Coming up:

MARS 2020 PERSEVERANCE

COUNTDOWN TO MARS

Wednesday, June 17 at 2pm EDT, 11am PDT

1
00:00:36,170 --> 00:00:32,590
[Music]

2
00:00:41,340 --> 00:00:38,700
after a decade in the making

3
00:00:44,160 --> 00:00:41,350
NASA is just weeks away from launching

4
00:00:46,160 --> 00:00:44,170
its next mission to Mars we are here

5
00:00:48,900 --> 00:00:46,170
today to talk about the Mars 2020

6
00:00:51,540 --> 00:00:48,910
perseverance rover and Mars helicopter

7
00:00:53,460 --> 00:00:51,550
I'm Mary Calvi and weather from NASA's

8
00:00:55,860 --> 00:00:53,470
Jet Propulsion Laboratory in Southern

9
00:00:58,049 --> 00:00:55,870
California I'm gonna be your host today

10
00:01:00,569 --> 00:00:58,059
as we were getting closer to the

11
00:01:02,639 --> 00:01:00,579
countdown to Mars since we're social

12
00:01:04,710 --> 00:01:02,649
distancing I'll introduce you virtually

13
00:01:07,529 --> 00:01:04,720

to the people who are working to get the

14
00:01:10,320 --> 00:01:07,539
rover to the launch pad on our panel

15
00:01:12,719 --> 00:01:10,330
today we have NASA Administrator Jim

16
00:01:14,790 --> 00:01:12,729
brightest enstein he will talk about how

17
00:01:17,820 --> 00:01:14,800
this mission will help pave the way for

18
00:01:19,710 --> 00:01:17,830
future human exploration Planetary

19
00:01:22,740 --> 00:01:19,720
Science Division director Laurie glaze

20
00:01:25,980 --> 00:01:22,750
will discuss NASA's strategy for

21
00:01:28,680 --> 00:01:25,990
exploring Mars deputy project scientist

22
00:01:31,380 --> 00:01:28,690
Cady stack Morgan will tell us why we

23
00:01:33,779 --> 00:01:31,390
have chosen our landing sites and what

24
00:01:36,330 --> 00:01:33,789
we hope to find there deputy project

25
00:01:38,490 --> 00:01:36,340
manager Matt Wallace will go over what

26
00:01:41,429 --> 00:01:38,500
makes this Rover different from the

27
00:01:44,700 --> 00:01:41,439
previous Rovers deputy electrical lead

28
00:01:47,069 --> 00:01:44,710
Luis Dominguez has an update on what we

29
00:01:49,859 --> 00:01:47,079
are doing on the spacecraft right now

30
00:01:52,950 --> 00:01:49,869
and finally NASA launch director Omar

31
00:01:55,709 --> 00:01:52,960
Baez will give us an update about launch

32
00:01:58,740 --> 00:01:55,719
preparations we will start with NASA

33
00:02:00,870 --> 00:01:58,750
Administrator Jim bridenstine Jim can

34
00:02:05,130 --> 00:02:00,880
you believe we're only a month away from

35
00:02:08,099 --> 00:02:05,140
launch it is it's pretty amazing and

36
00:02:09,960 --> 00:02:08,109
what a great what a great time to be at

37
00:02:12,830 --> 00:02:09,970
NASA what a great time to watch all of

38
00:02:16,590 --> 00:02:12,840

the exciting things that NASA is doing

39
00:02:19,110 --> 00:02:16,600
and I'll tell you you know we we have to

40
00:02:21,810 --> 00:02:19,120
remember that NASA has an amazing

41
00:02:24,330 --> 00:02:21,820
ability to do stunning achievements even

42
00:02:27,599 --> 00:02:24,340
in the midst of difficult times and you

43
00:02:29,580 --> 00:02:27,609
can see I'm in my living room in the

44
00:02:32,569 --> 00:02:29,590
midst of the corona virus pandemic and

45
00:02:35,520 --> 00:02:32,579
all of us have been working overtime

46
00:02:38,819 --> 00:02:35,530
working from home working with our

47
00:02:41,310 --> 00:02:38,829
children in many cases out of school and

48
00:02:44,100 --> 00:02:41,320
and it's been a challenge and we all

49
00:02:45,990 --> 00:02:44,110
know that but this mission was one of

50
00:02:47,460 --> 00:02:46,000
two missions that we protected to make

51
00:02:49,080 --> 00:02:47,470
sure that we were going to be able to

52
00:02:51,089 --> 00:02:49,090
launch angel

53
00:02:54,000 --> 00:02:51,099
and the reason that's important is

54
00:02:56,339 --> 00:02:54,010
because of the alignment when you talk

55
00:02:58,259 --> 00:02:56,349
about Earth and Mars being on the same

56
00:03:01,229 --> 00:02:58,269
side of the Sun that that happens once

57
00:03:03,350 --> 00:03:01,239
over 26 months so it's it's very

58
00:03:06,030 --> 00:03:03,360
expensive if we have to take

59
00:03:08,339 --> 00:03:06,040
perseverance and put it back into

60
00:03:10,440 --> 00:03:08,349
storage for a period of two years it

61
00:03:12,570 --> 00:03:10,450
could cost half a billion dollars and so

62
00:03:14,309 --> 00:03:12,580
this is an important mission for a whole

63
00:03:17,220 --> 00:03:14,319

host of reasons but what I really hope

64
00:03:20,670 --> 00:03:17,230
is that people watch this mission and

65
00:03:23,400 --> 00:03:20,680
that they are inspired that we know that

66
00:03:26,819 --> 00:03:23,410
we can strive and achieve even in the

67
00:03:28,890 --> 00:03:26,829
midst of very challenging times and so I

68
00:03:31,740 --> 00:03:28,900
think that's that's important

69
00:03:34,110 --> 00:03:31,750
Alex Mathur a 7th grader in Northern

70
00:03:36,360 --> 00:03:34,120
Virginia actually named this little

71
00:03:37,920 --> 00:03:36,370
robot I said I should say big robot

72
00:03:41,400 --> 00:03:37,930
we're talking about something the size

73
00:03:43,979 --> 00:03:41,410
of an SUV but he named it perseverance

74
00:03:47,069 --> 00:03:43,989
and I think right now more than ever

75
00:03:49,229 --> 00:03:47,079
that name is so important and I just

76
00:03:52,800 --> 00:03:49,239
want to thank Alex for giving us that

77
00:03:55,349 --> 00:03:52,810
name because we are persevering and we

78
00:03:58,410 --> 00:03:55,359
are achieving even in the midst of these

79
00:04:00,390 --> 00:03:58,420
very challenging times and I also want

80
00:04:03,479 --> 00:04:00,400
to say that you know we're talking about

81
00:04:05,610 --> 00:04:03,489
Mars today we have a big agenda we have

82
00:04:08,039 --> 00:04:05,620
been given a directive to go to Mars

83
00:04:10,740 --> 00:04:08,049
with humans and in order to achieve that

84
00:04:12,870 --> 00:04:10,750
we're doing two things number one we're

85
00:04:14,640 --> 00:04:12,880
building an architecture at the moon

86
00:04:16,650 --> 00:04:14,650
where humans are going to be able to

87
00:04:18,900 --> 00:04:16,660
sustain for long periods of time and

88
00:04:21,120 --> 00:04:18,910

we're doing that under our program

89
00:04:22,589 --> 00:04:21,130
called Artemis the other thing that

90
00:04:25,550 --> 00:04:22,599
we're doing is we're moving forward

91
00:04:28,710 --> 00:04:25,560
rapidly with these very important bars

92
00:04:30,930 --> 00:04:28,720
robotic precursor missions so that one

93
00:04:32,520 --> 00:04:30,940
day when we send humans to Mars we're

94
00:04:34,830 --> 00:04:32,530
going to know where to go to get the

95
00:04:38,219 --> 00:04:34,840
absolute best science and data that we

96
00:04:42,089 --> 00:04:38,229
can get and it's not it's not lost on me

97
00:04:44,879 --> 00:04:42,099
that 51 years ago on July 20th I mean

98
00:04:48,089 --> 00:04:44,889
this is important 51 years ago on July

99
00:04:49,830 --> 00:04:48,099
20th Neil Armstrong and Buzz Aldrin were

100
00:04:52,290 --> 00:04:49,840
walking on the moon for the first time

101
00:04:55,740 --> 00:04:52,300
in history and during that time they did

102
00:04:58,920 --> 00:04:55,750
the first-ever lunar return mission and

103
00:05:00,420 --> 00:04:58,930
here we are with Mars perseverance 51

104
00:05:01,490 --> 00:05:00,430
years later getting ready to do the

105
00:05:04,600 --> 00:05:01,500
first ever

106
00:05:07,610 --> 00:05:04,610
martien I should say Mars return mission

107
00:05:10,100 --> 00:05:07,620
so these I think are important

108
00:05:11,980 --> 00:05:10,110
milestones we've done it with the moon

109
00:05:14,180 --> 00:05:11,990
now we're going to do it with Mars

110
00:05:17,450 --> 00:05:14,190
perseverance is the first step in an

111
00:05:18,830 --> 00:05:17,460
eventual return of those samples but

112
00:05:21,290 --> 00:05:18,840
I'll tell you the thing that has me the

113
00:05:24,260 --> 00:05:21,300

most excited as the NASA Administrator

114
00:05:26,540 --> 00:05:24,270
is getting ready to watch a helicopter

115
00:05:28,100 --> 00:05:26,550
fly on another world that's something

116
00:05:30,500 --> 00:05:28,110
that's never been done before in human

117
00:05:32,870 --> 00:05:30,510
history and here we are getting ready to

118
00:05:36,020 --> 00:05:32,880
launch Mars perseverance with ingenuity

119
00:05:38,780 --> 00:05:36,030
it's little helicopter strapped to it I

120
00:05:40,820 --> 00:05:38,790
am very excited about watching a

121
00:05:42,260 --> 00:05:40,830
helicopter fly in another world for the

122
00:05:44,330 --> 00:05:42,270
first time in human history and I know

123
00:05:45,950 --> 00:05:44,340
there's a great panel you're gonna hear

124
00:05:47,900 --> 00:05:45,960
great things about all of these

125
00:05:50,420 --> 00:05:47,910
different experiments and Technology

126
00:05:52,280 --> 00:05:50,430
demonstrations that we have upcoming but

127
00:05:55,220 --> 00:05:52,290
but we're very excited about Mars

128
00:05:57,200 --> 00:05:55,230
perseverance and and it's a great time

129
00:05:59,240 --> 00:05:57,210
to be at NASA and I hope it's a great

130
00:06:01,820 --> 00:05:59,250
time for everybody to watch the stunning

131
00:06:03,350 --> 00:06:01,830
things that NASA is capable of doing so

132
00:06:05,780 --> 00:06:03,360
with that Raquelle I'll turn it back to

133
00:06:08,420 --> 00:06:05,790
you thanks Jim it really is an exciting

134
00:06:10,310 --> 00:06:08,430
first step and for anyone watching who

135
00:06:13,190 --> 00:06:10,320
would like to submit a question you can

136
00:06:15,380 --> 00:06:13,200
do so now by using the ask NASA hashtag

137
00:06:17,330 --> 00:06:15,390
our phone lines are now open to the

138
00:06:20,990 --> 00:06:17,340

media and you can ask a question by

139
00:06:22,760 --> 00:06:21,000
pressing star 1 and up next Planetary

140
00:06:24,740 --> 00:06:22,770
Science Division director Laurie glaze

141
00:06:27,620 --> 00:06:24,750
will talk about how the perseverance

142
00:06:32,740 --> 00:06:27,630
rover advances NASA's exploration of

143
