
MARS
2020
NASA
ZENA CARDMAN

1
00:07:44,070 --> 00:07:42,070
why we explore mars

2
00:07:46,390 --> 00:07:44,080
the mysteries of the red planet the

3
00:07:48,710 --> 00:07:46,400
history of water the possibilities

4
00:07:50,390 --> 00:07:48,720
of life you learn something and then you

5
00:07:51,270 --> 00:07:50,400
design the next mission based on what

6
00:07:53,749 --> 00:07:51,280
you learn

7
00:07:57,189 --> 00:07:53,759
has allowed us to literally go back in

8
00:08:01,350 --> 00:08:00,629
will cover an mars of 176 miles mariner

9
00:08:03,749 --> 00:08:01,360
4 began

10
00:08:04,710 --> 00:08:03,759
transmitting back images the first

11
00:08:07,350 --> 00:08:04,720
photograph

12
00:08:08,070 --> 00:08:07,360
that a human being has ever seen from

13
00:08:11,670 --> 00:08:08,080

the surface

14
00:08:13,990 --> 00:08:11,680
of another planet on august 20th 1975

15
00:08:16,790 --> 00:08:14,000
the first viking spaceship was launched

16
00:08:17,270 --> 00:08:16,800
you were seeing something that no other

17
00:08:20,390 --> 00:08:17,280
human

18
00:08:21,110 --> 00:08:20,400
has ever seen before former seas and

19
00:08:27,749 --> 00:08:21,120
mountains

20
00:08:29,749 --> 00:08:27,759
huge canyons

21
00:08:32,389 --> 00:08:29,759
that sense of wonderment and achievement

22
00:08:36,310 --> 00:08:32,399
and always working towards your goal

23
00:08:43,829 --> 00:08:36,320
we can do and we will do

24
00:08:47,750 --> 00:08:46,790
mars is unavoidably special we've landed

25
00:08:50,870 --> 00:08:47,760
and we've scooted

26
00:08:53,430 --> 00:08:50,880
we've roved we've orbited together

27
00:08:53,990 --> 00:08:53,440
we did it but the attitude was together

28
00:08:56,790 --> 00:08:54,000
we can

29
00:08:57,430 --> 00:08:56,800
do it the future is what you make out of

30
00:09:07,670 --> 00:08:57,440
it

31
00:09:08,630 --> 00:09:07,680
51 years later getting ready to do the

32
00:09:11,590 --> 00:09:08,640
first ever

33
00:09:13,430 --> 00:09:11,600
mars return mission eventually we can

34
00:09:15,829 --> 00:09:13,440
bring those samples back to earth

35
00:09:28,630 --> 00:09:15,839
and determine for the very first time

36
00:09:33,269 --> 00:09:31,750
the countdown to mars is on i'm joshua

37
00:09:34,310 --> 00:09:33,279
santor with nasa communications here at

38
00:09:35,750 --> 00:09:34,320

the kennedy space center

39
00:09:37,350 --> 00:09:35,760
thank you for joining us a special

40
00:09:39,430 --> 00:09:37,360
thanks to our special

41
00:09:41,110 --> 00:09:39,440
guests for the launch of the mars 2020

42
00:09:43,509 --> 00:09:41,120
mission with the perseverance rover

43
00:09:44,790 --> 00:09:43,519
an ingenuity robot or helicopter excuse

44
00:09:47,030 --> 00:09:44,800
me or both robots

45
00:09:48,389 --> 00:09:47,040
um but the first of its kind helicopter

46
00:09:51,110 --> 00:09:48,399
the first to ever be off of

47
00:09:52,870 --> 00:09:51,120
earth there's a ton going on this week

48
00:09:54,230 --> 00:09:52,880
there's so many amazing briefings

49
00:09:55,590 --> 00:09:54,240
um so please i encourage you to check

50
00:09:56,550 --> 00:09:55,600
out what's going on another special

51
00:09:58,710 --> 00:09:56,560
thanks to our

52
00:10:00,550 --> 00:09:58,720
social participants for joining us i've

53
00:10:01,110 --> 00:10:00,560
got a great group here on stage with me

54
00:10:02,550 --> 00:10:01,120
today

55
00:10:04,470 --> 00:10:02,560
and so we're going to keep almost all

56
00:10:05,670 --> 00:10:04,480
this q a we want you to ask your

57
00:10:07,430 --> 00:10:05,680
questions live in the chat and then

58
00:10:09,030 --> 00:10:07,440
we'll try and take those in real time

59
00:10:11,750 --> 00:10:09,040
the countdown to mars really ends in

60
00:10:13,509 --> 00:10:11,760
february as perseverance and ingenuity

61
00:10:14,870 --> 00:10:13,519
touch down safely on the surface of the

62
00:10:16,870 --> 00:10:14,880
red planet

63
00:10:17,990 --> 00:10:16,880

today or excuse me tomorrow morning we

64
00:10:20,710 --> 00:10:18,000
have probably the biggest

65
00:10:22,550 --> 00:10:20,720
moment before we get there the launch on

66
00:10:25,030 --> 00:10:22,560
board an atlas 5 rocket

67
00:10:26,310 --> 00:10:25,040
carrying those two robots up into space

68
00:10:28,790 --> 00:10:26,320
and on the way to mars so

69
00:10:30,550 --> 00:10:28,800
a ton going on we're gonna jump in now

70
00:10:33,190 --> 00:10:30,560
i'm gonna introduce on my right

71
00:10:34,150 --> 00:10:33,200
um nasa administrator jim bridenstine if

72
00:10:35,430 --> 00:10:34,160
you want to give us i'm going to have

73
00:10:36,310 --> 00:10:35,440
everybody give a kind of a brief opening

74
00:10:37,590 --> 00:10:36,320
statement here and then we'll just roll

75
00:10:40,630 --> 00:10:37,600
into questions

76
00:10:42,230 --> 00:10:40,640
absolutely and thank you josh it's great

77
00:10:43,030 --> 00:10:42,240
to be here at the kennedy space center

78
00:10:45,030 --> 00:10:43,040
for yet

79
00:10:47,190 --> 00:10:45,040
another amazing opportunity to launch

80
00:10:49,110 --> 00:10:47,200
something fantastic

81
00:10:51,590 --> 00:10:49,120
there's a couple of things that have

82
00:10:54,710 --> 00:10:51,600
make me very excited about this mission

83
00:10:55,990 --> 00:10:54,720
special importance number one as you

84
00:10:57,750 --> 00:10:56,000
mentioned josh we're going to fly a

85
00:11:00,069 --> 00:10:57,760
helicopter on another world

86
00:11:01,350 --> 00:11:00,079
that has never been done before and if

87
00:11:03,990 --> 00:11:01,360
successful when i said

88
00:11:06,069 --> 00:11:04,000

i should say when it is successful it's

89
00:11:07,430 --> 00:11:06,079
going to transform how we explore

90
00:11:08,949 --> 00:11:07,440
other worlds in the future we're going

91
00:11:11,110 --> 00:11:08,959
to be able to go to multiple

92
00:11:12,630 --> 00:11:11,120
destinations all at the same time on a

93
00:11:15,110 --> 00:11:12,640
single launch

94
00:11:15,990 --> 00:11:15,120
so so proving this capability is is

95
00:11:19,350 --> 00:11:16,000
going to be a

96
00:11:21,590 --> 00:11:19,360
a monumental um kind of capability for

97
00:11:24,069 --> 00:11:21,600
this little agency we call nasa

98
00:11:25,910 --> 00:11:24,079
and also we we need we need to be able

99
00:11:26,550 --> 00:11:25,920
to create oxygen on another world we

100
00:11:28,230 --> 00:11:26,560
have a

