trying to understand um how

1088
00:37:24,390 --> 00:37:21,119

physical processes like combustion take

1089
00:37:26,310 --> 00:37:24,400
place in in microgravity uh to the

1090
00:37:28,870 --> 00:37:26,320
extensive work we're doing on trying to

1091
00:37:31,190 --> 00:37:28,880
understand how can we have humans

1092
00:37:33,190 --> 00:37:31,200
go beyond low earth orbit for extended

1093
00:37:35,030 --> 00:37:33,200
periods of time and i thought that um

1094
00:37:36,710 --> 00:37:35,040
graphic that um

1095
00:37:38,230 --> 00:37:36,720
that bill gershmire showed earlier with

1096
00:37:40,150 --> 00:37:38,240
the how do you become moved to a

1097
00:37:42,150 --> 00:37:40,160
self-sufficient regime and so what we're

1098
00:37:43,910 --> 00:37:42,160
doing with plant research on the on the

1099
00:37:45,910 --> 00:37:43,920
iss what we're doing with trying to

1100
00:37:47,750 --> 00:37:45,920
understand the effects of humans the

1101
00:37:51,510 --> 00:37:47,760
exciting thing is in doing so we're

1102
00:37:54,550 --> 00:37:51,520
learning so much uh so many basic things

1103
00:37:57,109 --> 00:37:54,560
about plants about humans because of the

1104
00:37:59,510 --> 00:37:57,119
fact we evolved in a 1g environment you

1105
00:38:00,950 --> 00:37:59,520
put us in a zero-g environment and all

1106
00:38:02,950 --> 00:38:00,960
of a sudden things start happening and

1107
00:38:05,349 --> 00:38:02,960
when that happens you really start

1108
00:38:07,190 --> 00:38:05,359
pushing the the frontiers of science and

1109
00:38:09,430 --> 00:38:07,200
it's so exciting and i think the the

1110
00:38:11,270 --> 00:38:09,440
research that's coming out and the

1111
00:38:13,270 --> 00:38:11,280
specific things that we can do that will

1112
00:38:14,550 --> 00:38:13,280
actually end up benefiting us here back

1113
00:38:19,349 --> 00:38:14,560

on earth are

1114
00:38:23,670 --> 00:38:21,190
want to join in but i think that the

1115
00:38:25,670 --> 00:38:23,680
most salient point of all is that from

1116
00:38:28,230 --> 00:38:25,680
the perspective of spending a six-month

1117
00:38:30,870 --> 00:38:28,240
increment on space station and in 2015 a

1118
00:38:32,550 --> 00:38:30,880
one-year increment

1119
00:38:34,710 --> 00:38:32,560
the human body cannot discern the

1120
00:38:37,109 --> 00:38:34,720
difference between six months on stage

1121
00:38:40,069 --> 00:38:37,119
space station and six months cruise to

1122
00:38:41,750 --> 00:38:40,079
mars if we're going in free fall

1123
00:38:43,750 --> 00:38:41,760
other than radiation

1124
00:38:45,190 --> 00:38:43,760
and we've made measurements with the

1125
00:38:47,109 --> 00:38:45,200
mars science laboratory on the way to

1126
00:38:48,390 --> 00:38:47,119
mars and now on the surface of mars so

1127
00:38:50,150 --> 00:38:48,400
we understand the difference in the

1128
00:38:52,150 --> 00:38:50,160
radiation levels and there's still a lot

1129
00:38:54,550 --> 00:38:52,160
of research to be done there

1130
00:38:55,990 --> 00:38:54,560
but by having many crew members fly on

1131
00:38:58,870 --> 00:38:56,000
these long increments we're learning an

1132
00:39:01,510 --> 00:38:58,880
enormous amount about how the human body

1133
00:39:03,109 --> 00:39:01,520
responds in this unique environment

1134
00:39:04,790 --> 00:39:03,119
and there's you know all kinds of

1135
00:39:06,390 --> 00:39:04,800
different changes of course you know you

1136
00:39:08,390 --> 00:39:06,400
know about the very classical ones you

1137
00:39:09,829 --> 00:39:08,400
know the muscle atrophy the bone loss

1138
00:39:11,990 --> 00:39:09,839

and those things

1139
00:39:14,150 --> 00:39:12,000
and and i think it's incredibly