00:06:38,870 --> 00:06:36,200
thanks for Cal it is my pleasure to be

144
00:06:41,000 --> 00:06:38,880
here today as we begin our countdown to

145
00:06:44,990 --> 00:06:41,010
Mars and the launch of the perseverance

146
00:06:46,730 --> 00:06:45,000
Rover at NASA our vision for science is

147
00:06:49,730 --> 00:06:46,740
to lead a globally interconnected

148
00:06:52,610 --> 00:06:49,740
program of discovery that encourages

149
00:06:55,520 --> 00:06:52,620
innovation positively impacts people's

150
00:06:58,210 --> 00:06:55,530
lives and is a source of inspiration and

151
00:07:00,250 --> 00:06:58,220
this mission does all of that

152
00:07:02,659 --> 00:07:00,260
perseverance is the most sophisticated

153
00:07:05,600 --> 00:07:02,669
mission we've ever sent to the red

154
00:07:08,690 --> 00:07:05,610
planet's surface it's the next step in

155
00:07:10,940 --> 00:07:08,700
our historic Mars exploration program

156
00:07:14,060 --> 00:07:10,950
which has been exploring Mars and

157
00:07:15,180 --> 00:07:14,070
unlocking its secrets for decades and we

158
00:07:17,940 --> 00:07:15,190
couldn't be more

159
00:07:21,120 --> 00:07:17,950
about it some of perseverance --is main

160
00:07:23,910 --> 00:07:21,130
activities will be an astrobiology which

161
00:07:26,070 --> 00:07:23,920
is the study of how life comes to be the

162
00:07:28,380 --> 00:07:26,080
environments that can support life and

163
00:07:32,100 --> 00:07:28,390

the search to see if life exists

164
00:07:34,860 --> 00:07:32,110
anywhere else beyond Earth this is the

165
00:07:38,400 --> 00:07:34,870
first Rover mission designed to seek

166
00:07:40,800 --> 00:07:38,410
signs of past microbial life by context

167
00:07:43,380 --> 00:07:40,810
by collecting and caching

168
00:07:46,200 --> 00:07:43,390
rock and soil samples that will be

169
00:07:49,080 --> 00:07:46,210
returned to Earth by future missions the

170
00:07:50,910 --> 00:07:49,090
rover's instruments will also look for

171
00:07:53,400 --> 00:07:50,920
evidence of ancient habitable

172
00:07:55,410 --> 00:07:53,410
environments and monitor environmental

173
00:07:57,540 --> 00:07:55,420
conditions which will help us better

174
00:08:00,570 --> 00:07:57,550
understand how to protect future human

175
00:08:02,430 --> 00:08:00,580
explorers the rover will study the

176
00:08:05,250 --> 00:08:02,440
record that is preserved in the layers

177
00:08:07,800 --> 00:08:05,260
of rock on the surface of Mars looking

178
00:08:09,750 --> 00:08:07,810
for those rocks that formed in water and

179
00:08:12,660 --> 00:08:09,760
could have preserved evidence of the

180
00:08:14,580 --> 00:08:12,670
chemical building blocks of life the

181
00:08:16,590 --> 00:08:14,590
rover will also demonstrate a key

182
00:08:18,660 --> 00:08:16,600
technology for using natural resources

183
00:08:20,940 --> 00:08:18,670
in the Martian environment for life

184
00:08:23,250 --> 00:08:20,950
support and fuel like producing oxygen

185
00:08:26,280 --> 00:08:23,260
from the carbon dioxide in the Martian

186
00:08:28,200 --> 00:08:26,290
atmosphere its landing technology and

187
00:08:31,070 --> 00:08:28,210
environmental sensors will also help

188
00:08:33,959 --> 00:08:31,080

inform future human missions to Mars and

189
00:08:37,170 --> 00:08:33,969
just as perseverance builds on past

190
00:08:40,469 --> 00:08:37,180
missions it's also the first step in the

191
00:08:43,680 --> 00:08:40,479
first-ever round-trip mission to another

192
00:08:45,660 --> 00:08:43,690
planet in our solar system scientists

193
00:08:48,720 --> 00:08:45,670
have wanted a sample of Mars to study

194
00:08:50,610 --> 00:08:48,730
for generations we have meteorites on

195
00:08:52,830 --> 00:08:50,620
earth that came from Mars but it's not

196
00:08:55,170 --> 00:08:52,840
the same as getting an actual sample of

197
00:08:58,350 --> 00:08:55,180
pristine Mars rocks and soil to study

198
00:09:01,400 --> 00:08:58,360
and now we're at a point where we can

199
00:09:04,050 --> 00:09:01,410
begin to attempt this amazing feat

200
00:09:06,660 --> 00:09:04,060
samples from Mars have the potential to

201
00:09:09,360 --> 00:09:06,670
profoundly change our understanding of

202
00:09:11,790 --> 00:09:09,370
the origin evolution and distribution of

203
00:09:12,890 --> 00:09:11,800
life on Earth and elsewhere in the solar

204
00:09:16,410 --> 00:09:12,900
system

205
00:09:18,210 --> 00:09:16,420
even now NASA continues to study moon

206
00:09:21,690 --> 00:09:18,220
samples brought back by the Apollo

207
00:09:23,730 --> 00:09:21,700
program more than 50 years ago we expect

208
00:09:25,680 --> 00:09:23,740
samples of the red planet to provide new

209
00:09:27,879 --> 00:09:25,690
knowledge for decades to come

210
00:09:29,739 --> 00:09:27,889
as we study them with state

211
00:09:33,129 --> 00:09:29,749
the art laboratory equipment we couldn't

212
00:09:35,889 --> 00:09:33,139
possibly take to Mars right now the plan

213
00:09:39,519 --> 00:09:35,899

for Mars sample return is multifaceted

214
00:09:42,400 --> 00:09:39,529
and complex this historic feat requires

215
00:09:44,590 --> 00:09:42,410
multiple spacecraft and our partners at

216
00:09:48,159 --> 00:09:44,600
the European Space Agency working

217
00:09:52,809 --> 00:09:48,169
together in a synchronized manner let me

218
00:09:55,389 --> 00:09:52,819
show you how first perseverance is going

219
00:09:59,879 --> 00:09:55,399
to drill and prepare samples for return

220
00:10:03,039 --> 00:09:59,889
and cache them on the surface of Mars in

221
00:10:05,379 --> 00:10:03,049
2026 a fetch Rover will be launched to

222
00:10:07,509 --> 00:10:05,389
collect those samples and bring them to

223
00:10:09,179 --> 00:10:07,519
a rocket that will launch them into

224
00:10:12,099 --> 00:10:09,189
orbit around Mars

225
00:10:15,309 --> 00:10:12,109
another orbiter will rendezvous and

226
00:10:19,650 --> 00:10:15,319
capture those samples for safe delivery

227
00:10:22,449 --> 00:10:19,660
to Earth if it sounds complicated it is

228
00:10:24,699 --> 00:10:22,459
the technology to return the samples

229
00:10:27,400 --> 00:10:24,709
that perseverance collects is maturing

230
00:10:29,829 --> 00:10:27,410
but NASA's investments in developing

231
00:10:32,109 --> 00:10:29,839
autonomous robots and landing large

232
00:10:34,030 --> 00:10:32,119
payloads on Mars have laid the

233
00:10:37,239 --> 00:10:34,040
groundwork for a successful sample

234
00:10:39,220 --> 00:10:37,249
return campaign we're thrilled to be

235
00:10:42,100 --> 00:10:39,230
working with the European Space Agency

236
00:10:44,559 --> 00:10:42,110
on Mars sample return and partners from

237
00:10:47,229 --> 00:10:44,569
Spain Norway and France on perseverance

238
00:10:51,129 --> 00:10:47,239

science as we take our next steps and

239
00:10:52,659 --> 00:10:51,139
exploring the solar system so you

240
00:10:54,429 --> 00:10:52,669
probably want to know more about how

241
00:10:57,009 --> 00:10:54,439
perseverance is going to accomplish its

242
00:10:59,109 --> 00:10:57,019
mission and for that KT stack Morgan

243
00:11:00,579 --> 00:10:59,119
from NASA's Jet Propulsion Laboratory is

244
00:11:03,689 --> 00:11:00,589
going to talk about our landing site

245
00:11:06,460 --> 00:11:03,699
which is a really special place on Mars

246
00:11:08,619 --> 00:11:06,470
thanks so much Laurie so in just one

247
00:11:11,169 --> 00:11:08,629
month's time perseverance will begin its

248
00:11:13,359 --> 00:11:11,179
journey to mars specifically jezero a

249
00:11:15,729 --> 00:11:13,369
crater located on the inner rim of one

250
00:11:17,229 --> 00:11:15,739
of the largest and oldest impact basins

251
00:11:19,689 --> 00:11:17,239
on the surface of mars which you can see

252
00:11:21,699 --> 00:11:19,699
in this inset here ad Jazeera will have

253
00:11:23,559 --> 00:11:21,709
access to some of the oldest rocks in

254
00:11:25,809 --> 00:11:23,569
the solar system between three and a

255
00:11:27,489 --> 00:11:25,819
half and four billion years old as well

256
00:11:30,189 --> 00:11:27,499
as a record of diverse geologic

257
00:11:31,840 --> 00:11:30,199
processes including volcanism impact

258
00:11:33,400 --> 00:11:31,850
cratering as well as processes

259
00:11:35,439 --> 00:11:33,410
associated with water both at the

260
00:11:37,119 --> 00:11:35,449
surface and subsurface that can tell us

261
00:11:40,509 --> 00:11:37,129
about how the planet evolved over time

262
00:11:41,300 --> 00:11:40,519
we also think that jezero was home to a

263
00:11:42,860 --> 00:11:41,310

variety

264
00:11:44,810 --> 00:11:42,870
different potential habitable

265
00:11:46,970 --> 00:11:44,820
environments where perseverance can

266
00:11:50,120 --> 00:11:46,980
begin its search for the signs of

267
00:11:51,769 --> 00:11:50,130
ancient life on mars specifically jezero

268
00:11:54,680 --> 00:11:51,779
is host to one of the best-preserved

269
00:11:56,960 --> 00:11:54,690
deltas on the surface of mars deltas

270
00:11:59,240 --> 00:11:56,970
form when rivers enter open bodies of

271
00:12:01,130 --> 00:11:59,250
water and deposit rocks sand and

272
00:12:03,500 --> 00:12:01,140
potentially organic carbon in the layers

273
00:12:05,630 --> 00:12:03,510
of that Delta those layers are one of

274
00:12:08,240 --> 00:12:05,640
the prime astrobiology targets for the

275
00:12:09,980 --> 00:12:08,250
perseverance mission also in jezero we

276
00:12:12,380 --> 00:12:09,990
see carbonate minerals around the inner

277
00:12:14,180 --> 00:12:12,390
rim of the crater carbonates can form in

278
00:12:15,980 --> 00:12:14,190
shallow lake margin environments and

279
00:12:17,840 --> 00:12:15,990
based on what we know about carbonates

280
00:12:20,180 --> 00:12:17,850
here on earth we think those are another

281
00:12:22,130 --> 00:12:20,190
really important potential astrobiology

282
00:12:24,230 --> 00:12:22,140
target for the mission we'll also have a

283
00:12:26,150 --> 00:12:24,240
chance to explore the crater rim which

284
00:12:28,130 --> 00:12:26,160
exposes some of those oldest rocks in

285
00:12:29,540 --> 00:12:28,140