101
00:11:29,670 --> 00:11:28,240
directive from the president to go to

102
00:11:31,590 --> 00:11:29,680
mars with humans

103
00:11:33,030 --> 00:11:31,600
plant an american flag there go with

104
00:11:34,790 --> 00:11:33,040
international partners go with

105
00:11:36,150 --> 00:11:34,800
commercial partners

106
00:11:38,230 --> 00:11:36,160
and in order to do that we're going to

107
00:11:39,190 --> 00:11:38,240
need to be able to take the the carbon

108
00:11:42,150 --> 00:11:39,200
dioxide

109
00:11:44,150 --> 00:11:42,160
atmosphere of mars and turn it into pure

110
00:11:46,949 --> 00:11:44,160
oxygen so that we can breathe and so

111
00:11:47,990 --> 00:11:46,959
the moxie technology demonstrator on

112
00:11:50,150 --> 00:11:48,000
this mission

113
00:11:52,790 --> 00:11:50,160

is also very exciting i'm going to turn

114
00:11:55,110 --> 00:11:52,800
it over to an astrobiologist though

115
00:11:56,470 --> 00:11:55,120
xena cardman our astronaut who is in

116
00:11:58,870 --> 00:11:56,480
fact

117
00:12:01,030 --> 00:11:58,880
you know one of the most well-versed

118
00:12:02,389 --> 00:12:01,040
people as far as microbiology that you

119
00:12:03,990 --> 00:12:02,399
can imagine and one day we're going to

120
00:12:05,670 --> 00:12:04,000
send humans to mars and

121
00:12:08,389 --> 00:12:05,680
and she might be one of them that is

122
00:12:09,990 --> 00:12:08,399
doing uh you know biological research on

123
00:12:11,430 --> 00:12:10,000
on the surface of another planet i'll

124
00:12:13,430 --> 00:12:11,440
let her talk about some of the

125
00:12:16,230 --> 00:12:13,440
exciting things regarding our first

126
00:12:18,150 --> 00:12:16,240
mission that is in fact astrobiology

127
00:12:19,430 --> 00:12:18,160
thank you sir yeah xena i'm going to

128
00:12:21,990 --> 00:12:19,440
open by asking you

129
00:12:23,190 --> 00:12:22,000
um obviously as an astronaut like you're

130
00:12:25,110 --> 00:12:23,200
here to explore you're here to go into

131
00:12:26,069 --> 00:12:25,120
space but mars is a different kind of a

132
00:12:27,190 --> 00:12:26,079
mission

133
00:12:29,110 --> 00:12:27,200
how does that strike you like are you

134
00:12:31,030 --> 00:12:29,120
like yeah put me on board let's go or is

135
00:12:33,110 --> 00:12:31,040
there like any sort of reservation there

136
00:12:34,310 --> 00:12:33,120
i'll be ready to go when nasa is ready

137
00:12:36,069 --> 00:12:34,320
to send us it's

138
00:12:37,509 --> 00:12:36,079

you know a really exciting time to be

139
00:12:39,509 --> 00:12:37,519
part of the astronaut office

140
00:12:41,910 --> 00:12:39,519
but it's also a really exciting time to

141
00:12:42,710 --> 00:12:41,920
be a biologist who's interested in space

142
00:12:45,350 --> 00:12:42,720
i mean

143
00:12:46,550 --> 00:12:45,360
i am an earth biologist for now but i

144
00:12:49,269 --> 00:12:46,560
can think of

145
00:12:50,310 --> 00:12:49,279
maybe no more profound question than the

146
00:12:52,150 --> 00:12:50,320
question of

147
00:12:53,910 --> 00:12:52,160
whether there's life on another planet

148
00:12:54,629 --> 00:12:53,920
whether there ever was how did it

149
00:12:56,790 --> 00:12:54,639
originate

150
00:12:57,829 --> 00:12:56,800
and you know this when it touches down

151
00:12:59,750 --> 00:12:57,839
is going to be

152
00:13:01,350 --> 00:12:59,760
the best scientist we've ever sent to

153
00:13:02,310 --> 00:13:01,360
the planet to answer exactly those

154
00:13:03,910 --> 00:13:02,320
questions so

155
00:13:05,670 --> 00:13:03,920
i'm just so excited that i get to be

156
00:13:07,430 --> 00:13:05,680
here to watch awesome yeah

157
00:13:09,190 --> 00:13:07,440
obviously as a biologist you're probably

158
00:13:11,190 --> 00:13:09,200
most interested in the rover

159
00:13:12,310 --> 00:13:11,200
but mr breinstein i'm excited for this

160
00:13:14,150 --> 00:13:12,320
helicopter

161
00:13:15,910 --> 00:13:14,160
i mean like there's something just like

162
00:13:18,150 --> 00:13:15,920
amazing about that idea so

163
00:13:20,230 --> 00:13:18,160

excited for all of it uh and next mr jim

164
00:13:22,550 --> 00:13:20,240
moorhard he's the deputy administrator

165
00:13:23,829 --> 00:13:22,560
for nasa thanks for joining us thanks

166
00:13:26,310 --> 00:13:23,839
josh you know you ask

167
00:13:27,509 --> 00:13:26,320
what what gets me excited first off i

168
00:13:30,470 --> 00:13:27,519
mean look behind

169
00:13:31,269 --> 00:13:30,480
look behind us yeah this thing is ten by

170
00:13:34,310 --> 00:13:31,279
nine feet

171
00:13:35,750 --> 00:13:34,320
seven feet tall and it's about the size

172
00:13:38,069 --> 00:13:35,760
of a mini car

173
00:13:38,949 --> 00:13:38,079
and we're launching this to mars i mean

174
00:13:41,750 --> 00:13:38,959
let's let's

175
00:13:42,310 --> 00:13:41,760
i mean that's pretty exciting in itself

176
00:13:44,790 --> 00:13:42,320
and you

177
00:13:46,470 --> 00:13:44,800
we jim and xena talked about some of the

178
00:13:48,470 --> 00:13:46,480
the things that are on it

179
00:13:50,230 --> 00:13:48,480
but you know what excites me is really

180
00:13:51,670 --> 00:13:50,240
the nasa workforce

181
00:13:53,750 --> 00:13:51,680
you think about it we're in the middle

182
00:13:57,110 --> 00:13:53,760
of a pandemic and

183
00:14:00,150 --> 00:13:57,120
with that you know people have

184
00:14:00,550 --> 00:14:00,160
really stepped up to say the least this

185
00:14:03,670 --> 00:14:00,560
is a

186
00:14:04,629 --> 00:14:03,680
organization compared to the federal

187
00:14:06,790 --> 00:14:04,639
government

188
00:14:08,230 --> 00:14:06,800

but it's still a large organization with

189
00:14:10,069 --> 00:14:08,240
17 000

190
00:14:11,509 --> 00:14:10,079
civil servants as well as many many

191
00:14:14,230 --> 00:14:11,519
contractors

192
00:14:15,509 --> 00:14:14,240
and they came together to make sure that

193
00:14:17,350 --> 00:14:15,519
this mission

194
00:14:20,150 --> 00:14:17,360
because it was essential was going to

195
00:14:22,470 --> 00:14:20,160
happen in the middle of a pandemic

196
00:14:24,230 --> 00:14:22,480
and yes there's always conflict in

197
00:14:26,310 --> 00:14:24,240
organizations that's because of the

198
00:14:27,590 --> 00:14:26,320
arrow each of us have a different human

199
00:14:30,150 --> 00:14:27,600
condition

200
00:14:32,069 --> 00:14:30,160
but with that i didn't see any of that

201