1140
00:39:15,829 --> 00:39:14,160
important because the same things happen

1141
00:39:17,829 --> 00:39:15,839
here on earth and so when we see that on

1142
00:39:19,990 --> 00:39:17,839
orbit and we learn lessons from it we

1143
00:39:21,349 --> 00:39:20,000
can apply that here on earth there was a

1144
00:39:23,270 --> 00:39:21,359
recent paper

1145
00:39:25,109 --> 00:39:23,280
based on

1146
00:39:27,510 --> 00:39:25,119
the recent results from bone and muscle

1147
00:39:29,030 --> 00:39:27,520
loss that showed and a number of crew

1148
00:39:30,790 --> 00:39:29,040
members very little

1149
00:39:31,910 --> 00:39:30,800
bone degradation

1150
00:39:34,150 --> 00:39:31,920
and i think it's particularly

1151
00:39:35,589 --> 00:39:34,160
interesting that the solution was diet

1152
00:39:37,109 --> 00:39:35,599
and exercise

1153
00:39:39,190 --> 00:39:37,119
you know and you know that's no big

1154
00:39:40,630 --> 00:39:39,200
mystery but we have now the extra you

1155
00:39:42,550 --> 00:39:40,640
talk about medical

1156
00:39:44,550 --> 00:39:42,560
medical device is our

1157
00:39:47,910 --> 00:39:44,560
resistive exercise device

1158
00:39:50,069 --> 00:39:47,920
the international space station it turns

1159
00:39:51,510 --> 00:39:50,079
out you know that this this message that

1160
00:39:54,470 --> 00:39:51,520
we've all been getting especially as

1161
00:39:56,230 --> 00:39:54,480
americans get regular exercise

1162
00:39:58,710 --> 00:39:56,240
we now can do resistive exercise which

1163
00:40:01,829 --> 00:39:58,720

stresses the bones which encourages them

1164
00:40:03,510 --> 00:40:01,839
to rebuild the the calcium matrix

1165
00:40:05,510 --> 00:40:03,520
is working and you need the right

1166
00:40:07,190 --> 00:40:05,520
nutrition that exercise alone isn't

1167
00:40:08,230 --> 00:40:07,200
enough so we're learning these important

1168
00:40:09,829 --> 00:40:08,240
lessons

1169
00:40:11,190 --> 00:40:09,839
i think space nutrition is one of those

1170
00:40:12,870 --> 00:40:11,200
areas that we have to do a lot of work

1171
00:40:15,349 --> 00:40:12,880
on to be able to go to mars and come

1172
00:40:16,950 --> 00:40:15,359
back and certainly to colonize

1173
00:40:18,630 --> 00:40:16,960
and then the instrumentation as well the

1174
00:40:19,750 --> 00:40:18,640
technology end

1175
00:40:21,030 --> 00:40:19,760
and so

1176
00:40:22,309 --> 00:40:21,040
i think that's why you know it's

1177
00:40:25,750 --> 00:40:22,319
critically important that we do this

1178
00:40:27,589 --> 00:40:25,760
research on station and continue it

1179
00:40:29,750 --> 00:40:27,599
i'm going to wrap it up one question

1180
00:40:32,150 --> 00:40:29,760
again i could add a little bit

1181
00:40:33,910 --> 00:40:32,160
also too if you'd like dwayne great this

1182
00:40:36,230 --> 00:40:33,920
is sorry kirsten meyer i could add a

1183
00:40:38,069 --> 00:40:36,240
little bit more too i i'd add on what

1184
00:40:39,670 --> 00:40:38,079
john said that you know we've done a

1185
00:40:41,910 --> 00:40:39,680
pretty good job with bone loss and we

1186
00:40:43,990 --> 00:40:41,920
start to understand how a combination of

1187
00:40:45,990 --> 00:40:44,000
exercise and diet as john described

1188
00:40:47,589 --> 00:40:46,000

works well for space station but but

1189
00:40:49,109 --> 00:40:47,599
then if you think about the packaging

1190
00:40:51,190 --> 00:40:49,119
now for a

1191
00:40:54,069 --> 00:40:51,200
mission to mars you know our current

1192
00:40:56,150 --> 00:40:54,079
resistive exercise device that we use uh

1193
00:40:58,710 --> 00:40:56,160
on board space station is a pretty bulky

1194
00:41:00,870 --> 00:40:58,720