the field site as well as some potential

286
00:12:32,210 --> 00:12:29,550
habitable environments that might have

287
00:12:34,820 --> 00:12:32,220
formed as a result of that impact event

288
00:12:36,650 --> 00:12:34,830

itself at each one of these locations

289
00:12:38,990 --> 00:12:36,660
that perseverance will explore we'll be

290
00:12:41,600 --> 00:12:39,000
searching for bio signatures patterns

291
00:12:43,700 --> 00:12:41,610
textures or substances that require the

292
00:12:45,829 --> 00:12:43,710
influence of life to form now we don't

293
00:12:47,480 --> 00:12:45,839
know for sure what bio signatures on

294
00:12:49,220 --> 00:12:47,490
Mars are going to look like but we can

295
00:12:50,540 --> 00:12:49,230
look to our own earth rock record to

296
00:12:52,850 --> 00:12:50,550
give us an example of what we might

297
00:12:55,640 --> 00:12:52,860
expect to find what you see here is a

298
00:12:58,100 --> 00:12:55,650
3.4 billion year old rock from Australia

299
00:13:00,530 --> 00:12:58,110
called a stromatolite which is a

300
00:13:01,940 --> 00:13:00,540
fossilized microbial mat each one of

301
00:13:03,710 --> 00:13:01,950
these layers that you see in the rock

302
00:13:06,320 --> 00:13:03,720
represents the growth of that mat over

303
00:13:07,640 --> 00:13:06,330
time now if you look at that rock you

304
00:13:09,590 --> 00:13:07,650
wouldn't know for sure that it was a

305
00:13:11,900 --> 00:13:09,600
potential bio signature but when you

306
00:13:14,120 --> 00:13:11,910
couple the textures as well as the

307
00:13:16,490 --> 00:13:14,130
chemical composition the mineralogy and

308
00:13:18,320 --> 00:13:16,500
the distribution of organic carbon you

309
00:13:20,180 --> 00:13:18,330
can start to build a case that that rock

310
00:13:22,280 --> 00:13:20,190
could only have formed under the

311
00:13:23,810 --> 00:13:22,290
influence of life now this is exactly

312
00:13:25,520 --> 00:13:23,820
the type of thing that we do here on

313
00:13:27,500 --> 00:13:25,530

earth to make a case for bio signatures

314
00:13:29,180 --> 00:13:27,510
in our own rock record and for the very

315
00:13:30,800 --> 00:13:29,190
first time using our instruments we can

316
00:13:33,260 --> 00:13:30,810
do that on the surface of Mars

317
00:13:35,390 --> 00:13:33,270
so using that fine scale detail coupled

318
00:13:38,540 --> 00:13:35,400
with the geologic context we're gonna do

319
00:13:40,880 --> 00:13:38,550
our best to identify collect and

320
00:13:43,100 --> 00:13:40,890
document the most compelling scientific

321
00:13:44,930 --> 00:13:43,110
cache of samples that we possibly can to

322
00:13:47,329 --> 00:13:44,940
address some big-picture questions

323
00:13:50,120 --> 00:13:47,339
fundamental questions including you know

324
00:13:52,350 --> 00:13:50,130
how did the the surface and climate of

325
00:13:54,269 --> 00:13:52,360
Mars evolve over time

326
00:13:56,430 --> 00:13:54,279
how did how do Rock EPLAN its form and

327
00:13:59,069 --> 00:13:56,440
differentiate and of course was life

328
00:14:00,750 --> 00:13:59,079
ever-present on Mars to accomplish this

329
00:14:02,759 --> 00:14:00,760
we're going to use a scientific payload

330
00:14:04,590 --> 00:14:02,769
of seven instruments some of those

331
00:14:06,630 --> 00:14:04,600
instruments like the Sherlock and pixel

332
00:14:08,069 --> 00:14:06,640
instruments on the end of the rover's

333
00:14:10,350 --> 00:14:08,079
arm which provide those mapping

334
00:14:12,300 --> 00:14:10,360
capabilities as well as rim facts in the

335
00:14:13,710 --> 00:14:12,310
body of the rover that uses radar to

336
00:14:15,449 --> 00:14:13,720
study the subsurface of Mars our

337
00:14:17,790 --> 00:14:15,459
brand-new we've never sent them to Mars

338
00:14:20,100 --> 00:14:17,800

before other instruments like the super

339
00:14:22,259 --> 00:14:20,110
Kim instrument and mass kinzey up on the

340
00:14:24,110 --> 00:14:22,269
mast of the rover are updated versions

341
00:14:26,130 --> 00:14:24,120
of instruments that we flew on curiosity

342
00:14:28,019 --> 00:14:26,140
these instruments represent

343
00:14:30,780 --> 00:14:28,029
contributions from the US and our

344
00:14:32,790 --> 00:14:30,790
international collaborators and are

345
00:14:34,440 --> 00:14:32,800
uniquely well-suited for helping Mars

346
00:14:37,470 --> 00:14:34,450
2020 accomplish its science objectives

347
00:14:39,750 --> 00:14:37,480
as a part of that we're preparing for

348
00:14:41,370 --> 00:14:39,760
future human exploration of Mars and to

349
00:14:43,740 --> 00:14:41,380
do that we're using instruments like the

350
00:14:45,690 --> 00:14:43,750
Moxie instrument which takes co2 from

351
00:14:47,579 --> 00:14:45,700
the Martian atmosphere converts it to

352
00:14:49,889 --> 00:14:47,589
oxygen which is relevant for life

353
00:14:51,480 --> 00:14:49,899
support and potential creation of a fuel

354
00:14:53,819 --> 00:14:51,490
that could get those those astronauts

355
00:14:55,500 --> 00:14:53,829
back home to earth we also have the meta

356
00:14:57,060 --> 00:14:55,510
instrument which is our weather weather

357
00:14:59,009 --> 00:14:57,070
package that measures pressure

358
00:15:01,019 --> 00:14:59,019
temperature and humidity which are

359
00:15:02,130 --> 00:15:01,029
pieces of information that astronauts

360
00:15:05,100 --> 00:15:02,140
would want to know if they wanted to

361
00:15:06,210 --> 00:15:05,110
work and live safely on Mars so we're

362
00:15:08,250 --> 00:15:06,220
still eight months away from

363
00:15:10,290 --> 00:15:08,260

perseverance landing on the surface of

364
00:15:10,740 --> 00:15:10,300
Mars but our science team is busy at

365
00:15:13,019 --> 00:15:10,750
work

366
00:15:15,000 --> 00:15:13,029
prioritizing are our most important

367
00:15:16,680 --> 00:15:15,010
science questions trying to figure out

368
00:15:18,660 --> 00:15:16,690
where we would go with perseverance to

369
00:15:20,310 --> 00:15:18,670
answer those questions and thinking

370
00:15:22,860 --> 00:15:20,320
about what samples we'd want to put in

371
00:15:24,600 --> 00:15:22,870
Ark on our sample cache and we can't

372
00:15:26,130 --> 00:15:24,610
wait to get perseverance to the surface

373
00:15:27,900 --> 00:15:26,140
of Mars and so with that I'll hand

374
00:15:29,790 --> 00:15:27,910
things over to our deputy project

375
00:15:31,350 --> 00:15:29,800
manager Matt Wallace he'll tell us a

376
00:15:33,180 --> 00:15:31,360
little bit more about the engineering

377
00:15:34,560 --> 00:15:33,190
side of perseverance and share with you

378
00:15:36,180 --> 00:15:34,570
some of the challenges that our team has

379
00:15:37,910 --> 00:15:36,190
had to overcome over these past few

380
00:15:39,720 --> 00:15:37,920
months

381
00:15:43,230 --> 00:15:39,730
thanks very much Katie

382
00:15:45,750 --> 00:15:43,240
yeah curia perseverance is a big one

383
00:15:48,630 --> 00:15:45,760
metric ton vehicle as administrator said

384
00:15:50,220 --> 00:15:48,640
it's a very capable system at first

385
00:15:52,769 --> 00:15:50,230
glance it looks a little bit like the

386
00:15:54,210 --> 00:15:52,779
Curiosity vehicle and in fact we have

387
00:15:57,090 --> 00:15:54,220
been able to leverage a lot of the

388
00:15:59,009 --> 00:15:57,100

investment that was made to bring

389
00:16:02,220 --> 00:15:59,019
curiosity to the surface in particular

390
00:16:04,110 --> 00:16:02,230
the entry descent and landing system has

391
00:16:06,900 --> 00:16:04,120
some commonality

392
00:16:08,610 --> 00:16:06,910
however this vehicle is in fact a new

393
00:16:11,220 --> 00:16:08,620
mission a new vehicle with new

394
00:16:13,530 --> 00:16:11,230
capabilities Kady talked about some of

395
00:16:15,680 --> 00:16:13,540
these enhanced instrumentation which

396
00:16:17,070 --> 00:16:15,690
were taken with us in technology

397
00:16:18,660 --> 00:16:17,080
experiments

398
00:16:22,110 --> 00:16:18,670
I'll mention a couple of the engineering

399
00:16:24,120 --> 00:16:22,120
systems starting with the the wheels at

400
00:16:26,790 --> 00:16:24,130
the bottom of the vehicle there are six

401
00:16:28,920 --> 00:16:26,800
wheels and there they've been ruggedized

402
00:16:31,650 --> 00:16:28,930
so that the more capable of dealing with

403
00:16:34,230 --> 00:16:31,660
the the surface of Mars and pretty much

404
00:16:37,040 --> 00:16:34,240
anything that jezero crater can can

405
00:16:40,110 --> 00:16:37,050
throw at us also we have a new powerful

406
00:16:43,260 --> 00:16:40,120
computer that we've added it's doing

407
00:16:45,240 --> 00:16:43,270
double duty in fact its first task is to

408
00:16:47,640 --> 00:16:45,250
help us get safely down up to the

409
00:16:51,930 --> 00:16:47,650
surface of the planet it's taking

410
00:16:54,570 --> 00:16:51,940
imagery of the of the surface during the

411
00:16:57,420 --> 00:16:54,580
descent activity and processing that

412
00:17:01,230 --> 00:16:57,430
imagery and figuring out where we are

413
00:17:03,840 --> 00:17:01,240

in jezero understanding relative to the

414
00:17:06,030 --> 00:17:03,850
different hazards in the in the crater

415
00:17:07,110 --> 00:17:06,040
and it will divert the spacecraft away

416
00:17:09,390 --> 00:17:07,120
from those hazards

417
00:17:12,860 --> 00:17:09,400
now jezero is a very interesting

418
00:17:15,870 --> 00:17:12,870
scientific target it's got a lot of

419
00:17:17,640 --> 00:17:15,880
relief rocks cliffs

420
00:17:20,340 --> 00:17:17,650
you know hills things like that which

421
00:17:22,650 --> 00:17:20,350
are great for science but they are also

422
00:17:25,350 --> 00:17:22,660
challenging for landing a spacecraft on

423
00:17:27,900 --> 00:17:25,360
Mars and so this new system will keep us

424
00:17:30,900 --> 00:17:27,910
safe and going to this exciting new

425
00:17:32,940 --> 00:17:30,910
science target jezero crater we also use

426
00:17:37,020 --> 00:17:32,950
this computer to help us process imagery

427
00:17:39,270 --> 00:17:37,030
on the surface more rapidly and by doing

428
00:17:41,720 --> 00:17:39,280
that we can look for hazards and we can

429
00:17:44,370 --> 00:17:41,730