00:14:33,829 --> 00:14:32,079
as we went through this

202
00:14:35,269 --> 00:14:33,839
and we work together as a team and we

203
00:14:37,829 --> 00:14:35,279
continue to

204
00:14:38,389 --> 00:14:37,839
and that's what really excites me so

205
00:14:41,829 --> 00:14:38,399
thank you

206
00:14:42,230 --> 00:14:41,839
being here uh and and finally uh

207
00:14:45,269 --> 00:14:42,240
certainly

208
00:14:46,710 --> 00:14:45,279
last but not least um mr and petro our

209
00:14:48,790 --> 00:14:46,720
deputy administrator here at the kennedy

210
00:14:49,910 --> 00:14:48,800
space center and i'm hoping that you can

211
00:14:51,670 --> 00:14:49,920
tell us a little bit about what

212
00:14:53,350 --> 00:14:51,680
we're about to be photobombed i will um

213
00:14:54,310 --> 00:14:53,360

so tell us why you're excited for mars

214
00:14:56,949 --> 00:14:54,320
and who this is

215
00:14:58,230 --> 00:14:56,959
okay thanks uh josh um let me just start

216
00:15:00,150 --> 00:14:58,240
by saying you know when

217
00:15:01,590 --> 00:15:00,160
2020 came along we thought we were going

218
00:15:03,189 --> 00:15:01,600
to be busy we thought we were going to

219
00:15:04,790 --> 00:15:03,199
have a good year at the kennedy space

220
00:15:06,949 --> 00:15:04,800
center and this week is where

221
00:15:08,790 --> 00:15:06,959
really it's all coming together i'm

222
00:15:10,470 --> 00:15:08,800
super excited that perseverance is going

223
00:15:12,389 --> 00:15:10,480
to be making its planetary

224
00:15:14,389 --> 00:15:12,399
window in the next couple days super

225
00:15:15,829 --> 00:15:14,399
excited for the launch

226
00:15:17,829 --> 00:15:15,839
and then of course over the weekend

227
00:15:20,629 --> 00:15:17,839
we're looking to get bob and doug back

228
00:15:21,590 --> 00:15:20,639
uh here uh and then as you point out uh

229
00:15:23,350 --> 00:15:21,600
uh

230
00:15:25,269 --> 00:15:23,360
for artemis one here's the launch

231
00:15:27,590 --> 00:15:25,279
vehicle stage adapter

232
00:15:28,310 --> 00:15:27,600
floating up on pegasus as we speak for

233
00:15:29,910 --> 00:15:28,320
the sls

234
00:15:32,629 --> 00:15:29,920
program and so those are three different

235
00:15:34,389 --> 00:15:32,639
programs major major events happening

236
00:15:35,430 --> 00:15:34,399
here at the kennedy space center what

237
00:15:37,110 --> 00:15:35,440
what better place

238
00:15:39,430 --> 00:15:37,120

to be i'm incredibly uh proud and

239
00:15:42,069 --> 00:15:39,440
honored for me i just want to say

240
00:15:44,069 --> 00:15:42,079
uh for perseverance that uh helicopter

241
00:15:44,389 --> 00:15:44,079
on mars being a former helicopter pilot

242
00:15:47,670 --> 00:15:44,399
i

243
00:15:49,430 --> 00:15:47,680
that fly thanks josh

244
00:15:50,389 --> 00:15:49,440
awesome good uh so we're gonna jump into

245
00:15:51,269 --> 00:15:50,399
questions here i know we've already had

246
00:15:53,670 --> 00:15:51,279
some coming in

247
00:15:54,949 --> 00:15:53,680
um so i'm gonna just ask this and i'm

248
00:15:56,470 --> 00:15:54,959
gonna kind of just say hey jump in

249
00:15:58,389 --> 00:15:56,480
whoever wants to here

250
00:16:01,189 --> 00:15:58,399
the first one my seven-year-old aspires

251
00:16:03,110 --> 00:16:01,199
to be one of your future mars colonists

252
00:16:05,350 --> 00:16:03,120
she's curious how you foresee your

253
00:16:08,069 --> 00:16:05,360
expectations of human exploration

254
00:16:09,350 --> 00:16:08,079
and astronaut training to change as we

255
00:16:11,350 --> 00:16:09,360
move ahead

256
00:16:13,350 --> 00:16:11,360
will there be more desirable skills for

257
00:16:15,509 --> 00:16:13,360
the mars exploration missions

258
00:16:16,470 --> 00:16:15,519
that she can concentrate on now so xena

259
00:16:17,269 --> 00:16:16,480
you want to take a stab at that one

260
00:16:18,470 --> 00:16:17,279
first

261
00:16:20,550 --> 00:16:18,480
so how do you think astronaut training

262
00:16:22,710 --> 00:16:20,560
will evolve sure well i think one of the

263
00:16:24,470 --> 00:16:22,720

most important things as we're going

264
00:16:26,470 --> 00:16:24,480
farther and farther afield

265
00:16:27,590 --> 00:16:26,480
is learning how to work in space for a

266
00:16:29,590 --> 00:16:27,600
long time

267
00:16:31,590 --> 00:16:29,600
and with that in mind you know if you

268
00:16:32,710 --> 00:16:31,600
look at the newest astronaut class my

269
00:16:34,389 --> 00:16:32,720
class the turtles

270
00:16:36,069 --> 00:16:34,399
we come from so many different

271
00:16:38,629 --> 00:16:36,079
backgrounds you know we have everyone

272
00:16:39,829 --> 00:16:38,639
from military pilots to microbiologists

273
00:16:42,389 --> 00:16:39,839
like myself we have

274
00:16:43,189 --> 00:16:42,399
engineers we have geoscientists so

275
00:16:45,189 --> 00:16:43,199
there's no

276
00:16:47,030 --> 00:16:45,199
single path to becoming an astronaut but

277
00:16:49,509 --> 00:16:47,040
the one thing that we all have in common

278
00:16:50,550 --> 00:16:49,519
is we loved working in teams and you

279
00:16:52,710 --> 00:16:50,560
know being able to

280
00:16:53,829 --> 00:16:52,720
collaborate and work together when you

281
00:16:55,990 --> 00:16:53,839
are stuck

282
00:16:57,430 --> 00:16:56,000
in in a vehicle you know far away from

283
00:16:58,790 --> 00:16:57,440
your home planet for a long time is

284
00:17:00,710 --> 00:16:58,800
really important so

285
00:17:02,870 --> 00:17:00,720
whatever you do just follow your passion

286
00:17:05,029 --> 00:17:02,880
but you know be able to work with people

287
00:17:05,750 --> 00:17:05,039
and collaborate so before you step back

288
00:17:07,590 --> 00:17:05,760

i know that

289
00:17:09,909 --> 00:17:07,600
every astronaut class gets a nickname

290
00:17:11,829 --> 00:17:09,919
and you just said yours was the turtles

291
00:17:12,710 --> 00:17:11,839
are those all inside stories or is that

292
00:17:13,270 --> 00:17:12,720
something that you can share with us

293
00:17:15,270 --> 00:17:13,280
briefly

294
00:17:17,510 --> 00:17:15,280
yeah so the tradition is that the

295
00:17:18,150 --> 00:17:17,520
previous class names the incoming class

296
00:17:20,390 --> 00:17:18,160
and

297
00:17:21,590 --> 00:17:20,400
uh the inspiration for ours was actually

298
00:17:24,309 --> 00:17:21,600
at our class announcement

299
00:17:26,549 --> 00:17:24,319
and vice president pence was there he