device it's a it's a pretty large device

1195
00:41:02,309 --> 00:41:00,880
and could give us our way we can package

1196
00:41:03,750 --> 00:41:02,319
that device in a little smaller

1197
00:41:06,790 --> 00:41:03,760
footprint that we could actually use on

1198
00:41:08,950 --> 00:41:06,800
a mars class mission so it's not just

1199
00:41:11,030 --> 00:41:08,960
you know overcoming these problems with

1200
00:41:12,790 --> 00:41:11,040
the human adaptation of microgravity but

1201
00:41:14,550 --> 00:41:12,800
it's also how do we package them in a

1202
00:41:16,710 --> 00:41:14,560
unique way that's going to fit inside

1203
00:41:18,870 --> 00:41:16,720
the spacecraft that we take to mars and

1204
00:41:20,790 --> 00:41:18,880
then there's this natural contradiction

1205
00:41:22,390 --> 00:41:20,800
right that that you'd like to go do

1206
00:41:24,870 --> 00:41:22,400
exercise to

1207
00:41:26,790 --> 00:41:24,880
essentially stay fit from both a muscle

1208
00:41:28,550 --> 00:41:26,800
wasting standpoint and also from a bone

1209
00:41:29,589 --> 00:41:28,560
loss standpoint but those

1210
00:41:31,430 --> 00:41:29,599
involve

1211
00:41:33,670 --> 00:41:31,440
use of calories and burning calories

1212
00:41:35,910 --> 00:41:33,680
that requires more food and on a mars

1213
00:41:37,670 --> 00:41:35,920

mission where supplies are tight and how

1214
00:41:39,990 --> 00:41:37,680
much food you carry is a critical

1215
00:41:42,390 --> 00:41:40,000
consideration you know can you do plant

1216
00:41:44,069 --> 00:41:42,400
growth as ellen talked about we need to

1217
00:41:46,069 --> 00:41:44,079
we need to look at this kind of as more

1218
00:41:47,910 --> 00:41:46,079
of a system standpoint where

1219
00:41:49,750 --> 00:41:47,920
the human is really becoming part of the

1220
00:41:51,910 --> 00:41:49,760
spacecraft we even see that onboard

1221
00:41:53,910 --> 00:41:51,920
space station you know we recycle the

1222
00:41:56,069 --> 00:41:53,920
urine onboard space station back into

1223
00:41:57,990 --> 00:41:56,079
drinking water it turned out that the

1224
00:41:59,750 --> 00:41:58,000
bone loss and the calcium loss was

1225
00:42:02,069 --> 00:41:59,760
actually clogging up our urine

1226
00:42:04,069 --> 00:42:02,079
processing system on board space station

1227
00:42:06,470 --> 00:42:04,079
so the human was actually a part of the

1228
00:42:07,349 --> 00:42:06,480
machine so as we go to mars and we try

1229
00:42:10,069 --> 00:42:07,359
to

1230
00:42:11,829 --> 00:42:10,079
eke out every ounce of efficiency from

1231
00:42:13,510 --> 00:42:11,839
both the machine that's taking us there

1232
00:42:15,109 --> 00:42:13,520
and the human that we're transporting we

1233
00:42:17,109 --> 00:42:15,119
need to look at new innovative and

1234
00:42:18,069 --> 00:42:17,119
creative ways to combine that man and

1235
00:42:20,309 --> 00:42:18,079
machine

1236
00:42:21,990 --> 00:42:20,319
into a system that actually operates in

1237
00:42:23,750 --> 00:42:22,000
an extremely efficient manner that keeps

1238
00:42:25,349 --> 00:42:23,760

the human healthy and also the the

1239
00:42:27,430 --> 00:42:25,359
machine that they're traveling in is

1240
00:42:29,430 --> 00:42:27,440
also supported in a good manner so

1241
00:42:31,349 --> 00:42:29,440
station is a tremendous environment for

1242
00:42:33,109 --> 00:42:31,359
us to learn about that and as john

1243
00:42:34,550 --> 00:42:33,119
described pretty eloquently the things

1244
00:42:36,390 --> 00:42:34,560
we're learning on space station have

1245
00:42:38,069 --> 00:42:36,400
direct application to our elderly

1246
00:42:40,230 --> 00:42:38,079
population here on the earth some of the

1247