avoid those hazards as we're traversing

430
00:17:46,350 --> 00:17:44,380
doing our science mission that allows us

431
00:17:50,669 --> 00:17:46,360
to drive at about twice the speed that

432
00:17:52,799 --> 00:17:50,679
curiosity was able to drive in fact in

433
00:17:55,260 --> 00:17:52,809
addition to the computer we have some

434
00:17:56,669 --> 00:17:55,270
new cameras now now our all our missions

435
00:17:59,370 --> 00:17:56,679
carry a lot of science and engineering

436
00:18:01,410 --> 00:17:59,380
cameras to begin with but we have

437
00:18:03,919 --> 00:18:01,420
something new this time we've taken some

438
00:18:06,600 --> 00:18:03,929

ruggedized commercial cameras and we've

439
00:18:09,500 --> 00:18:06,610
dispensed them around the spacecraft and

440
00:18:12,360 --> 00:18:09,510
those those cameras will be taking

441
00:18:14,240 --> 00:18:12,370
high-definition video of the spacecraft

442
00:18:16,340 --> 00:18:14,250
during the entry descent and landing

443
00:18:18,440 --> 00:18:16,350
activities so we should be able to watch

444
00:18:20,240 --> 00:18:18,450
this big parachute inflate

445
00:18:23,120 --> 00:18:20,250
supersonically we should be able to

446
00:18:25,610 --> 00:18:23,130
watch the rover deploy and touch down on

447
00:18:28,250 --> 00:18:25,620
the surface and this is going to be very

448
00:18:31,100 --> 00:18:28,260
exciting it's the first time that we

449
00:18:33,110 --> 00:18:31,110
have ever been able to see a spacecraft

450
00:18:33,680 --> 00:18:33,120
land on another planet and we're looking

451
00:18:36,710 --> 00:18:33,690
forward to that

452
00:18:38,840 --> 00:18:36,720
imagery out obviously you know we take a

453
00:18:40,520 --> 00:18:38,850
lot of cameras with us to the surface of

454
00:18:43,430 --> 00:18:40,530
Mars and we have again on previous

455
00:18:45,770 --> 00:18:43,440
missions a lot of eyes but we've never

456
00:18:47,720 --> 00:18:45,780
taken years and so this time we're also

457
00:18:50,360 --> 00:18:47,730
taking microphone a couple microphones

458
00:18:51,890 --> 00:18:50,370
actually and again those microphones

459
00:18:54,560 --> 00:18:51,900
will be active during the entry descent

460
00:18:56,090 --> 00:18:54,570
and landing activity we should be able

461
00:18:57,770 --> 00:18:56,100
to hear this system as it's going

462
00:18:59,690 --> 00:18:57,780
through the process of actually landing

463
00:19:01,610 --> 00:18:59,700

on Mars and then when we get on Mars

464
00:19:03,800 --> 00:19:01,620
we'll also be able to turn on the

465
00:19:06,440 --> 00:19:03,810
microphone listen to the wheels turn

466
00:19:08,510 --> 00:19:06,450
over the surface on the on the rocks

467
00:19:10,940 --> 00:19:08,520
listen to our big rotary percussive

468
00:19:16,190 --> 00:19:10,950
drill out on the end of the robot arm

469
00:19:18,980 --> 00:19:16,200
sample those rocks as well as as well as

470
00:19:20,810 --> 00:19:18,990
wind and other things and so those are

471
00:19:23,210 --> 00:19:20,820
all exciting new capabilities that we

472
00:19:25,460 --> 00:19:23,220
have on the vehicle now you don't get

473
00:19:28,460 --> 00:19:25,470
through a development of this complexity

474
00:19:30,680 --> 00:19:28,470
without a few problems and I'll just

475
00:19:34,990 --> 00:19:30,690
mention a couple I'll start with a

476
00:19:39,560 --> 00:19:35,000
couple years ago due to an anomaly on a

477
00:19:41,450 --> 00:19:39,570
parachute test program we had to take a

478
00:19:43,820 --> 00:19:41,460
second look at our own parachute and the

479
00:19:46,280 --> 00:19:43,830
design that we had for that parachute

480
00:19:48,140 --> 00:19:46,290
and we made the difficult decision to

481
00:19:50,870 --> 00:19:48,150
actually modify that parachute to

482
00:19:54,190 --> 00:19:50,880
strengthen the canopy to give us more

483
00:19:56,780 --> 00:19:54,200
robustness during that supersonic entry

484
00:19:59,930 --> 00:19:56,790
activity and that is not an easy thing

485
00:20:03,020 --> 00:19:59,940
to do in part because you have to test

486
00:20:04,910 --> 00:20:03,030
this parachute and testing parachutes on

487
00:20:06,890 --> 00:20:04,920
earth is difficult you have to put it on

488
00:20:09,080 --> 00:20:06,900

a sounding rocket which we did out of

489
00:20:10,880 --> 00:20:09,090
Wallops facility down in southern

490
00:20:12,980 --> 00:20:10,890
Virginia you take them up to the upper

491
00:20:15,020 --> 00:20:12,990
atmosphere and then you deploy these

492
00:20:16,880 --> 00:20:15,030
parachutes in the thin upper atmosphere

493
00:20:20,579 --> 00:20:16,890
to simulate the Martian environment and

494
00:20:22,989 --> 00:20:20,589
what you're seeing here is a slow-mo

495
00:20:25,959 --> 00:20:22,999
video of one of those parachutes

496
00:20:28,509 --> 00:20:25,969
inflating and in fact these are

497
00:20:30,579 --> 00:20:28,519
difficult tests to do this is the first

498
00:20:34,269 --> 00:20:30,589
supersonic planetary parachute tests

499
00:20:37,059 --> 00:20:34,279
that we've done in about 40 years for

500
00:20:38,949 --> 00:20:37,069
the agency and and the project was

501
00:20:43,389 --> 00:20:38,959
fortunate and able to pull off three

502
00:20:45,309 --> 00:20:43,399
pretty much perfect tests and so and so

503
00:20:47,979 --> 00:20:45,319
that was one of the challenges we had

504
00:20:49,629 --> 00:20:47,989
and Katie mentioned and others mentioned

505
00:20:52,119 --> 00:20:49,639
the sampling system that we have on the

506
00:20:53,529 --> 00:20:52,129
vehicle our sampling system is of course

507
00:20:55,569 --> 00:20:53,539
composed of a lot of different

508
00:20:58,449 --> 00:20:55,579
mechanisms that we use to move the robot

509
00:21:02,169 --> 00:20:58,459
arm to core the sample and then to

510
00:21:04,869 --> 00:21:02,179
manipulate and seal the sample after we

511
00:21:08,199 --> 00:21:04,879
after we've collected it and it's very

512
00:21:11,379 --> 00:21:08,209
difficult to build mechanisms for a

513
00:21:13,930 --> 00:21:11,389

rover that has to operate flawlessly 100

514
00:21:16,029 --> 00:21:13,940
million miles away with no human

515
00:21:20,079 --> 00:21:16,039
intervention and so building those

516
00:21:22,089 --> 00:21:20,089
gearboxes and those and those motors in

517
00:21:24,849 --> 00:21:22,099
an environment that that drops down to

518
00:21:28,719 --> 00:21:24,859
minus 200 degrees Fahrenheit pretty much

519
00:21:29,829 --> 00:21:28,729
every night that's exposed to this very

520
00:21:32,109 --> 00:21:29,839
fine

521
00:21:34,329 --> 00:21:32,119
Martian dust and has to deal with other

522
00:21:37,089 --> 00:21:34,339
adverse environments is always a

523
00:21:39,399 --> 00:21:37,099
challenge our sampling system was

524
00:21:41,769 --> 00:21:39,409
particularly challenging in that we also

525
00:21:43,779 --> 00:21:41,779
had to keep it very very clean in fact

526
00:21:47,649 --> 00:21:43,789
this is probably the cleanest system

527
00:21:50,439 --> 00:21:47,659
that we've ever launched to to Mars and

528
00:21:52,059 --> 00:21:50,449
the reason we needed to do that is that

529
00:21:55,329 --> 00:21:52,069
the science community as you just heard

530
00:21:57,699 --> 00:21:55,339
is looking for trace signatures from

531
00:22:00,369 --> 00:21:57,709
billions of years ago trace chemical

532
00:22:02,349 --> 00:22:00,379
signatures we don't want to confuse the

533
00:22:04,959 --> 00:22:02,359
search for those ancient signs of life

534
00:22:07,209 --> 00:22:04,969
with terrestrial contamination that we

535
00:22:10,329 --> 00:22:07,219
took with us to Mars and then of course

536
00:22:12,639 --> 00:22:10,339
brought back and so that required a lot

537
00:22:15,609 --> 00:22:12,649
of effort to understand how to get this

538
00:22:19,059 --> 00:22:15,619

system both biologically and chemically

539
00:22:21,399 --> 00:22:19,069
as clean as we needed it so those are

540
00:22:22,959 --> 00:22:21,409
some of the challenges some of those

541
00:22:25,029 --> 00:22:22,969
kind of come along with the territory

542
00:22:27,549 --> 00:22:25,039
but I will say a few months ago we were

543
00:22:29,680 --> 00:22:27,559
faced with something we really never

544
00:22:31,449 --> 00:22:29,690
expected as was the rest of our

545
00:22:31,670 --> 00:22:31,459
community and the rest of the country

546
00:22:38,840 --> 00:22:31,680
and

547
00:22:40,730 --> 00:22:38,850
really began to affect us in mid-march

548
00:22:43,370 --> 00:22:40,740
we were at a critical time in the

549
00:22:44,870 --> 00:22:43,380
processing for the spacecraft all the

550
00:22:48,350 --> 00:22:44,880
elements were down at Kennedy Space

551
00:22:50,180 --> 00:22:48,360
Center and we had to fully assemble and

552
00:22:52,220 --> 00:22:50,190
do the final testing of the spacecraft

553
00:22:55,910 --> 00:22:52,230
it had to be done right you can't make a

554
00:22:57,950 --> 00:22:55,920
mistake at that point and and and of

555
00:22:59,810 --> 00:22:57,960
course the environment made that a lot

556
00:23:01,280 --> 00:22:59,820
more difficult so I think we have a

557
00:23:03,310 --> 00:23:01,290
short video here to talk a little bit

558
00:23:06,440 --> 00:23:03,320
about some of that final processing and

559
00:23:14,930 --> 00:23:06,450
how we approach those those challenges

560
00:23:16,610 --> 00:23:14,940
relative to the Cova 19 situation this

561
00:23:19,220 --> 00:23:16,620
new Rover will search for signs of

562
00:23:21,170 --> 00:23:19,230
ancient life test new technologies and

563
00:23:22,940 --> 00:23:21,180

gather rock samples which may someday

564
00:23:24,560 --> 00:23:22,950
become the first pieces of the red

565
00:23:27,070 --> 00:23:24,570
planet ever returned to Earth for

566
00:23:31,370 --> 00:23:27,080
analysis today we are naming a

567
00:23:38,120 --> 00:23:31,380
spacecraft that will go to Mars and the

568
00:23:40,550 --> 00:23:38,130
name is when perseverance was first

569
00:23:42,390 --> 00:23:40,560
selected you know I wasn't sure about it

570
00:23:46,999 --> 00:23:42,400
to be honest

571
00:23:51,180 --> 00:23:47,009
[Applause]