300
00:17:29,029 --> 00:17:26,559
told an anecdote from his childhood

301
00:17:30,789 --> 00:17:29,039
an idiom where you know if you if you

302
00:17:32,150 --> 00:17:30,799
see a turtle on a fence post you know he

303
00:17:34,710 --> 00:17:32,160
didn't get there alone

304
00:17:36,310 --> 00:17:34,720
and the you know the sentiment behind

305
00:17:38,310 --> 00:17:36,320
this is that

306
00:17:39,350 --> 00:17:38,320
anyone that you see on this stage today

307
00:17:41,430 --> 00:17:39,360
didn't get there alone

308
00:17:42,870 --> 00:17:41,440
it's thanks to the family members the

309
00:17:44,950 --> 00:17:42,880
mentors the teachers

310
00:17:46,870 --> 00:17:44,960
everyone who worked hard to help us get

311
00:17:48,310 --> 00:17:46,880
there and so it was with that in mind

312
00:17:49,909 --> 00:17:48,320
that we were named the turtles awesome

313
00:17:50,950 --> 00:17:49,919

yeah so nothing derogatory there that is

314
00:17:52,630 --> 00:17:50,960
all good news

315
00:17:53,590 --> 00:17:52,640
thanks for sharing that thank you um

316
00:17:55,110 --> 00:17:53,600
anybody else want to jump in on

317
00:17:57,270 --> 00:17:55,120
astronauts or we can keep moving

318
00:17:58,310 --> 00:17:57,280
um how does perseverance different from

319
00:18:00,470 --> 00:17:58,320
curiosity

320
00:18:02,150 --> 00:18:00,480
in the types of science it will perform

321
00:18:04,230 --> 00:18:02,160
there was a similar question about the

322
00:18:08,549 --> 00:18:04,240
landing is the landing sequence the same

323
00:18:13,270 --> 00:18:10,630
so a lot of the technology on the

324
00:18:14,710 --> 00:18:13,280
vehicle of course is is very similar

325
00:18:16,870 --> 00:18:14,720
i will tell you that it's even more

326
00:18:18,150 --> 00:18:16,880
advanced than it was on curiosity

327
00:18:20,549 --> 00:18:18,160
um and we have some different

328
00:18:22,310 --> 00:18:20,559
technologies so we're going to have even

329
00:18:24,710 --> 00:18:22,320
better cameras we're going to have

330
00:18:25,510 --> 00:18:24,720
even better spectroscopy so we're going

331
00:18:27,510 --> 00:18:25,520
to be looking

332
00:18:28,950 --> 00:18:27,520
at the you know the the sediment the

333
00:18:30,950 --> 00:18:28,960
soil and and

334
00:18:32,549 --> 00:18:30,960
and and shooting light into it in in

335
00:18:34,549 --> 00:18:32,559
different wavelengths and

336
00:18:35,909 --> 00:18:34,559
depending on you know what comes back

337
00:18:37,669 --> 00:18:35,919
and what gets absorbed we can make

338
00:18:38,710 --> 00:18:37,679

determinations as to what the chemical

339
00:18:41,350 --> 00:18:38,720
composition

340
00:18:42,870 --> 00:18:41,360
of the soils and sediments are and then

341
00:18:45,029 --> 00:18:42,880
compare that to

342
00:18:46,070 --> 00:18:45,039
what we know is true of soils and

343
00:18:48,470 --> 00:18:46,080
sediments that

344
00:18:50,070 --> 00:18:48,480
had ancient life here on earth and make

345
00:18:50,390 --> 00:18:50,080
a determination whether we think maybe

346
00:18:53,909 --> 00:18:50,400
or

347
00:18:56,230 --> 00:18:53,919
maybe not there was ancient life on mars

348
00:18:57,350 --> 00:18:56,240
so i think that's a very exciting

349
00:18:59,669 --> 00:18:57,360
capability

350
00:19:00,470 --> 00:18:59,679
um it's just kind of a next generation

351
00:19:03,190 --> 00:19:00,480
kind of uh

352
00:19:04,950 --> 00:19:03,200
capability that obviously we've been

353
00:19:06,310 --> 00:19:04,960
doing spectroscopy for a long time but

354
00:19:07,830 --> 00:19:06,320
it's just becoming better and better and

355
00:19:09,590 --> 00:19:07,840
more advanced

356
00:19:11,590 --> 00:19:09,600
but i think the big things are we're

357
00:19:13,350 --> 00:19:11,600
going to some other things

358
00:19:15,110 --> 00:19:13,360
we're going to cash samples for an

359
00:19:16,710 --> 00:19:15,120
eventual return which we've never done

360
00:19:17,830 --> 00:19:16,720
before so when we make an assessment

361
00:19:21,669 --> 00:19:17,840
that we think that hey

362
00:19:24,230 --> 00:19:21,679
maybe there was life here in an ancient

363
00:19:25,350 --> 00:19:24,240

mars we can cash a sample for an

364
00:19:27,669 --> 00:19:25,360
eventual

365
00:19:29,990 --> 00:19:27,679
mars return mission which we would like

366
00:19:32,070 --> 00:19:30,000
to launch in 2026 and we're working on

367
00:19:35,909 --> 00:19:32,080
that in our budget right now

368
00:19:38,070 --> 00:19:35,919
so caching samples spectroscopy

369
00:19:40,070 --> 00:19:38,080
cameras but but also of course there's

370
00:19:41,750 --> 00:19:40,080
the moxie uh

371
00:19:43,270 --> 00:19:41,760
tech demonstrator which is going to say

372
00:19:44,870 --> 00:19:43,280
hey we're going to turn the carbon

373
00:19:47,270 --> 00:19:44,880
dioxide into oxygen

374
00:19:49,669 --> 00:19:47,280
the helicopter all these things are i

375
00:19:50,789 --> 00:19:49,679
think extremely exciting and unique

376
00:19:53,590 --> 00:19:50,799
and the other thing is we're going to a

377
00:19:53,830 --> 00:19:53,600
different location the the jezero crater

378
00:19:56,470 --> 00:19:53,840
is

379
00:19:57,750 --> 00:19:56,480
we haven't studied it yet it's a it's a

380
00:20:02,789 --> 00:19:57,760
lake bed

381
00:20:04,230 --> 00:20:02,799
and and right there where the river

382
00:20:05,430 --> 00:20:04,240
flows into the lake bed there's a big

383
00:20:07,110 --> 00:20:05,440
delta

384
00:20:08,870 --> 00:20:07,120
and what do we know about life on earth

385
00:20:10,870 --> 00:20:08,880
well if there's if there's a river

386
00:20:12,310 --> 00:20:10,880
with a lake bed there's a good chance

387
00:20:14,230 --> 00:20:12,320
there's life there on earth

388
00:20:15,430 --> 00:20:14,240

the question is might that have been

389
00:20:17,430 --> 00:20:15,440
true um

390
00:20:19,029 --> 00:20:17,440
on you know on an ancient mars and

391
00:20:20,789 --> 00:20:19,039
that's really i think that the big thing

392
00:20:24,549 --> 00:20:20,799
that we need to go and discover

393
00:20:25,590 --> 00:20:24,559
awesome yeah not running water um but

394
00:20:27,270 --> 00:20:25,600
we're hoping there's going to be water

395
00:20:28,070 --> 00:20:27,280
well it's it's it's dry enough right now

396
00:20:28,870 --> 00:20:28,080
yeah yeah

397
00:20:30,950 --> 00:20:28,880
people don't think that we actually

398