00:42:43,589 --> 00:42:40,240
things we see bone loss the muscle

1248
00:42:45,190 --> 00:42:43,599
wasting the immune system degradation

1249
00:42:47,430 --> 00:42:45,200
those type of

1250
00:42:49,190 --> 00:42:47,440
things that occur on board space station

1251
00:42:51,109 --> 00:42:49,200
they have direct applications to folks

1252
00:42:52,790 --> 00:42:51,119
here on the earth and and we can start

1253
00:42:55,030 --> 00:42:52,800
learning from our experience on how we

1254
00:42:56,630 --> 00:42:55,040
control them on space station to provide

1255
00:42:59,030 --> 00:42:56,640
some innovative and creative ways for

1256
00:43:01,589 --> 00:42:59,040
folks here on the earth so i think this

1257
00:43:03,670 --> 00:43:01,599
is a tremendously challenging time but

1258
00:43:05,589 --> 00:43:03,680
it's also neat as we push out to mars it

1259
00:43:06,470 --> 00:43:05,599
forces us to learn new things in new

1260
00:43:08,309 --> 00:43:06,480
ways

1261
00:43:09,829 --> 00:43:08,319
station allows us to experiment with

1262
00:43:11,670 --> 00:43:09,839
those and then those ultimately have

1263
00:43:14,230 --> 00:43:11,680

application back to us in here on the

1264
00:43:16,550 --> 00:43:14,240
earth so it's a it's a really nice

1265
00:43:18,870 --> 00:43:16,560
kind of triumvirate of three pieces of

1266
00:43:20,390 --> 00:43:18,880
pushing to mars using station and then

1267
00:43:22,230 --> 00:43:20,400
feeding those results back to people

1268
00:43:24,870 --> 00:43:22,240
here on the earth

1269
00:43:27,190 --> 00:43:24,880
that's question sir in the back

1270
00:43:29,589 --> 00:43:27,200
my name's todd mesaro i'm here uh for

1271
00:43:31,510 --> 00:43:29,599
the travel channel and it's my first

1272
00:43:34,309 --> 00:43:31,520
launch i'm really excited to be here and

1273
00:43:36,550 --> 00:43:34,319
uh and see maven on its 10-month journey

1274
00:43:39,589 --> 00:43:36,560
it's a long trip why is a travel channel

1275
00:43:42,150 --> 00:43:39,599
here some people say well

1276
00:43:44,069 --> 00:43:42,160
maven maven's traveling and maven's

1277
00:43:45,510 --> 00:43:44,079
going to mars and you know mike and

1278
00:43:47,829 --> 00:43:45,520
other people in this room probably want

1279
00:43:50,390 --> 00:43:47,839
to go to mars too

1280
00:43:53,589 --> 00:43:50,400
as a taxpayer i think nasa is an

1281
00:43:55,430 --> 00:43:53,599
astonishing return on bang for buck i

1282
00:43:56,950 --> 00:43:55,440
mean it's just it's remarkable

1283
00:43:58,309 --> 00:43:56,960
everything that's been done on such a

1284
00:44:00,309 --> 00:43:58,319
tiny budget

1285
00:44:02,710 --> 00:44:00,319
and i guess it feels like we're in this

1286
00:44:04,630 --> 00:44:02,720
transition phase with all these private

1287
00:44:06,390 --> 00:44:04,640
ventures into space and people think oh

1288
00:44:08,309 --> 00:44:06,400

yeah richard branson's gonna send people

1289
00:44:10,069 --> 00:44:08,319
up into space you know it's low earth

1290
00:44:12,150 --> 00:44:10,079
orbit it's you know it's just a couple

1291
00:44:14,230 --> 00:44:12,160
of minutes of weightlessness i guess my

1292
00:44:17,109 --> 00:44:14,240
question is is there any sort of

1293
00:44:19,829 --> 00:44:17,119
long-term marketing plan to capture the

1294
00:44:22,309 --> 00:44:19,839
excitement of what nasa is doing and

1295
00:44:24,550 --> 00:44:22,319
sort of translate it into better funding

1296
00:44:26,870 --> 00:44:24,560
because it seems like this comes up all

1297
00:44:28,950 --> 00:44:26,880
the time and reaching outside of this

1298
00:44:31,190 --> 00:44:28,960
room and outside of this people

1299
00:44:34,870 --> 00:44:31,200
in my mind is nasa's biggest challenge