572
00:23:53,039 --> 00:23:51,190
when the pandemic struck the future was

573
00:23:55,139 --> 00:23:53,049
certainly unknown it was like walking

574
00:23:56,759 --> 00:23:55,149
into a blind dark alley you didn't know

575
00:23:59,659 --> 00:23:56,769
what was there what was in front of you

576
00:24:02,519 --> 00:23:59,669
what you were gonna have to deal with

577
00:24:04,409 --> 00:24:02,529
it's something that nobody expected it's

578
00:24:06,480 --> 00:24:04,419
something nobody could plan for rather

579
00:24:09,930 --> 00:24:06,490
than your first priority being mission

580
00:24:11,580 --> 00:24:09,940
success and getting to the launch pad

581
00:24:13,980 --> 00:24:11,590
your first priority immediately gets

582
00:24:15,930 --> 00:24:13,990
displaced and it's now the safety of the

583
00:24:17,789 --> 00:24:15,940
people and it's like a lot of work to

584
00:24:19,769 --> 00:24:17,799
put stuff together in order to keep

585
00:24:22,259 --> 00:24:19,779
momentum going to keep people working

586
00:24:24,960 --> 00:24:22,269
safely keep them healthy and to keep the

587
00:24:27,659 --> 00:24:24,970
project on schedule we called the effort

588
00:24:31,159 --> 00:24:27,669

Mars 2020 safe at work and the objective

589
00:24:33,749 --> 00:24:31,169
was to keep the team as safe or safer

590
00:24:35,759 --> 00:24:33,759
than they would be if they were not

591
00:24:38,190 --> 00:24:35,769
working you know putting a spacecraft

592
00:24:40,139 --> 00:24:38,200
together that's going to Mars and not

593
00:24:42,629 --> 00:24:40,149
making a mistake it's hard no matter

594
00:24:45,110 --> 00:24:42,639
what trying to do it during the middle

595
00:24:49,220 --> 00:24:45,120
of the pandemic it's it's a lot harder

596
00:24:53,070 --> 00:24:49,230
there's no doubt that working in

597
00:24:55,860 --> 00:24:53,080
isolation not virtual isolation but in

598
00:24:58,379 --> 00:24:55,870
physical isolation from everyone else is

599
00:25:01,799 --> 00:24:58,389
a challenge it's hard for me I have two

600
00:25:04,499 --> 00:25:01,809
young kids and sometimes I'm not able to

601
00:25:06,749 --> 00:25:04,509
focus or listen probably as well as I

602
00:25:07,830 --> 00:25:06,759
would want to a lot of our work was

603
00:25:10,200 --> 00:25:07,840
occurring in a cleanroom

604
00:25:12,509 --> 00:25:10,210
anyways but that meant that even before

605
00:25:16,529 --> 00:25:12,519
we entered the cleanroom we had that

606
00:25:18,080 --> 00:25:16,539
find ways of ensuring that we were not

607
00:25:21,379 --> 00:25:18,090
putting ourselves or others at risk

608
00:25:23,759 --> 00:25:21,389
we're really doing something that's

609
00:25:25,740 --> 00:25:23,769
transformative and trying to understand

610
00:25:27,629 --> 00:25:25,750
whether or not life evolved on another

611
00:25:31,680 --> 00:25:27,639
planet that's the fundamental objective

612
00:25:34,250 --> 00:25:31,690
of this mission we are explorers our job

613
00:25:38,000 --> 00:25:34,260

is to go into the unknown

614
00:25:41,390 --> 00:25:38,010
and this is just another example of the

615
00:25:43,100 --> 00:25:41,400
unknown how to make this job happen when

616
00:25:45,230 --> 00:25:43,110
you're doing it largely through a

617
00:25:47,300 --> 00:25:45,240
computer II pretty much everybody that

618
00:25:49,610 --> 00:25:47,310
I've talked to that's associated with

619
00:25:51,560 --> 00:25:49,620
the mission has has said the same thing

620
00:25:54,140 --> 00:25:51,570
which is you could not have come up with

621
00:25:56,780 --> 00:25:54,150
a better name than perseverance you know

622
00:25:59,150 --> 00:25:56,790
I'm a convert now I perseverance is the

623
00:26:01,550 --> 00:25:59,160
right name for the rover it's an amazing

624
00:26:04,430 --> 00:26:01,560
serendipity that we get to persevere

625
00:26:06,650 --> 00:26:04,440
through working on perseverance I think

626
00:26:09,710 --> 00:26:06,660
it now is it's a really important symbol

627
00:26:11,810 --> 00:26:09,720
of humanity hopefully persevering

628
00:26:18,890 --> 00:26:11,820
through this great challenging time that

629
00:26:20,960 --> 00:26:18,900
we have right now so you can see it was

630
00:26:23,450 --> 00:26:20,970
a challenge for us to overcome this and

631
00:26:27,650 --> 00:26:23,460
we understand that the the Mars 2020

632
00:26:29,660 --> 00:26:27,660
community was not the only group facing

633
00:26:31,520 --> 00:26:29,670
this as I said the community and the

634
00:26:34,070 --> 00:26:31,530
country and around the globe

635
00:26:35,690 --> 00:26:34,080
everybody had to deal with this I asked

636
00:26:38,660 --> 00:26:35,700
the team a couple months ago if they

637
00:26:41,090 --> 00:26:38,670
would like to do something to kind of

638
00:26:43,400 --> 00:26:41,100

symbolize and Mark these these

639
00:26:46,430 --> 00:26:43,410
challenges that we faced and they

640
00:26:49,520 --> 00:26:46,440
designed something that we called a code

641
00:26:51,890 --> 00:26:49,530
19 perseverance plate this is a plate

642
00:26:57,580 --> 00:26:51,900
that's now affixed to the port side of

643
00:27:00,830 --> 00:26:57,590
the rover it has some symbol of a globe

644
00:27:02,720 --> 00:27:00,840
representing all of us that face this

645
00:27:05,390 --> 00:27:02,730
challenge together the spacecraft

646
00:27:07,970 --> 00:27:05,400
leaving the earth on its way to Mars and

647
00:27:08,780 --> 00:27:07,980
all of this supported by the

648
00:27:11,180 --> 00:27:08,790
now-familiar

649
00:27:13,790 --> 00:27:11,190
staff and servant of the medical

650
00:27:17,330 --> 00:27:13,800
community the community that was really

651
00:27:21,080 --> 00:27:17,340
on the front lines keeping keeping us

652
00:27:22,730 --> 00:27:21,090
safe and you know they they really

653
00:27:26,270 --> 00:27:22,740
inspired us I think through this period

654
00:27:29,360 --> 00:27:26,280
and and we hope that this plate and we

655
00:27:31,790 --> 00:27:29,370
hope that this mission and some in some

656
00:27:36,710 --> 00:27:31,800
small way can inspire it can inspire

657
00:27:39,440 --> 00:27:36,720
them in return you know this is this has

658
00:27:42,710 --> 00:27:39,450
been a team effort all along it's a big

659
00:27:46,760 --> 00:27:42,720
group of people that's required to do

660
00:27:49,510 --> 00:27:46,770
this type of mission and it's not just

661
00:27:52,100 --> 00:27:49,520
the people on the team but it is the the

662
00:27:55,700 --> 00:27:52,110
people that support us from the public

663
00:27:58,430 --> 00:27:55,710

and and to mark that we are carrying

664
00:28:01,610 --> 00:27:58,440
this plate that you see here it has

665
00:28:04,730 --> 00:28:01,620
three microfiche and those microfiche

666
00:28:07,940 --> 00:28:04,740
hold the 11 million names of the people

667
00:28:10,940 --> 00:28:07,950
that signed up to take their name along

668
00:28:13,340 --> 00:28:10,950
with this spacecraft to Mars we're very

669
00:28:15,890 --> 00:28:13,350
appreciative of that interest and the

670
00:28:18,500 --> 00:28:15,900
support that we have and that's part of

671
00:28:21,470 --> 00:28:18,510
what makes this job so exciting

672
00:28:23,210 --> 00:28:21,480
I mentioned the team as I said it's it's

673
00:28:27,170 --> 00:28:23,220
a big team and this is just the team

674
00:28:30,590 --> 00:28:27,180
here at JPL that were part most part of

675
00:28:34,430 --> 00:28:30,600
this development in fact the the team

676
00:28:37,060 --> 00:28:34,440
spans every Center in the agency pretty

677
00:28:40,580 --> 00:28:37,070
much as well as our international

678
00:28:42,700 --> 00:28:40,590
contributors and our tremendous industry

679
00:28:44,990 --> 00:28:42,710
partners that have been part of this

680
00:28:47,300 --> 00:28:45,000
everybody has worked together a lot of

681
00:28:49,850 --> 00:28:47,310
days a lot of nights a lot of weekends

682
00:28:51,830 --> 00:28:49,860
and holidays to get us to the point

683
00:28:53,510 --> 00:28:51,840
where we're at and they kind of tell you

684
00:28:55,040 --> 00:28:53,520
a little bit more about the integration

685
00:28:58,910 --> 00:28:55,050
and test activity that's been happening

686
00:29:01,310 --> 00:28:58,920
down at Kennedy Space Center and and the

687
00:29:06,980 --> 00:29:01,320
final steps to get us to the pad I'm

688
00:29:09,980 --> 00:29:06,990

gonna hand it off to Luis Dominguez okay

689
00:29:12,140 --> 00:29:09,990
thanks Matt so the assembly test and

690
00:29:14,690 --> 00:29:12,150
launch operations team also known as the

691
00:29:16,910 --> 00:29:14,700
atlo team start bid assembly of the

692
00:29:20,870 --> 00:29:16,920
spacecraft up back at JPL in January of

693
00:29:23,450 --> 00:29:20,880
2018 the ATLA team is the team on the

694
00:29:24,890 --> 00:29:23,460
project that's entrusted with with

695
00:29:27,680 --> 00:29:24,900
putting together the final flight

696
00:29:30,830 --> 00:29:27,690
vehicle and we take components from

697
00:29:32,600 --> 00:29:30,840
across JPL the US and the world and we

698
00:29:34,280 --> 00:29:32,610
start populating that onto the

699
00:29:36,560 --> 00:29:34,290
spacecraft and testing them to make sure

700
00:29:38,000 --> 00:29:36,570
that everything works properly we're

701
00:29:40,820 --> 00:29:38,010
talking about the radio the flight

702
00:29:42,320 --> 00:29:40,830
computer control boxes antennas lasers

703
00:29:45,170 --> 00:29:42,330
all the different instruments that allow

704
00:29:46,300 --> 00:29:45,180
the spacecraft to to do its mission once

705
00:29:49,280 --> 00:29:46,310
it gets to Mars

706
00:29:51,320 --> 00:29:49,290
when we initially shipped to KSC the

707
00:29:54,140 --> 00:29:51,330
spacecraft that was actually shipped in

708
00:29:55,100 --> 00:29:54,150
pieces so all the individual stages of

709
00:29:57,950 --> 00:29:55,110
the spacecraft were shipped

710
00:30:00,500 --> 00:29:57,960
independently the crew stage the descent

711
00:30:02,810 --> 00:30:00,510
stage the rover stage the back show on

712
00:30:04,880 --> 00:30:02,820
the heat shield and when we arrived we

713
00:30:06,560 --> 00:30:04,890

did a lot a lot of testing to make sure

714
00:30:08,300 --> 00:30:06,570
that nothing was damaged in

715
00:30:11,240 --> 00:30:08,310
transportation and that everything was

716
00:30:13,310 --> 00:30:11,250
working appropriately and then we began

717
00:30:16,130 --> 00:30:13,320
to assemble the spacecraft for the last

718
00:30:17,930 --> 00:30:16,140
time as the deputy electrical and

719
00:30:21,170 --> 00:30:17,940
integration and test lead for the team

720
00:30:22,520 --> 00:30:21,180
my main focus is on integrating all the

721
00:30:24,740 --> 00:30:22,530
electrical and electrical mechanical

722
00:30:26,060 --> 00:30:24,750
components of the spacecraft while

723
00:30:27,740 --> 00:30:26,070
making sure that the personnel and the

724
00:30:30,220 --> 00:30:27,750
hardware is kept are kept as safe as

725
00:30:32,930 --> 00:30:30,230
possible during that integration process

726
00:30:35,360 --> 00:30:32,940
you also you know it's a it's a highly

727
00:30:37,460 --> 00:30:35,370
stressful highly demanding environment

728
00:30:40,760 --> 00:30:37,470
but it's also extremely rewarding to see

729
00:30:42,170 --> 00:30:40,770
the spacecraft put together like that at

730
00:30:44,300 --> 00:30:42,180
the moment we're currently in the

731
00:30:46,670 --> 00:30:44,310
process of electrically integrating the

732
00:30:48,170 --> 00:30:46,680
harness that connects the spacecraft to

733
00:30:50,630 --> 00:30:48,180
the last stage of the launch vehicle

734
00:30:52,820 --> 00:30:50,640
which was just installed last night

735
00:30:55,850 --> 00:30:52,830
actually and as soon as I'm done here

736
00:30:58,790 --> 00:30:55,860
I'm gonna head into the into the high

737
00:31:00,280 --> 00:30:58,800
bay to start checking that out and after

738
00:31:03,290 --> 00:31:00,290

that's complete we will begin

739
00:31:04,760 --> 00:31:03,300
encapsulation of the spacecraft and the

740
00:31:07,040 --> 00:31:04,770
encapsulation of the spacecraft is

741
00:31:08,420 --> 00:31:07,050
exactly is where we actually clamshell

742
00:31:10,610 --> 00:31:08,430
the spacecraft in between its two

743
00:31:13,190 --> 00:31:10,620
payload fairing which will protect it

744
00:31:15,230 --> 00:31:13,200
while it's exiting or its orbit and on

745
00:31:17,480 --> 00:31:15,240
its way to Mars as you can see the

746
00:31:20,990 --> 00:31:17,490
spacecraft is a very small part of this