00:20:31,909 --> 00:20:30,960
found like actual running water right um

399
00:20:33,830 --> 00:20:31,919
but we do know

400
00:20:35,669 --> 00:20:33,840
yes based on there was yeah there was

401
00:20:37,350 --> 00:20:35,679
running water and there very well could

402
00:20:40,390 --> 00:20:37,360
be liquid water under the surface of

403
00:20:41,990 --> 00:20:40,400
mars even today yep hoping for it yep

404
00:20:43,669 --> 00:20:42,000
if i could add to that jim you know the

405
00:20:44,549 --> 00:20:43,679
other part of this is the entry descent

406
00:20:47,270 --> 00:20:44,559
landing

407
00:20:48,789 --> 00:20:47,280
which is really the most difficult part

408
00:20:51,190 --> 00:20:48,799
of this mission

409
00:20:53,350 --> 00:20:51,200
and i say that many have heard it we

410
00:20:57,110 --> 00:20:53,360
call it the seven minutes of terror

411
00:21:00,950 --> 00:20:57,120
because we really lose any communication

412
00:21:01,669 --> 00:21:00,960
with the rover and but with that we've

413
00:21:03,909 --> 00:21:01,679

set it up

414
00:21:06,310 --> 00:21:03,919
for the rover to be autonomous and for

415
00:21:09,110 --> 00:21:06,320
the first time we're gonna have cameras

416
00:21:10,710 --> 00:21:09,120
on the rover as it descends and it's

417
00:21:12,390 --> 00:21:10,720
gonna be able to watch and see the

418
00:21:13,990 --> 00:21:12,400
parachutes deploy

419
00:21:15,830 --> 00:21:14,000
it's gonna where it's also gonna have

420
00:21:17,750 --> 00:21:15,840
micro two microphones so we're gonna be

421
00:21:20,470 --> 00:21:17,760
able to hear what it sounds like

422
00:21:21,990 --> 00:21:20,480
to descend into mars and we're gonna be

423
00:21:23,909 --> 00:21:22,000
able to use that

424
00:21:25,350 --> 00:21:23,919
in the future when we have astronauts

425
00:21:28,230 --> 00:21:25,360
going to mars so we are

426
00:21:29,669 --> 00:21:28,240
safely can land but there's there's also

427
00:21:33,909 --> 00:21:29,679
more to it i mean

428
00:21:36,950 --> 00:21:33,919
it's not obviously it's not easy

429
00:21:37,669 --> 00:21:36,960
to do that part of it but what we're

430
00:21:41,110 --> 00:21:37,679
doing is

431
00:21:45,270 --> 00:21:41,120
we've already mapped mars

432
00:21:47,430 --> 00:21:45,280
a lot and so as this mission comes down

433
00:21:48,310 --> 00:21:47,440
it's going to be taking pictures and

434
00:21:51,430 --> 00:21:48,320
comparing it

435
00:21:52,870 --> 00:21:51,440
with the current pictures that we have

436
00:21:55,110 --> 00:21:52,880
and so we're going to make sure that

437
00:21:57,669 --> 00:21:55,120
we're going to land in a safe place

438
00:21:59,110 --> 00:21:57,679

by these comparisons and that too i

439
00:22:01,510 --> 00:21:59,120
think is going to be a new effort

440
00:22:02,870 --> 00:22:01,520
that we haven't seen before yeah when we

441
00:22:05,029 --> 00:22:02,880
talk about the landing sequence

442
00:22:06,549 --> 00:22:05,039
i want to make sure to remind everybody

443
00:22:08,950 --> 00:22:06,559
that it's that size

444
00:22:09,830 --> 00:22:08,960
that's not a that's not an inflation

445
00:22:12,630 --> 00:22:09,840
that's not

446
00:22:13,510 --> 00:22:12,640
that's the actual size of perseverance

447
00:22:17,430 --> 00:22:13,520
and so that thing

448
00:22:20,070 --> 00:22:17,440
is is folded up and it's inside the

449
00:22:21,990 --> 00:22:20,080
the fairing of the atlas v ready to

450
00:22:23,350 --> 00:22:22,000
deploy itself autonomously so this is

451
00:22:25,669 --> 00:22:23,360
rocket science and it is

452
00:22:26,549 --> 00:22:25,679
awesome um yeah you want to jump in

453
00:22:29,110 --> 00:22:26,559
there and i'm going to also

454
00:22:29,750 --> 00:22:29,120
have tossed this question to you as well

455
00:22:31,350 --> 00:22:29,760
of

456
00:22:33,270 --> 00:22:31,360
i'm still in high school and my school

457
00:22:35,110 --> 00:22:33,280
doesn't offer astronomy classes

458
00:22:37,270 --> 00:22:35,120
what types of classes would be good to

459
00:22:39,190 --> 00:22:37,280
take to to take to help prepare myself

460
00:22:40,789 --> 00:22:39,200
for astronomy overall

461
00:22:42,950 --> 00:22:40,799
um so to answer that question in high

462
00:22:43,350 --> 00:22:42,960
school i would focus on the science and

463
00:22:45,190 --> 00:22:43,360

math

464
00:22:46,390 --> 00:22:45,200
right anything you can do to study in

465
00:22:48,710 --> 00:22:46,400
the science and math

466
00:22:50,789 --> 00:22:48,720
areas is going to help you out um you

467
00:22:53,029 --> 00:22:50,799
know for astronomy or any of the other

468
00:22:54,310 --> 00:22:53,039
sciences but i did want to add to what

469
00:22:55,990 --> 00:22:54,320
jim said about the sev

470
00:22:57,669 --> 00:22:56,000
the seven minutes of terror you know in

471
00:22:59,110 --> 00:22:57,679
the microphone um

472
00:23:00,310 --> 00:22:59,120
and so this time we'll be able to hear

473
00:23:01,430 --> 00:23:00,320
it and we'll be able to see it as it

474
00:23:04,789 --> 00:23:01,440
comes down

475
00:23:06,950 --> 00:23:04,799
i saw a youtube link it was a great uh

476
00:23:07,990 --> 00:23:06,960
and it was a pretty short 15 minute

477
00:23:10,630 --> 00:23:08,000
video put together

478
00:23:11,029 --> 00:23:10,640
by jpl and it talked about the history

479
00:23:12,870 --> 00:23:11,039
of

480
00:23:14,870 --> 00:23:12,880
mars or mars 20 years i think it's what

481
00:23:16,149 --> 00:23:14,880
it's called and it's an incredible video

482
00:23:18,149 --> 00:23:16,159
if you if you think you're going to be

483
00:23:20,149 --> 00:23:18,159
excited tomorrow about the launch

484
00:23:22,230 --> 00:23:20,159
next february when that thing lands you

485
00:23:23,590 --> 00:23:22,240
can see the excitement of the landing

486
00:23:26,149 --> 00:23:23,600
from all the previous

487
00:23:28,549 --> 00:23:26,159
other rovers that landed um and and the

488
00:23:30,470 --> 00:23:28,559

teams within the jpl uh control centers

489
00:23:32,149 --> 00:23:30,480
and just the emotion people crying

490
00:23:33,430 --> 00:23:32,159
jumping up and down and so i encourage

491
00:23:34,549 --> 00:23:33,440
everybody to read about that it's a

492
00:23:36,390 --> 00:23:34,559
great history of

493
00:23:37,909 --> 00:23:36,400
all of what nasa's done over the past 20

494
00:23:39,510 --> 00:23:37,919
years of mars yeah

495
00:23:41,110 --> 00:23:39,520
and you might be surprised to hear that