1300
00:44:37,670 --> 00:44:34,880
to secure enough long-term funding to

1301
00:44:41,030 --> 00:44:37,680
make it uh you know make us get allow us

1302
00:44:42,630 --> 00:44:41,040
to get to mars sooner um the last thing

1303
00:44:44,470 --> 00:44:42,640
that in my mind that captured the public

1304
00:44:46,230 --> 00:44:44,480
imagination was chris hadfield singing

1305
00:44:48,790 --> 00:44:46,240
you know ground control to major tom

1306
00:44:50,630 --> 00:44:48,800
that reached outside of all these people

1307
00:44:53,349 --> 00:44:50,640
here who love space

1308
00:44:55,990 --> 00:44:53,359
is there any plan art i know there's uh

1309
00:44:57,750 --> 00:44:56,000
you know there's legisl there's uh

1310
00:44:59,670 --> 00:44:57,760
legal restrictions on lobbying and

1311
00:45:00,630 --> 00:44:59,680
things that nasa can do but is there any

1312
00:45:06,309 --> 00:45:00,640
sort of

1313
00:45:09,589 --> 00:45:06,319

plan to communicate the great excitement

1314
00:45:13,349 --> 00:45:09,599
of everything that nasa does

1315
00:45:17,430 --> 00:45:15,030
okay so now now we know why the travel

1316
00:45:19,030 --> 00:45:17,440
channel is here and so let me just fire

1317
00:45:24,870 --> 00:45:19,040
a question right back best places to eat

1318
00:45:28,790 --> 00:45:26,950
anyway uh i i think it's really cool

1319
00:45:29,829 --> 00:45:28,800
that travel channel is well represented

1320
00:45:34,630 --> 00:45:29,839
here

1321
00:45:37,109 --> 00:45:34,640
you know we don't you know marketing is

1322
00:45:39,430 --> 00:45:37,119
is something that nasa you know doesn't

1323
00:45:41,270 --> 00:45:39,440
really do but we do communicate and we

1324
00:45:44,069 --> 00:45:41,280
do educate and i think that's our

1325
00:45:45,829 --> 00:45:44,079
marketing plan we queue up amazing

1326
00:45:46,950 --> 00:45:45,839
missions and we do it with our partners

1327
00:45:49,109 --> 00:45:46,960
we do it

1328
00:45:52,790 --> 00:45:49,119
for maven with university of colorado

1329
00:45:54,950 --> 00:45:52,800
boulder lasp and all of the partners

1330
00:45:56,790 --> 00:45:54,960
mars curiosity landing

1331
00:45:58,630 --> 00:45:56,800
keep in mind we reached millions and

1332
00:46:02,309 --> 00:45:58,640
millions of people the big screens in

1333
00:46:04,870 --> 00:46:02,319
times square libraries museums

1334
00:46:07,349 --> 00:46:04,880
all the news channels above the fold and

1335
00:46:08,950 --> 00:46:07,359
we do that by cueing up really exciting

1336
00:46:11,030 --> 00:46:08,960
missions whether it's a science mission

1337
00:46:12,470 --> 00:46:11,040
or a human space flight mission

1338
00:46:16,150 --> 00:46:12,480

activities on the international space

1339
00:46:17,750 --> 00:46:16,160
station our technology demonstrations

1340
00:46:19,510 --> 00:46:17,760
you know that's our return to the

1341
00:46:21,829 --> 00:46:19,520
country and

1342
00:46:24,069 --> 00:46:21,839
because they're engaging and exciting

1343
00:46:25,750 --> 00:46:24,079
and especially when we go to mars i

1344
00:46:27,829 --> 00:46:25,760
think that's the marketing plan if you

1345
00:46:29,030 --> 00:46:27,839
will is to continue to provide great

1346
00:46:31,109 --> 00:46:29,040
returns

1347
00:46:32,630 --> 00:46:31,119
the question on budget is one that you

1348
00:46:34,870 --> 00:46:32,640
know you know

1349
00:46:37,030 --> 00:46:34,880
we do as much as we can with the budget

1350
00:46:38,710 --> 00:46:37,040
that we get and that's a much more uh

1351
00:46:39,349 --> 00:46:38,720
complicated question but i do just want

1352
00:46:41,430 --> 00:46:39,359
to

1353
00:46:43,990 --> 00:46:41,440
end with a couple of things uh yesterday