747
00:31:23,450 --> 00:31:21,000
of this launch vehicle but it's the most

748
00:31:27,260 --> 00:31:23,460
important part and we're hoping she gets

749
00:31:28,850 --> 00:31:27,270
there safe thanks Louise and I actually

750
00:31:30,680 --> 00:31:28,860
have a couple questions for you what

751
00:31:35,440 --> 00:31:30,690
else is left for your team to complete

752
00:31:37,790 --> 00:31:35,450
on the perseverance rover so once the

753
00:31:39,500 --> 00:31:37,800
spacecraft is encapsulated we will

754
00:31:41,300 --> 00:31:39,510
actually lift the spacecraft onto a

755
00:31:42,890 --> 00:31:41,310
transport vehicle and then that

756
00:31:45,320 --> 00:31:42,900
transport vehicle will take it to the

757
00:31:47,480 --> 00:31:45,330
vertical integration fixture facility

758
00:31:49,310 --> 00:31:47,490
where it'll get crane to the top of the

759
00:31:51,290 --> 00:31:49,320
rocket and mechanically integrated and

760
00:31:54,980 --> 00:31:51,300
we'll do some final electrical close

761
00:31:57,650 --> 00:31:54,990
outs before we like to candle that's

762
00:31:59,640 --> 00:31:57,660
great and I also heard you started as an

763
00:32:02,070 --> 00:31:59,650

intern for the Curiosity rover

764
00:32:04,560 --> 00:32:02,080
so what's it like to see your work on

765
00:32:07,950 --> 00:32:04,570
this next-generation Rover as it gets to

766
00:32:10,350 --> 00:32:07,960
the launch pad it's been an amazing

767
00:32:12,570 --> 00:32:10,360
adventure here at NASA I started as an

768
00:32:15,210 --> 00:32:12,580
intern on the ATLA team actually for the

769
00:32:17,490 --> 00:32:15,220
Mars Science Laboratory project and it

770
00:32:20,310 --> 00:32:17,500
was interesting moving from more smaller

771
00:32:25,140 --> 00:32:20,320
day-to-day week-to-week tasks when I was

772
00:32:27,660 --> 00:32:25,150
a student to being a lead on this very

773
00:32:28,380 --> 00:32:27,670
important mission and and taking a much

774
00:32:30,120 --> 00:32:28,390
more strategic

775
00:32:32,820 --> 00:32:30,130
big pitch review of integrating a

776
00:32:34,590 --> 00:32:32,830
spacecraft I can actually say I touched

777
00:32:37,740 --> 00:32:34,600
and tested in some form every piece of

778
00:32:39,720 --> 00:32:37,750
hardware on this spacecraft and I truly

779
00:32:42,150 --> 00:32:39,730
appreciate the work NASA does to provide

780
00:32:44,640 --> 00:32:42,160
internships to students around the

781
00:32:47,130 --> 00:32:44,650
country and thankful everyday for having

782
00:32:49,410 --> 00:32:47,140
been given that opportunity having grown

783
00:32:50,580 --> 00:32:49,420
up in South Central Los Angeles I never

784
00:32:53,220 --> 00:32:50,590
thought I would be where I'm at today

785
00:32:54,570 --> 00:32:53,230
and it's an honor and a privilege to

786
00:32:59,370 --> 00:32:54,580
work with all the brilliant people on

787
00:33:01,620 --> 00:32:59,380
this team at JPL and at NASA I'm really

788
00:33:02,880 --> 00:33:01,630

looking forward to long stay Thank You

789
00:33:06,090 --> 00:33:02,890
Louise thank you for answering my

790
00:33:07,860 --> 00:33:06,100
questions and hitching a ride on the

791
00:33:10,260 --> 00:33:07,870
perseverance Rover is the Mars

792
00:33:13,050 --> 00:33:10,270
helicopter which now has a new name

793
00:33:15,030 --> 00:33:13,060
ingenuity ingenuity will attempt to be

794
00:33:17,970 --> 00:33:15,040
the first powered flight on another

795
00:33:20,220 --> 00:33:17,980
planet Mars helicopter project manager

796
00:33:23,640 --> 00:33:20,230
Mimi Young has an update on this

797
00:33:25,890 --> 00:33:23,650
exciting new technology experiment at

798
00:33:28,650 --> 00:33:25,900
this time Mars helicopter ingenuity is

799
00:33:31,140 --> 00:33:28,660
fully integrated on the rover the

800
00:33:33,480 --> 00:33:31,150
helicopter is stowed under the belly pin

801
00:33:34,980 --> 00:33:33,490
of the rover and has been checked out to

802
00:33:36,420 --> 00:33:34,990
be fully operational in the

803
00:33:39,390 --> 00:33:36,430
configuration that is going to be

804
00:33:42,180 --> 00:33:39,400
launched and operated in space our team

805
00:33:44,820 --> 00:33:42,190
is now preparing for operation after

806
00:33:46,890 --> 00:33:44,830
launch updating our simulations and

807
00:33:49,050 --> 00:33:46,900
rehearsing for the scenarios that we're

808
00:33:50,970 --> 00:33:49,060
going to encounter starting with

809
00:33:52,830 --> 00:33:50,980
monitoring the health of the vehicle

810
00:33:54,750 --> 00:33:52,840
through the cruise to Mars when the

811
00:33:56,910 --> 00:33:54,760
rover deploys the helicopter and

812
00:33:59,640 --> 00:33:56,920
commissioning of the helicopter all the

813
00:34:02,010 --> 00:33:59,650

way to our very first route across

814
00:34:04,350 --> 00:34:02,020
flight attempt at Mars seeing our

815
00:34:06,499 --> 00:34:04,360
helicopter get launched it's the start

816
00:34:08,359 --> 00:34:06,509
of everything our team has worked for

817
00:34:11,389 --> 00:34:08,369
and after it lands it's gonna be

818
00:34:13,669 --> 00:34:11,399
extraordinary after all of us working

819
00:34:17,029 --> 00:34:13,679
really hard for over six years it's

820
00:34:20,899 --> 00:34:17,039
gonna be outstanding to get to attempt

821
00:34:24,919 --> 00:34:20,909
the very first rotorcraft flight test at

822
00:34:30,230 --> 00:34:24,929
Mars and in fact first time on any other

823
00:34:32,690 --> 00:34:30,240
planet outside of our own earth both

824
00:34:35,839 --> 00:34:32,700
perseverance and ingenuity are riding on

825
00:34:38,419 --> 00:34:35,849
the same rocket to Mars right now NASA

826
00:34:43,999 --> 00:34:38,429
launch director Omar Baez joins us with

827
00:34:48,499 --> 00:34:44,009
an update hello there hello from Florida

828
00:34:51,139 --> 00:34:48,509
so we're 34 days from launch and the

829
00:34:54,470 --> 00:34:51,149
things that are going on have been

830
00:34:56,899 --> 00:34:54,480
touched on here the spacecraft will go

831
00:35:00,289 --> 00:34:56,909
undergo encapsulation as we says into

832
00:35:04,450 --> 00:35:00,299
the clamshell or the fairing halves in

833
00:35:10,460 --> 00:35:04,460
the coming weeks the launch vehicle if

834
00:35:14,150 --> 00:35:10,470
they could roll the tape this is

835
00:35:18,079 --> 00:35:14,160
actually the rover coming in and this is

836
00:35:20,059 --> 00:35:18,089
misleading because that rover that's one

837
00:35:22,099 --> 00:35:20,069
piece of it there was 16 tractor

838
00:35:24,259 --> 00:35:22,109

trailers that came in with other

839
00:35:29,210 --> 00:35:24,269
equipment there was another flight for

840
00:35:31,549 --> 00:35:29,220
other pieces so it just it did not just

841
00:35:34,849 --> 00:35:31,559
fit in that box there's a lot more that

842
00:35:37,670 --> 00:35:34,859
went into this mission and the assembly

843
00:35:41,420 --> 00:35:37,680
started in January back here this is

844
00:35:44,749 --> 00:35:41,430
actually the Atlas booster being

845
00:35:47,599 --> 00:35:44,759
offloaded from the Antonov airplane that

846
00:35:51,700 --> 00:35:47,609
brings it in from Decatur Alabama where

847
00:35:55,009 --> 00:35:51,710
the booster is built the booster

848
00:35:57,799 --> 00:35:55,019
provides the first four minutes and 20

849
00:36:03,349 --> 00:35:57,809
seconds of power for the flight before

850
00:36:07,130 --> 00:36:03,359
the Centaur this the upper stage it

851
00:36:11,809 --> 00:36:07,140
takes over and and puts us into its

852
00:36:14,440 --> 00:36:11,819
final escape orbit from the earth to

853
00:36:20,049 --> 00:36:14,450
Mars

854
00:36:22,960 --> 00:36:20,059
along with the the first stage booster

855
00:36:25,480 --> 00:36:22,970
our four solid rocket motors which you

856
00:36:28,180 --> 00:36:25,490
see being assembled here those will burn

857
00:36:31,180 --> 00:36:28,190
for approximately a minute and 50

858
00:36:33,970 --> 00:36:31,190
seconds providing the initial boost to

859
00:36:37,359 --> 00:36:33,980
get that complete stack of the first

860
00:36:41,319 --> 00:36:37,369
stage in the upper stage curiosity the

861
00:36:43,960 --> 00:36:41,329
payload fairing - its c3 velocity the

862
00:36:47,710 --> 00:36:43,970
escape velocity the fourteen point four

863
00:36:51,280 --> 00:36:47,720

kilometers quare not for those that need

864
00:36:56,220 --> 00:36:51,290
the preciseness that'll get us on its

865
00:37:00,250 --> 00:36:56,230
way we're looking forward to July 20th

866
00:37:03,609 --> 00:37:00,260
for that 915 time to get them going and

867
00:37:09,490 --> 00:37:03,619
so that the booster can do its descent

868
00:37:11,530 --> 00:37:09,500
and landing into Mars in February from

869
00:37:14,349 --> 00:37:11,540
behalf of the launch services program

870
00:37:16,930 --> 00:37:14,359
here at KSC we look forward to it

871
00:37:19,510 --> 00:37:16,940
we're looking forward to the fuelling

872
00:37:24,220 --> 00:37:19,520
the vehicle this coming Monday as part

873
00:37:27,010 --> 00:37:24,230
of our wet dress rehearsal and after

874
00:37:29,890 --> 00:37:27,020
that we will be putting that

875
00:37:33,190 --> 00:37:29,900
encapsulated Assembly of the spacecraft

876
00:37:37,260 --> 00:37:33,200
and the fairing on top of the booster

877
00:37:40,270 --> 00:37:37,270
and doing the final preparations for

878
00:37:43,329 --> 00:37:40,280
installation of the power source that

879
00:37:46,569 --> 00:37:43,339
will power the rover for years to come

880
00:37:49,960 --> 00:37:46,579
so from behalf of NASA and the launch

881
00:37:53,799 --> 00:37:49,970
services program it's a pleasure to do

882
00:37:57,190 --> 00:37:53,809
this launch and 34 days from now we'll

883
00:37:58,839 --> 00:37:57,200
have some happy faces here thanks for

884
00:38:01,900 --> 00:37:58,849
the update Omar we're looking forward to

885
00:38:04,900 --> 00:38:01,910
the happy faces now we are ready to take

886
00:38:06,910 --> 00:38:04,910
media questions remember to press star 1

887
00:38:08,470 --> 00:38:06,920
to get put in the queue and please

888
00:38:10,569 --> 00:38:08,480

direct your questions to one of the

889
00:38:12,760 --> 00:38:10,579
panelists we're also gonna take

890
00:38:15,069 --> 00:38:12,770
questions through the askin s a hashtag

891
00:38:18,970 --> 00:38:15,079
but first on the phone line is bill

892
00:38:21,579 --> 00:38:18,980
Harwood from CBS News thank you very

893
00:38:24,970 --> 00:38:21,589
much for taking the time to chat with us

894
00:38:26,650 --> 00:38:24,980
um two very quick questions one is just

895
00:38:28,690 --> 00:38:26,660
to have an update maybe for Lori what's

896
00:38:30,460 --> 00:38:28,700
the what is the total cost of this

897
00:38:31,450 --> 00:38:30,470
mission or what number should we be

898
00:38:34,930 --> 00:38:31,460
using

899
00:38:36,910 --> 00:38:34,940
and maybe for Omar how much and and for

900
00:38:38,650 --> 00:38:36,920
Matt well it's how much reserve is left

901
00:38:40,600 --> 00:38:38,660
in the schedule to handle anything that

902
00:38:42,130 --> 00:38:40,610
goes out of the ordinary are you right

903
00:38:48,970 --> 00:38:42,140
down to the wire if you get some time to

904
00:38:50,260 --> 00:38:48,980
handle unexpected issues Thanks great so

905
00:38:53,020 --> 00:38:50,270
thanks for the question

906
00:38:56,260 --> 00:38:53,030
so I can tell you that the cost for the

907
00:38:58,690 --> 00:38:56,270
development of the perseverance rover

908
00:39:01,000 --> 00:38:58,700
all the way up through launch is about

909
00:39:03,670 --> 00:39:01,010
2.4 billion dollars and there's another

910
00:39:06,340 --> 00:39:03,680
300 million that will spend to to

911
00:39:07,840 --> 00:39:06,350
operate perseverance once it's after its

912
00:39:09,940 --> 00:39:07,850
launch and it's on its way and then once

913
00:39:13,210 --> 00:39:09,950

it lands and to do all of the surface

914
00:39:16,300 --> 00:39:13,220
science once it gets to Mars I'll toss

915
00:39:20,530 --> 00:39:16,310
it back over to Omar in - Matt yeah I'll

916
00:39:23,680 --> 00:39:20,540
just say relative to the spacecraft the

917
00:39:26,110 --> 00:39:23,690
the the key margin that we have is in

918
00:39:29,440 --> 00:39:26,120
the launch window itself we're targeting

919
00:39:32,460 --> 00:39:29,450
the first launch launch date as July

920
00:39:37,930 --> 00:39:32,470
20th as Omar said but the window in fact

921
00:39:39,610 --> 00:39:37,940
lasts until August 11th and so and in

922