496
00:23:43,190 --> 00:23:41,120
there's tears involved but when you've

497
00:23:45,029 --> 00:23:43,200
dedicated literally your entire career

498
00:23:46,310 --> 00:23:45,039
uh it's pretty incredible there are some

499
00:23:46,950 --> 00:23:46,320
people who have dedicated 20 years of

500
00:23:49,110 --> 00:23:46,960
their life

501
00:23:51,029 --> 00:23:49,120
to the landing sequence itself um so

502
00:23:52,870 --> 00:23:51,039
seven minutes has been their life's work

503
00:23:54,390 --> 00:23:52,880
um so it's a big deal when that goes

504
00:23:56,070 --> 00:23:54,400
well um and they are

505
00:23:57,510 --> 00:23:56,080
all of those are tears of joy um that's

506
00:23:59,029 --> 00:23:57,520
what we're hoping for because again the

507
00:24:00,870 --> 00:23:59,039
countdown to mars does not end

508
00:24:03,269 --> 00:24:00,880
tomorrow the countdown to mars ends in

509
00:24:04,630 --> 00:24:03,279
february so stay tuned after the launch

510
00:24:06,390 --> 00:24:04,640
all right a couple more questions before

511
00:24:08,310 --> 00:24:06,400
we got to sign off here uh

512
00:24:09,669 --> 00:24:08,320
what's the life expectancy of

513
00:24:13,350 --> 00:24:09,679

perseverance

514
00:24:14,310 --> 00:24:13,360
and uh there was one more um

515
00:24:16,070 --> 00:24:14,320
what's kind of like the overall

516
00:24:20,789 --> 00:24:16,080
messaging what's what's the one or two

517
00:24:24,310 --> 00:24:23,510
so the design life of perseverance is a

518
00:24:26,470 --> 00:24:24,320
year and a half

519
00:24:29,110 --> 00:24:26,480
which is a lot longer than curiosity we

520
00:24:31,350 --> 00:24:29,120
designed curiosity to last for one year

521
00:24:33,669 --> 00:24:31,360
the great thing is though these robots

522
00:24:36,149 --> 00:24:33,679
all live longer than their design lives

523
00:24:38,070 --> 00:24:36,159
so um the question is how long will it

524
00:24:41,029 --> 00:24:38,080
last uh it's it's unknown

525
00:24:41,990 --> 00:24:41,039
you know we we designed um spirit and

526
00:24:43,669 --> 00:24:42,000
opportunity to

527
00:24:46,149 --> 00:24:43,679
to last for a matter of months i think

528
00:24:48,630 --> 00:24:46,159
it was a 90 days

529
00:24:50,549 --> 00:24:48,640
90 days and they ended up lasting 10 and

530
00:24:52,390 --> 00:24:50,559
15 years and delivering more science

531
00:24:54,149 --> 00:24:52,400
than anybody ever imagined

532
00:24:55,669 --> 00:24:54,159
so the return on investment if we go

533
00:24:57,990 --> 00:24:55,679
beyond a year and a half

534
00:24:59,269 --> 00:24:58,000
is going to be fantastic it's fantastic

535
00:24:59,830 --> 00:24:59,279
even if we can make it to a year and a

536
00:25:02,149 --> 00:24:59,840
half but

537
00:25:03,830 --> 00:25:02,159
it's designed for a year and a half um

538
00:25:05,430 --> 00:25:03,840

and then uh if we go beyond that we're

539
00:25:07,909 --> 00:25:05,440
going to be ecstatic and you know if

540
00:25:08,710 --> 00:25:07,919
it it very well could last 15 or 20

541
00:25:10,470 --> 00:25:08,720
years

542
00:25:11,590 --> 00:25:10,480
awesome and so if you had to pick one

543
00:25:12,549 --> 00:25:11,600
i'm going to make you i'm going to pick

544
00:25:14,230 --> 00:25:12,559
a favorite like

545
00:25:15,750 --> 00:25:14,240
of the science on board what's what's

546
00:25:17,190 --> 00:25:15,760
the one science piece that you're the

547
00:25:19,110 --> 00:25:17,200
most interested in i want to see a

548
00:25:20,950 --> 00:25:19,120
helicopter fly in another world and if

549
00:25:22,789 --> 00:25:20,960
we can make that was that was really my

550
00:25:25,029 --> 00:25:22,799
one of my first initiatives as the nasa

551
00:25:26,390 --> 00:25:25,039
administrator was to make that happen

552
00:25:28,149 --> 00:25:26,400
and i know a lot of people jumped

553
00:25:29,830 --> 00:25:28,159
through a lot of hoops um

554
00:25:31,590 --> 00:25:29,840
and maybe some people weren't ecstatic

555
00:25:33,029 --> 00:25:31,600
about it at the time but dang it they

556
00:25:33,590 --> 00:25:33,039
made it happen and now we're gonna get

557
00:25:36,070 --> 00:25:33,600
to see it

558
00:25:37,190 --> 00:25:36,080
realized cool yeah awesome xena what's

559
00:25:38,390 --> 00:25:37,200
if you had to pick one

560
00:25:40,710 --> 00:25:38,400
as a biologist i'm sure this is

561
00:25:42,549 --> 00:25:40,720
difficult it's impossible but i think

562
00:25:44,390 --> 00:25:42,559
i'm most excited for the chance of

563
00:25:45,029 --> 00:25:44,400

sample return you know this rover is

564
00:25:47,110 --> 00:25:45,039
going to be

565
00:25:48,870 --> 00:25:47,120
going around caching samples collecting

566
00:25:50,950 --> 00:25:48,880
them from different locations

567
00:25:52,230 --> 00:25:50,960
and that's the first leg of a round-trip

568
00:25:54,310 --> 00:25:52,240
journey

569
00:25:55,990 --> 00:25:54,320
that's a first and that is phenomenal

570
00:25:57,830 --> 00:25:56,000
the chance to see actual

571
00:25:59,590 --> 00:25:57,840
martian samples back here on earth oh

572
00:26:00,390 --> 00:25:59,600
man i'm really really excited to see

573
00:26:01,830 --> 00:26:00,400
where that goes

574
00:26:03,269 --> 00:26:01,840
cool yeah when we say caching what we're

575
00:26:04,230 --> 00:26:03,279
talking about is they're actually i

576
00:26:06,630 --> 00:26:04,240
think it's 43

577
00:26:07,830 --> 00:26:06,640
tubes they're these small tubes that uh

578
00:26:10,630 --> 00:26:07,840
perseverance will

579
00:26:11,830 --> 00:26:10,640
put samples in and deploy and then those

580
00:26:13,269 --> 00:26:11,840
will be left behind

581
00:26:15,430 --> 00:26:13,279
for a future mission to come and pick

582
00:26:16,870 --> 00:26:15,440
those up and actually launch off of mars

583
00:26:18,950 --> 00:26:16,880
to come back to earth

584
00:26:20,390 --> 00:26:18,960
again it's rocket scientist it's rocket

585
00:26:21,269 --> 00:26:20,400
science it's very difficult but it's

586
00:26:25,590 --> 00:26:21,279
amazing

587
00:26:27,029 --> 00:26:25,600
um all right oh let's continue sorry i

588
00:26:29,350 --> 00:26:27,039

i didn't i didn't finish that thought so

589
00:26:31,029 --> 00:26:29,360
mr morehard no you know honestly the one

590
00:26:34,470 --> 00:26:31,039
that really gets me excited

591
00:26:37,510 --> 00:26:34,480
is moxie and this is about converting

592