1354
00:46:45,670 --> 00:46:44,000
at uh nasa sho the social event that i

1355
00:46:47,589 --> 00:46:45,680
did and i'm sure it was a similar

1356
00:46:49,270 --> 00:46:47,599
experience for others

1357
00:46:51,349 --> 00:46:49,280
i asked the assembled group who wants to

1358
00:46:53,750 --> 00:46:51,359
go to mars and this isn't something i

1359
00:46:56,470 --> 00:46:53,760
just did yesterday i ask every time i

1360
00:46:57,190 --> 00:46:56,480
address you know a group of kids i was

1361
00:46:59,030 --> 00:46:57,200
in

1362
00:47:01,109 --> 00:46:59,040
nepal and thailand the last two weeks

1363
00:47:02,950 --> 00:47:01,119

and i asked folks there culturally very

1364
00:47:03,990 --> 00:47:02,960
different and i always get the same

1365
00:47:06,630 --> 00:47:04,000
result

1366
00:47:08,550 --> 00:47:06,640
a lot of hands go up and i'll do it now

1367
00:47:09,990 --> 00:47:08,560
to all of you here from from the media

1368
00:47:11,910 --> 00:47:10,000
and the press how many of you would like

1369
00:47:14,870 --> 00:47:11,920
to go to mars

1370
00:47:16,950 --> 00:47:14,880
and lots of hands go up uh frank no

1371
00:47:17,829 --> 00:47:16,960
yeah

1372
00:47:19,670 --> 00:47:17,839
uh

1373
00:47:21,270 --> 00:47:19,680
that's okay but you'll report on your

1374
00:47:23,589 --> 00:47:21,280
report

1375
00:47:25,430 --> 00:47:23,599
and so so i'm just really excited for

1376
00:47:27,510 --> 00:47:25,440
tomorrow's maven launch for our other

1377
00:47:30,309 --> 00:47:27,520
mars missions and just to remind

1378
00:47:32,710 --> 00:47:30,319
everyone uh the curiosity landing was a

1379
00:47:34,630 --> 00:47:32,720
real nail-biter it was exciting but now

1380
00:47:37,270 --> 00:47:34,640
we're roving on the surface we're trying

1381
00:47:38,630 --> 00:47:37,280
to understand look for signs of you know

1382
00:47:40,950 --> 00:47:38,640
past

1383
00:47:42,630 --> 00:47:40,960
you know organic compounds and we've

1384
00:47:44,790 --> 00:47:42,640
already made enormous discoveries there

1385
00:47:46,470 --> 00:47:44,800
that the results just keep on coming out

1386
00:47:48,230 --> 00:47:46,480
and i encourage you to keep following it

1387
00:47:49,910 --> 00:47:48,240
so tomorrow we'll launch maven in about

1388
00:47:51,510 --> 00:47:49,920

10 months start looking for the science

1389
00:47:53,430 --> 00:47:51,520
return because i think we're going to

1390
00:47:54,950 --> 00:47:53,440
learn a lot we're going to answer some

1391
00:47:56,630 --> 00:47:54,960
we're going to unravel some mysteries of

1392
00:47:59,030 --> 00:47:56,640
the universe at least with respect to

1393
00:48:01,349 --> 00:47:59,040
mars and so i hope you will continue

1394
00:48:03,510 --> 00:48:01,359
your travels with us at nasa

1395
00:48:04,790 --> 00:48:03,520
as we get to mars

1396
00:48:06,950 --> 00:48:04,800
so with that ladies and gentlemen let me

1397
00:48:09,829 --> 00:48:06,960
thank bill for joining us in washington

1398
00:48:11,750 --> 00:48:09,839
john mike and ellen ladies and gentlemen

1399
00:48:13,349 --> 00:48:11,760
the uh the message is very clear and you

1400
00:48:14,549 --> 00:48:13,359
heard from these folks

1401
00:48:16,390 --> 00:48:14,559
a mission

1402
00:48:18,470 --> 00:48:16,400
human mission to mars in the 2030s

1403
00:48:21,430 --> 00:48:18,480
there's real progress being made thanks

1404
00:48:22,950 --> 00:48:21,440
to these folks and an incredible team

1405
00:48:25,349 --> 00:48:22,960
the stage is set

1406
00:48:29,190 --> 00:48:25,359
launch coverage begins tomorrow at 11

1407
00:48:31,270 --> 00:48:29,200
a.m at nasa television

1408
00:48:33,109 --> 00:48:31,280
let's go back to mars folks