00:39:42,640 --> 00:39:39,620
even during those single days we have

923
00:39:44,530 --> 00:39:42,650
multiple opportunities to recycle if

924
00:39:46,900 --> 00:39:44,540
there's some issues and so we think we

925
00:39:48,720 --> 00:39:46,910
have some robustness there we have good

926
00:39:51,070 --> 00:39:48,730
robustness there in the launch window

927
00:39:52,870 --> 00:39:51,080
relative to the launch vehicle

928
00:39:59,200 --> 00:39:52,880
processing oh I'll turn it back over to

929
00:40:00,970 --> 00:39:59,210
a more and yeah bill relative to

930
00:40:03,760 --> 00:40:00,980
schedule we are a green light schedule

931
00:40:05,740 --> 00:40:03,770
from here on out in other words any any

932
00:40:07,720 --> 00:40:05,750
major perturbation could affect the

933
00:40:11,440 --> 00:40:07,730
launch date but as matt said we got

934
00:40:13,570 --> 00:40:11,450
plenty of of window or runway ahead of

935
00:40:17,250 --> 00:40:13,580
us and we're not worried about it I'm

936
00:40:19,420 --> 00:40:17,260
sure you know Florida weather as it is

937
00:40:21,610 --> 00:40:19,430
you know it's been perfect the last

938
00:40:23,860 --> 00:40:21,620

couple of days but we'll probably run

939
00:40:26,560 --> 00:40:23,870
into some not so perfect days that could

940
00:40:31,570 --> 00:40:26,570
set us back and the team is flexible

941
00:40:35,560 --> 00:40:31,580
enough to be able to handle a three week

942
00:40:39,220 --> 00:40:35,570
window I would say and and we have

943
00:40:42,610 --> 00:40:39,230
analyzed that to the 11th of August and

944
00:40:43,359 --> 00:40:42,620
if need be and the analysis provides

945
00:40:45,579 --> 00:40:43,369
this

946
00:40:48,880 --> 00:40:45,589
additional margin we might even get up

947
00:40:53,259 --> 00:40:48,890
to the 15th of August so no concerns

948
00:40:55,690 --> 00:40:53,269
from our part great and now the next

949
00:41:00,640 --> 00:40:55,700
question is for marina Corinth from the

950
00:41:03,099 --> 00:41:00,650
Atlantic hi everyone this question is

951
00:41:04,660 --> 00:41:03,109
for whom I would like to take it there

952
00:41:06,489 --> 00:41:04,670
are some sciences and other space fans

953
00:41:08,680 --> 00:41:06,499
out there who think that nASA has given

954
00:41:10,779 --> 00:41:08,690
a lot of attention to robotic mission to

955
00:41:12,489 --> 00:41:10,789
Mars over the years and they want to see

956
00:41:14,200 --> 00:41:12,499
spacecrafts visit other spots in our

957
00:41:15,670 --> 00:41:14,210
solar system especially moons where

958
00:41:18,819 --> 00:41:15,680
there might be evidence of life right

959
00:41:20,410 --> 00:41:18,829
now rather than ancient science so I'm

960
00:41:22,359 --> 00:41:20,420
wondering what you would say to those

961
00:41:24,190 --> 00:41:22,369
people who believe that Mars is a little

962
00:41:26,349 --> 00:41:24,200
bit over studied and that we should be

963
00:41:31,180 --> 00:41:26,359

focusing elsewhere in the solar system

964
00:41:36,009 --> 00:41:31,190
on the search for life I'll be happy to

965
00:41:40,749 --> 00:41:36,019
take that question we're thank you I'll

966
00:41:43,269 --> 00:41:40,759
take it yeah I for one am a fan of our

967
00:41:44,829 --> 00:41:43,279
entire solar system I love every every

968
00:41:47,109 --> 00:41:44,839
destination that we have there's

969
00:41:50,620 --> 00:41:47,119
incredible science across as you know

970
00:41:54,460 --> 00:41:50,630
the entire solar system Mars has been a

971
00:41:56,170 --> 00:41:54,470
really fantastic place to to really

972
00:41:57,759 --> 00:41:56,180
explore in depth and saw our Mars

973
00:42:00,069 --> 00:41:57,769
exploration program has really done an

974
00:42:02,289 --> 00:42:00,079
amazing job at Mars and we there's still

975
00:42:04,239 --> 00:42:02,299
a lot of work to be done there but I

976
00:42:05,920 --> 00:42:04,249
absolutely agree with you that there are

977
00:42:09,729 --> 00:42:05,930
other places in the solar system that

978
00:42:12,160 --> 00:42:09,739
might actually be maybe even better

979
00:42:14,440 --> 00:42:12,170
places to be looking for actual extant

980
00:42:17,529 --> 00:42:14,450
life that might be present today and of

981
00:42:20,950 --> 00:42:17,539
course the moons of of Jupiter and

982
00:42:24,370 --> 00:42:20,960
Saturn you know for Europa or Enceladus

983
00:42:26,609 --> 00:42:24,380
or maybe even Titan our places where we

984
00:42:28,749 --> 00:42:26,619
feel like there may actually be

985
00:42:31,150 --> 00:42:28,759
environments that could be conducive to

986
00:42:32,829 --> 00:42:31,160
having life today for example on Europa

987
00:42:34,870 --> 00:42:32,839
and Enceladus that are covered in ice

988
00:42:36,759 --> 00:42:34,880

certainly there is probably low

989
00:42:39,279 --> 00:42:36,769
probability of life on the surface but

990
00:42:42,670 --> 00:42:39,289
beneath that ice we believe there are

991
00:42:45,400 --> 00:42:42,680
these deep oceans that may have thermals

992
00:42:47,380 --> 00:42:45,410
sources at the at the base of those that

993
00:42:49,779 --> 00:42:47,390
are driven by geologic processes that

994
00:42:52,539 --> 00:42:49,789
recycle the oceans and recycle the

995
00:42:54,339 --> 00:42:52,549
nutrients within those waters and could

996
00:42:56,079 --> 00:42:54,349
actually be sites where we think you

997
00:42:57,010 --> 00:42:56,089
have all the ingredients necessary for

998
00:42:59,620 --> 00:42:57,020
life

999
00:43:01,150 --> 00:42:59,630
so we are looking for great ideas to

1000
00:43:03,550 --> 00:43:01,160
send other missions we've got Europa

1001
00:43:07,030 --> 00:43:03,560
clipper that's going to be going to

1002
00:43:08,560 --> 00:43:07,040
Europa to map the surface it's an

1003
00:43:12,040 --> 00:43:08,570
orbiting mission that will orbit Jupiter

1004
00:43:14,620 --> 00:43:12,050
and make several passes of Europa that

1005
00:43:16,110 --> 00:43:14,630
will launch later in this decade and now

1006
00:43:20,230 --> 00:43:16,120
we're also developing the mission

1007
00:43:23,140 --> 00:43:20,240
dragonfly which will launch in 2026 to

1008
00:43:24,610 --> 00:43:23,150
go to to Titan and to explore the

1009
00:43:26,650 --> 00:43:24,620
environments there on the surface that's

1010
00:43:28,480 --> 00:43:26,660
actually the next rotor craft that will

1011
00:43:30,340 --> 00:43:28,490
fly in a planetary atmosphere as an

1012
00:43:33,070 --> 00:43:30,350
octocopter that will land on the surface

1013
00:43:35,050 --> 00:43:33,080

of Titan so those are also excellent

1014
00:43:36,790 --> 00:43:35,060
destinations and we're very interested

1015
00:43:39,600 --> 00:43:36,800
in them and pursuing a variety of

1016
00:43:42,340 --> 00:43:39,610
different ways to get there

1017
00:43:46,450 --> 00:43:42,350
thanks Laurie and up next on the

1018
00:43:47,920 --> 00:43:46,460
phonelines is Marsha done with AP yes

1019
00:43:50,380 --> 00:43:47,930
hello thank you

1020
00:43:53,170 --> 00:43:50,390
I have some questions about the returned

1021
00:43:55,720 --> 00:43:53,180
samples the animation almost makes it

1022
00:43:57,700 --> 00:43:55,730
look like the cylinders with samples or

1023
00:44:01,000 --> 00:43:57,710
just sort of dropped on the surface of

1024
00:44:05,020 --> 00:44:01,010
Mars sort of scattered how are you going

1025
00:44:07,810 --> 00:44:05,030
to leave these samples for pickup do

1026
00:44:10,840 --> 00:44:07,820
they have beacons in case there's a dust

1027
00:44:14,560 --> 00:44:10,850
storm of some sort and also maybe for

1028
00:44:16,570 --> 00:44:14,570
dr. glaze why ten years to get the

1029
00:44:18,040 --> 00:44:16,580
samples back I would think I know you

1030
00:44:19,720 --> 00:44:18,050
want them as soon as possible and

1031
00:44:22,000 --> 00:44:19,730
waiting a decade just seems like a long

1032
00:44:27,510 --> 00:44:22,010
time so if you could answer that they'd

1033
00:44:33,220 --> 00:44:29,950
so I'm gonna suggest that perhaps Katy

1034
00:44:35,170 --> 00:44:33,230
take the first part or Matt yeah I could

1035
00:44:37,540 --> 00:44:35,180
start off and Katie can can jump in here

1036
00:44:40,120 --> 00:44:37,550
just just understand how the these

1037
00:44:42,070 --> 00:44:40,130
samples are collected and and then left

1038
00:44:44,650 --> 00:44:42,080

on the surface we do collect them as

1039
00:44:46,990 --> 00:44:44,660
individual tubes and we have the ability

1040
00:44:48,640 --> 00:44:47,000
to drop those tubes either in ones and

1041
00:44:52,610 --> 00:44:48,650
twos or in groups

1042
00:44:55,730 --> 00:44:52,620
our current intent is is to drop them in

1043
00:44:57,620 --> 00:44:55,740
grouping so that the fetcher over which

1044
00:45:00,260 --> 00:44:57,630
you saw in the animation would not have

1045
00:45:02,960 --> 00:45:00,270
to go to many locations to actually pick

1046
00:45:05,780 --> 00:45:02,970
those tubes up and so we have complete

1047
00:45:09,200 --> 00:45:05,790
flexibility but that would be the the

1048
00:45:11,330 --> 00:45:09,210
intent as far as the dust storms go we

1049
00:45:14,330 --> 00:45:11,340
know how we know how the sand and the

1050
00:45:16,610 --> 00:45:14,340
dust moves on Mars and we know what

1051
00:45:20,300 --> 00:45:16,620
locations to select to make sure these

1052
00:45:22,970 --> 00:45:20,310
these are not affected by by those types

1053
00:45:24,440 --> 00:45:22,980
of issues and so we don't think there's

1054
00:45:27,050 --> 00:45:24,450
gonna be any issue with respect to

1055
00:45:29,360 --> 00:45:27,060
covering up the tubes over the period of

1056
00:45:32,030 --> 00:45:29,370
time that we're talking about or finding

1057
00:45:33,740 --> 00:45:32,040
the tubes on the surface Katie can say a

1058
00:45:35,450 --> 00:45:33,750
word or two maybe about the sort of

1059
00:45:37,790 --> 00:45:35,460
science strategy associate with that

1060
00:45:39,200 --> 00:45:37,800
yeah that's something that we are still

1061
00:45:41,000 --> 00:45:39,210
very much thinking about and will be

1062
00:45:44,180 --> 00:45:41,010
guided by our exploration on the surface

1063
00:45:46,790 --> 00:45:44,190

as we you know decide where and how to

1064
00:45:48,350 --> 00:45:46,800
sample and where we'd like to leave that

1065
00:45:50,960 --> 00:45:48,360
sample cache you know I think it's

1066
00:45:53,210 --> 00:45:50,970
important too to think about what

1067
00:45:55,430 --> 00:45:53,220
samples go in what cache and where as

1068
00:45:56,930 --> 00:45:55,440
the the fetch River capabilities develop

1069
00:45:58,580 --> 00:45:56,940
and Mars sample return architecture

1070
00:46:00,050 --> 00:45:58,590
develops as well so we'll be thinking

1071
00:46:02,210 --> 00:46:00,060
about that and that'll probably be an

1072
00:46:04,220 --> 00:46:02,220
active iterative conversation that we

1073
00:46:05,690 --> 00:46:04,230
have with the Mars 2020 project as well

1074
00:46:11,990 --> 00:46:05,700
as the Mars sample return architecture

1075
00:46:13,610 --> 00:46:12,000
as it as it develops great yeah so I'm

1076
00:46:15,500 --> 00:46:13,620
not trying to take the next part of that

1077
00:46:17,390 --> 00:46:15,510
question which is you know why does it

1078
00:46:19,130 --> 00:46:17,400
take so long to actually get the samples

1079
00:46:20,330 --> 00:46:19,140
back and you're absolutely right we

1080
00:46:21,890 --> 00:46:20,340
definitely want to try and get those

1081
00:46:24,320 --> 00:46:21,900
samples back here they're very precious

1082
00:46:26,150 --> 00:46:24,330
we want to to get them back here so that

1083
00:46:28,310 --> 00:46:26,160
we can start the analysis and and learn

1084
00:46:31,850 --> 00:46:28,320
from from the samples but this is a

1085
00:46:33,200 --> 00:46:31,860
really complex concept to try and bring

1086
00:46:34,700 --> 00:46:33,210
those samples back and in fact we've

1087
00:46:36,770 --> 00:46:34,710
always known from the very beginning

1088
00:46:38,870 --> 00:46:36,780

that this was not going to be a simple a

1089
00:46:40,430 --> 00:46:38,880
simple mission where we simply fly to

1090
00:46:41,900 --> 00:46:40,440
Mars collect the samples and bring them

1091
00:46:44,530 --> 00:46:41,910
back we've always known it was going to

1092
00:46:47,150 --> 00:46:44,540
require multiple steps and multiple

1093
00:46:49,400 --> 00:46:47,160
launches in order to actually get the

1094
00:46:51,950 --> 00:46:49,410
the samples back not only because of the

1095
00:46:54,320 --> 00:46:51,960
time required but the cost as well so we