00:26:39,269 --> 00:26:37,520
carbon dioxide into oxygen well why does

593
00:26:42,710 --> 00:26:39,279
what does that matter well the reality

594
00:26:45,669 --> 00:26:42,720
is that the atmosphere of mars is 95

595
00:26:47,110 --> 00:26:45,679
carbon dioxide and xena is going to need

596
00:26:50,149 --> 00:26:47,120
to breathe

597
00:26:51,029 --> 00:26:50,159
and you know what it really gets down to

598
00:26:54,230 --> 00:26:51,039
is you're taking

599
00:26:56,549 --> 00:26:54,240
carbon dioxide is co2 carbon

600
00:26:57,909 --> 00:26:56,559
and two molecules of oxygen we're going

601
00:27:01,750 --> 00:26:57,919
to borrow

602
00:27:03,590 --> 00:27:01,760
one molecule of oxygen and make it pure

603
00:27:04,549 --> 00:27:03,600
oxygen so that the astronauts can

604
00:27:07,029 --> 00:27:04,559
breathe

605
00:27:08,149 --> 00:27:07,039
so important we can't do this mission to

606
00:27:10,149 --> 00:27:08,159
get as

607
00:27:11,590 --> 00:27:10,159
as the president has directed us to get

608
00:27:14,710 --> 00:27:11,600
astronauts to land

609
00:27:16,950 --> 00:27:14,720
on mars we can't do it

610
00:27:17,750 --> 00:27:16,960
unless we've figured this out so i look

611
00:27:19,750 --> 00:27:17,760
forward to seeing

612
00:27:22,870 --> 00:27:19,760
how that the results of that yeah

613
00:27:26,549 --> 00:27:24,870

so i already said uh ingenuity the

614
00:27:28,630 --> 00:27:26,559
helicopter is cool i also think the

615
00:27:30,710 --> 00:27:28,640
sample return and i have to also

616
00:27:32,389 --> 00:27:30,720
uh that jim mentioned moxie because we

617
00:27:33,750 --> 00:27:32,399
had people at ksc work on that

618
00:27:35,750 --> 00:27:33,760
technology so i got to say that or a

619
00:27:37,269 --> 00:27:35,760
little get mad at me

620
00:27:39,029 --> 00:27:37,279
yeah represent all right so we're just

621
00:27:40,149 --> 00:27:39,039
about time but let me open it up for any

622
00:27:41,269 --> 00:27:40,159
last thoughts or comments things you

623
00:27:44,870 --> 00:27:41,279
want to leave people with

624
00:27:47,510 --> 00:27:44,880
as we are about 15 hours

625
00:27:47,990 --> 00:27:47,520
away from liftoff give or take is that

626
00:27:52,230 --> 00:27:48,000
math right

627
00:27:54,630 --> 00:27:52,240
i think that's close yeah so just a

628
00:27:56,470 --> 00:27:54,640
final thought you know this uh planetary

629
00:27:57,990 --> 00:27:56,480
science robotic mission

630
00:27:59,669 --> 00:27:58,000
is really really important for the

631
00:28:00,950 --> 00:27:59,679
future of human space flight you know

632
00:28:02,789 --> 00:28:00,960
we've been doing

633
00:28:05,110 --> 00:28:02,799
robotic science missions for an awful

634
00:28:06,149 --> 00:28:05,120
long time every time we go out there we

635
00:28:07,590 --> 00:28:06,159
learn something

636
00:28:10,230 --> 00:28:07,600
we take what we've learned we

637
00:28:12,230 --> 00:28:10,240
demonstrate technologies that we can

638
00:28:14,070 --> 00:28:12,240

turn around and use to further the

639
00:28:15,590 --> 00:28:14,080
future of human space flight going out

640
00:28:16,070 --> 00:28:15,600
there which i think is ultimately our

641
00:28:19,510 --> 00:28:16,080
goal

642
00:28:22,789 --> 00:28:19,520
to get xena on that surface of mars yeah

643
00:28:26,630 --> 00:28:25,750
you know it gets down to why are we here

644
00:28:28,789 --> 00:28:26,640
we're here to

645
00:28:30,389 --> 00:28:28,799
improve the human condition of all

646
00:28:32,789 --> 00:28:30,399
people on earth

647
00:28:36,470 --> 00:28:32,799
that's why nasa was set up and we

648
00:28:38,149 --> 00:28:36,480
continue to continue with that mission

649
00:28:41,190 --> 00:28:38,159
and i just hope everyone will keep that

650
00:28:43,269 --> 00:28:41,200
in mind we know we have a lot going on

651
00:28:45,190 --> 00:28:43,279
right now in the planet i hope will

652
00:28:47,909 --> 00:28:45,200
provide hope to others

653
00:28:49,269 --> 00:28:47,919
but also inspire the next generation so

654
00:28:53,510 --> 00:28:49,279
we can continue

655
00:28:54,870 --> 00:28:53,520
because we are a species of explorers

656
00:28:57,350 --> 00:28:54,880
i think those two comments just go hand

657
00:28:58,870 --> 00:28:57,360
in hand so well of of not only

658
00:29:00,389 --> 00:28:58,880
is this what we're about but this is

659
00:29:01,669 --> 00:29:00,399
also everything ties together

660
00:29:03,430 --> 00:29:01,679
is that it's easy to look at any one of

661
00:29:05,190 --> 00:29:03,440
these things as a really cool thing

662
00:29:07,029 --> 00:29:05,200
but ultimately each of these things ties

663
00:29:08,549 --> 00:29:07,039

into a bigger story that all makes sense

664
00:29:09,510 --> 00:29:08,559
if you if you really kind of dig into it

665
00:29:10,789 --> 00:29:09,520
and kind of

666
00:29:12,389 --> 00:29:10,799
take time to really learn about what's

667
00:29:13,269 --> 00:29:12,399
going on so appreciate those comments

668
00:29:15,750 --> 00:29:13,279
xena

669
00:29:17,750 --> 00:29:15,760
any last thoughts comments yeah it's

670
00:29:19,269 --> 00:29:17,760
such an exciting time for anybody who's

671
00:29:20,870 --> 00:29:19,279
interested in space but

672
00:29:22,470 --> 00:29:20,880
it's also an exciting time for anyone

673
00:29:24,470 --> 00:29:22,480
interested in earth i think

674
00:29:26,389 --> 00:29:24,480
one of the most important parts of doing

675
00:29:27,990 --> 00:29:26,399
these missions is what we learn about

676
00:29:29,590 --> 00:29:28,000
our own planet and our place in the

677
00:29:31,269 --> 00:29:29,600
solar system and

678
00:29:32,389 --> 00:29:31,279
you know how to how to learn about our

679
00:29:33,990 --> 00:29:32,399
history and how to learn about our

680
00:29:37,669 --> 00:29:34,000
future it's really exciting

681
00:29:40,149 --> 00:29:37,679
yeah awesome well said mr breinstein

682
00:29:42,870 --> 00:29:40,159
yeah i'll just piggyback on on what zena

683
00:29:45,190 --> 00:29:42,880
said we know that mars at one time was

684
00:29:46,470 --> 00:29:45,200
covered in liquid water we know that not

685
00:29:47,750 --> 00:29:46,480
entirely but it but

686
00:29:49,909 --> 00:29:47,760
you know two thirds of the northern

687
00:29:51,750 --> 00:29:49,919
hemisphere was covered in liquid water

688
00:29:53,510 --> 00:29:51,760

we know that it had you know a thick

689
00:29:55,269 --> 00:29:53,520
atmosphere and a magnetosphere that

690
00:29:56,149 --> 00:29:55,279
protected it from the radiation of deep

691
00:29:57,909 --> 00:29:56,159
space

692
00:30:00,230 --> 00:29:57,919
and then three billion years ago it very

693
00:30:03,269 --> 00:30:00,240
rapidly changed and the question is

694
00:30:05,029 --> 00:30:03,279
what caused that rapid change and and as

695
00:30:06,789 --> 00:30:05,039
xena said could this help us get a

696
00:30:08,230 --> 00:30:06,799
better understanding of our own planet

697
00:30:09,750 --> 00:30:08,240
based on studying

698
00:30:11,909 --> 00:30:09,760
you know this planet that used to be a

699
00:30:14,389 --> 00:30:11,919
lot like earth and has fundamentally

700
00:30:15,190 --> 00:30:14,399
transformed to being now what we believe

701
00:30:18,310 --> 00:30:15,200
to be

702
00:30:19,909 --> 00:30:18,320
uninhabitable at least by by what we

703
00:30:21,430 --> 00:30:19,919
know today but of course we're seeing

704
00:30:22,789 --> 00:30:21,440
that maybe at one time in the ancient

705
00:30:24,230 --> 00:30:22,799
past it was

706
00:30:26,310 --> 00:30:24,240
we know it was habitable was it

707
00:30:28,470 --> 00:30:26,320
inhabited and could there even be life

708
00:30:31,669 --> 00:30:28,480
under the surface today so these are all

709
00:30:33,990 --> 00:30:31,679
important discoveries um uh but look

710
00:30:35,269 --> 00:30:34,000
we're going to mars and it can't be lost

711
00:30:37,590 --> 00:30:35,279
on people at

712
00:30:39,269 --> 00:30:37,600
at how unique of an opportunity this is

713
00:30:40,549 --> 00:30:39,279

and you know the kids that are going to

714
00:30:42,389 --> 00:30:40,559
watch us today

715
00:30:44,389 --> 00:30:42,399
um are are going to be seeing the

716
00:30:46,710 --> 00:30:44,399
science of this come back

717
00:30:47,430 --> 00:30:46,720
maybe 10 years from now maybe 15 years

718
00:30:49,029 --> 00:30:47,440
from now

719
00:30:51,830 --> 00:30:49,039
yet you know if you're in elementary

720
00:30:53,909 --> 00:30:51,840
school today you may be in college when

721
00:30:55,190 --> 00:30:53,919
we make an amazing discovery that would

722
00:30:58,230 --> 00:30:55,200
transform how we

723
00:30:59,830 --> 00:30:58,240
how we talk about history and science so

724
00:31:03,269 --> 00:30:59,840
all of these things i think

725
00:31:03,909 --> 00:31:03,279
i i think are important but but here we

726
00:31:05,990 --> 00:31:03,919
are uh

727
00:31:08,149 --> 00:31:06,000
so much work over so much time and and

728
00:31:09,669 --> 00:31:08,159
we're on the cusp of launching to mars

729
00:31:11,430 --> 00:31:09,679
yet again and this time with the most

730
00:31:13,669 --> 00:31:11,440
sophisticated rabbit uh

731
00:31:14,710 --> 00:31:13,679
robot in the history of of of

732
00:31:17,190 --> 00:31:14,720
interplanetary

733
00:31:18,149 --> 00:31:17,200
kind of uh exploration so yeah it's

734
00:31:19,990 --> 00:31:18,159
great awesome

735
00:31:21,750 --> 00:31:20,000
yes uh 10 years can seem like a long

736
00:31:23,269 --> 00:31:21,760
time for a return mission but it goes by

737
00:31:23,909 --> 00:31:23,279
pretty fast i remember when new horizons

738
00:31:25,669 --> 00:31:23,919

launched

739
00:31:28,470 --> 00:31:25,679
the conversation was nine years to get

740
00:31:29,990 --> 00:31:28,480
to pluto um but then when it came around

741
00:31:32,710 --> 00:31:30,000
we were there we were pluto and so

742
00:31:34,870 --> 00:31:32,720
someday in a decade or so hopefully

743
00:31:36,470 --> 00:31:34,880
we get some mars dirt back here just to

744
00:31:37,590 --> 00:31:36,480
be clear this thing is going to be there

745
00:31:39,269 --> 00:31:37,600
in february so

746
00:31:41,350 --> 00:31:39,279
everybody you know hold your breath

747
00:31:43,430 --> 00:31:41,360
because you're going to get the most

748
00:31:44,630 --> 00:31:43,440
beautiful images we've got more cameras

749
00:31:46,710 --> 00:31:44,640
on this bad boy

750
00:31:47,909 --> 00:31:46,720
than any previous lander you're gonna

751
00:31:50,549 --> 00:31:47,919
see everything

752
00:31:51,350 --> 00:31:50,559
entry descent landing you know the the

753
00:31:53,909 --> 00:31:51,360
parachute

754
00:31:55,830 --> 00:31:53,919
the uh the the the propelled you know

755
00:31:57,350 --> 00:31:55,840
soft landing on the surface the images

756
00:31:58,710 --> 00:31:57,360
are gonna be better than anything we've

757
00:32:00,149 --> 00:31:58,720
ever seen before so

758
00:32:01,909 --> 00:32:00,159
and that's going to happen in february

759
00:32:02,710 --> 00:32:01,919
so everybody make sure you're there when

760
00:32:04,470 --> 00:32:02,720
that happens

761
00:32:06,230 --> 00:32:04,480
yes and with that note uh make sure you

762
00:32:08,389 --> 00:32:06,240
track with the countdown to mars

763
00:32:09,590 --> 00:32:08,399

hashtag countdown to mars all the way

764
00:32:11,350 --> 00:32:09,600
through february because that's when the

765
00:32:13,350 --> 00:32:11,360
countdown ends it does not end tomorrow

766
00:32:15,110 --> 00:32:13,360
although tomorrow is the planned liftoff

767
00:32:16,789 --> 00:32:15,120
of the atlas 5 rocket off space launch

768
00:32:19,590 --> 00:32:16,799
complex 41 behind me

769
00:32:20,870 --> 00:32:19,600
uh that's scheduled for 7 50 a.m eastern

770
00:32:22,310 --> 00:32:20,880
time that's at the beginning of a

771
00:32:23,350 --> 00:32:22,320
two-hour launch window

772
00:32:24,950 --> 00:32:23,360
uh and we're about halfway through the

773
00:32:25,990 --> 00:32:24,960
launch period so we have extra time in

774
00:32:27,269 --> 00:32:26,000
case anybody's concerned

775
00:32:29,269 --> 00:32:27,279
we've got more days to try and do this

776
00:32:30,549 --> 00:32:29,279
but let's do it the first day i want to

777
00:32:32,070 --> 00:32:30,559
highlight a couple of sites for you you

778
00:32:34,230 --> 00:32:32,080
can watch that show tomorrow

779
00:32:35,430 --> 00:32:34,240
coverage begins at 7 a.m eastern time

780
00:32:37,509 --> 00:32:35,440
nasa.gov

781
00:32:39,029 --> 00:32:37,519
live also track the entire mission at

782
00:32:41,430 --> 00:32:39,039
nasa.gov

783
00:32:42,070 --> 00:32:41,440
perseverance and on twitter and facebook

784
00:32:44,230 --> 00:32:42,080
the handle

785
00:32:45,909 --> 00:32:44,240
nasa persevere uh that's gonna do it for

786
00:32:48,230 --> 00:32:45,919
us today thank you for joining us thanks