1096
00:46:56,510 --> 00:46:54,330
need to paste that out we're really in a

1097
00:46:58,940 --> 00:46:56,520
great position right now where we have

1098
00:47:00,770 --> 00:46:58,950
developed a fantastic partnership with

1099
00:47:02,240 --> 00:47:00,780
European Space Agency which actually

1100
00:47:03,920 --> 00:47:02,250
allows us to get those samples back a

1101
00:47:05,840 --> 00:47:03,930
little bit earlier than had originally

1102
00:47:06,260 --> 00:47:05,850
been planned if we were trying to do it

1103
00:47:08,840 --> 00:47:06,270
all on

1104
00:47:11,180 --> 00:47:08,850
our own by collaborating with ESET

1105
00:47:13,280 --> 00:47:11,190
allows us to have two launchers from

1106
00:47:15,260 --> 00:47:13,290
Earth a new European launch and a NASA

1107
00:47:17,990 --> 00:47:15,270
launch that will send the Mars sample

1108
00:47:19,370 --> 00:47:18,000
return mission out to Mars collect the

1109
00:47:21,650 --> 00:47:19,380
samples and bring them back like the

1110
00:47:23,780 --> 00:47:21,660
animation that you saw allows us to do

1111
00:47:25,910 --> 00:47:23,790
that in the shorter time period right

1112
00:47:27,260 --> 00:47:25,920
now we're working on in developing the

1113
00:47:29,540 --> 00:47:27,270

plans for that Mars sample return

1114
00:47:32,210 --> 00:47:29,550
mission we're planning towards a launch

1115
00:47:35,060 --> 00:47:32,220
around 2026 which would then bring those

1116
00:47:36,650 --> 00:47:35,070
samples back in 2031 it takes a little

1117
00:47:38,960 --> 00:47:36,660
time to get out there it takes time to

1118
00:47:40,400 --> 00:47:38,970
pick up the samples on the surface then

1119
00:47:41,930 --> 00:47:40,410
it takes time to actually get out of

1120
00:47:43,910 --> 00:47:41,940
orbit at Mars and bring them back so

1121
00:47:45,680 --> 00:47:43,920
it's a long and involved process but

1122
00:47:47,440 --> 00:47:45,690
it's one we're absolutely dedicated to

1123
00:47:49,340 --> 00:47:47,450
and we're gonna make it happen

1124
00:47:51,050 --> 00:47:49,350
great that was some great team work

1125
00:47:53,750 --> 00:47:51,060
getting that question answered thank you

1126
00:47:58,460 --> 00:47:53,760
and on the line now we have Keith Cohen

1127
00:48:00,710 --> 00:47:58,470
with NASA watch I have a question for

1128
00:48:03,730 --> 00:48:00,720
Jim bridenstine it's a branding question

1129
00:48:06,770 --> 00:48:03,740
you just brought back the worm logo so

1130
00:48:08,540 --> 00:48:06,780
Bobby Brown was recently on 60 minutes

1131
00:48:11,210 --> 00:48:08,550
and he referred to this mission as

1132
00:48:12,980 --> 00:48:11,220
NASA's first ask a biology mission now

1133
00:48:15,560 --> 00:48:12,990
of course the Vikings were but I'll let

1134
00:48:17,120 --> 00:48:15,570
Bobby add that but NASA is a program

1135
00:48:19,010 --> 00:48:17,130
that's been going on for 20 years it's

1136
00:48:21,380 --> 00:48:19,020
called astrobiology yet if you go to the

1137
00:48:23,060 --> 00:48:21,390
website for this mission unless you know

1138
00:48:25,490 --> 00:48:23,070

where the one page is where it mentions

1139
00:48:28,460 --> 00:48:25,500
astrobiology there's no links no nothing

1140
00:48:30,650 --> 00:48:28,470
we go to the astrobiology page you don't

1141
00:48:32,630 --> 00:48:30,660
even know this thing is happening today

1142
00:48:34,010 --> 00:48:32,640
they don't even mention the rover and so

1143
00:48:35,420 --> 00:48:34,020
I'm kind of wondering you know this

1144
00:48:37,910 --> 00:48:35,430
started there gonna be four Rovers on

1145
00:48:40,460 --> 00:48:37,920
Mars soon all doing astrobiology there's

1146
00:48:41,510 --> 00:48:40,470
going to be a big deal so maybe you

1147
00:48:43,310 --> 00:48:41,520
could explain a little bit on the

1148
00:48:45,440 --> 00:48:43,320
branding of the marketing here why NASA

1149
00:48:47,480 --> 00:48:45,450
can't get their act together and maybe

1150
00:48:48,830 --> 00:48:47,490
you know hoping to hear that you're

1151
00:48:53,090 --> 00:48:48,840
going to get this all figured out by the

1152
00:48:58,150 --> 00:48:55,310
Keith that's a great a great question

1153
00:49:00,850 --> 00:48:58,160
and a great point well I'll tell you

1154
00:49:03,470 --> 00:49:00,860
astrobiology is is really something that

1155
00:49:05,210 --> 00:49:03,480
it depends how you define it whether or

1156
00:49:07,370 --> 00:49:05,220
not this is the first mission or not if

1157
00:49:09,740 --> 00:49:07,380
you look at what we did with Spirit and

1158
00:49:11,120 --> 00:49:09,750
Opportunity we made discoveries we

1159
00:49:14,150 --> 00:49:11,130
discovered that on the northern

1160
00:49:16,880 --> 00:49:14,160
hemisphere of Mars it was 2/3 covered

1161
00:49:19,130 --> 00:49:16,890
with water that indicate that it had a

1162
00:49:19,950 --> 00:49:19,140
very thick atmosphere that it had maybe

1163
00:49:21,690 --> 00:49:19,960

even a straw

1164
00:49:24,750 --> 00:49:21,700
magnetosphere which would indicate that

1165
00:49:25,980 --> 00:49:24,760
Mars at one time had a molten core when

1166
00:49:28,620 --> 00:49:25,990
we think about having a thick atmosphere

1167
00:49:31,589 --> 00:49:28,630
and liquid water on the surface and a

1168
00:49:35,130 --> 00:49:31,599
magnetosphere all of that indicates that

1169
00:49:37,170 --> 00:49:35,140
Mars was maybe at one time habitable in

1170
00:49:39,630 --> 00:49:37,180
other words it could have supported life

1171
00:49:42,089 --> 00:49:39,640
so you could argue that even when we

1172
00:49:43,980 --> 00:49:42,099
were doing Spirit and Opportunity that

1173
00:49:45,420 --> 00:49:43,990
those missions were astrobiology

1174
00:49:48,900 --> 00:49:45,430
missions and of course with curiosity

1175
00:49:51,240 --> 00:49:48,910
and now perseverance or building on that

1176
00:49:54,210 --> 00:49:51,250
base of knowledge so all of that is so

1177
00:49:57,480 --> 00:49:54,220
important we are in fact trying to find

1178
00:49:59,720 --> 00:49:57,490
signatures of life and of course we're

1179
00:50:01,800 --> 00:49:59,730
interested in finding life itself now

1180
00:50:03,810 --> 00:50:01,810
that's not what this mission

1181
00:50:06,930 --> 00:50:03,820
specifically is all about but I can tell

1182
00:50:08,910 --> 00:50:06,940
you in the last couple of years you know

1183
00:50:11,910 --> 00:50:08,920
nASA has made some significant

1184
00:50:13,020 --> 00:50:11,920
discoveries complex organic compounds on

1185
00:50:15,720 --> 00:50:13,030
the surface of Mars

1186
00:50:19,500 --> 00:50:15,730
methane cycles that match the seasons of

1187
00:50:22,230 --> 00:50:19,510
Mars liquid water 12 kilometers under

1188
00:50:24,839 --> 00:50:22,240

the surface of Mars so there's there's

1189
00:50:27,240 --> 00:50:24,849
so many things that are kind of building

1190
00:50:29,820 --> 00:50:27,250
up here to say that look the probability

1191
00:50:32,130 --> 00:50:29,830
of finding life on another world is

1192
00:50:33,450 --> 00:50:32,140
going up we're not saying it's there I

1193
00:50:35,930 --> 00:50:33,460
don't know that it's there or nobody

1194
00:50:38,040 --> 00:50:35,940
else knows either but that's really what

1195
00:50:40,109 --> 00:50:38,050
astrobiology is all about and Mars

1196
00:50:42,240 --> 00:50:40,119
really gives us the best opportunity I

1197
00:50:44,160 --> 00:50:42,250
think in the short term to make a

1198
00:50:46,079 --> 00:50:44,170
significant discovery that will forever

1199
00:50:49,109 --> 00:50:46,089
change how we think of ourselves and

1200
00:50:51,390 --> 00:50:49,119
forever change how we think of space

1201
00:50:54,780 --> 00:50:51,400
exploration in general look we can find

1202
00:50:56,430 --> 00:50:54,790
life on another world it I think people

1203
00:50:59,970 --> 00:50:56,440
are going to be so excited about the

1204
00:51:01,109 --> 00:50:59,980
discovery and what comes next that that

1205
00:51:02,700 --> 00:51:01,119
we're going to be doing missions

1206
00:51:04,560 --> 00:51:02,710
throughout the solar system I know the

1207
00:51:06,050 --> 00:51:04,570
question earlier about why are we going

1208
00:51:08,040 --> 00:51:06,060
to Mars and not these other places

1209
00:51:09,900 --> 00:51:08,050
certainly we want to go to all those

1210
00:51:13,820 --> 00:51:09,910
places and we have plans to go to all

1211
00:51:16,500 --> 00:51:13,830
those places but but it's also true that

1212
00:51:18,660 --> 00:51:16,510
that you know the highest probability of

1213
00:51:20,339 --> 00:51:18,670

maybe finding life at this point is

1214
00:51:22,310 --> 00:51:20,349
going to is going to be ours there are

1215
00:51:25,880 --> 00:51:22,320
there are people out there who would say

1216
00:51:29,930 --> 00:51:25,890
that Europa or Enceladus provide

1217
00:51:31,859 --> 00:51:29,940
biologically a higher probability but

1218
00:51:32,620 --> 00:51:31,869
technologically that's going to take

1219
00:51:34,900 --> 00:51:32,630
some time

1220
00:51:37,780 --> 00:51:34,910
and of course working on that JPL I want

1221
00:51:40,360 --> 00:51:37,790
to give a lot of kudos a lot of

1222
00:51:42,880 --> 00:51:40,370
compliments to JPL which is you know a

1223
00:51:45,310 --> 00:51:42,890
partner with NASA it's we call it one of

1224
00:51:48,700 --> 00:51:45,320
NASA's centers of course it's affiliated

1225
00:51:50,410 --> 00:51:48,710
with Caltech but what an amazing job by

1226
00:51:52,840 --> 00:51:50,420
that team and of course they're building

1227
00:51:54,760 --> 00:51:52,850
the the plans and and and the hardware

1228
00:51:56,740 --> 00:51:54,770
that's going to help us get to Europa

1229
00:52:00,430 --> 00:51:56,750
that month of Jupiter where where we

1230
00:52:03,160 --> 00:52:00,440
believe there's the the the ingredients

1231
00:52:05,080 --> 00:52:03,170
that could potentially have life so

1232
00:52:07,960 --> 00:52:05,090
there's a lot of exciting things in the

1233
00:52:08,740 --> 00:52:07,970
field of astrobiology and you know 15

1234
00:52:12,370 --> 00:52:08,750
years ago

1235
00:52:13,690 --> 00:52:12,380
said these things people would have

1236
00:52:16,540 --> 00:52:13,700
looked at you like you're crazy about

1237
00:52:18,400 --> 00:52:16,550
it's starting to become more and more

1238
00:52:20,080 --> 00:52:18,410

real so it's a it's a great question

1239
00:52:23,310 --> 00:52:20,090
it's a great point and it's it's

1240
00:52:25,780 --> 00:52:23,320
something NASA thinks about all the time

1241
00:52:27,340 --> 00:52:25,790
thanks Jim and we've been getting some

1242
00:52:29,380 --> 00:52:27,350
questions coming in through the ask NASA

1243
00:52:32,770 --> 00:52:29,390
hashtag I'm gonna read one of them now

1244
00:52:35,230 --> 00:52:32,780
everyone on Twitter is asking apart from

1245
00:52:39,420 --> 00:52:35,240
entry descent and landing what is the

1246
00:52:45,160 --> 00:52:43,240
well I can I can answer try to answer

1247
00:52:48,040 --> 00:52:45,170
that question there's a lot to choose

1248
00:52:49,750 --> 00:52:48,050
from these these missions are very very

1249
00:52:52,470 --> 00:52:49,760
difficult you know we talked about the

1250
00:52:55,180 --> 00:52:52,480
challenge just in the last few months

1251
00:52:58,060 --> 00:52:55,190
dealing with the pandemic obviously but

1252
00:53:01,770 --> 00:52:58,070
I think from a basic mission perspective

1253
00:53:04,510 --> 00:53:01,780
the most difficult part has been

1254
00:53:07,570 --> 00:53:04,520
building and testing the the sampling

1255
00:53:09,460 --> 00:53:07,580
system that we referred to as I said

1256
00:53:13,660 --> 00:53:09,470
before it's composed of a lot of

1257
00:53:15,700 --> 00:53:13,670
different mechanisms these are systems

1258
00:53:19,030 --> 00:53:15,710
that have to operate a very high level

1259
00:53:22,030 --> 00:53:19,040
of reliability they have to operate

1260
00:53:24,640 --> 00:53:22,040
autonomously there's a lot of control

1261
00:53:27,430 --> 00:53:24,650
and autonomy and our software systems

1262
00:53:31,180 --> 00:53:27,440
that go along with them they require

1263
00:53:33,460 --> 00:53:31,190

extensive test facilities so that we can

1264
00:53:36,340 --> 00:53:33,470
simulate the Martian environment and and

1265
00:53:39,100 --> 00:53:36,350
the right set of rocks and targets and

1266
00:53:42,970 --> 00:53:39,110
then of course you know on this mission

1267
00:53:46,150 --> 00:53:42,980
in particular because of the the search

1268
00:53:48,010 --> 00:53:46,160
for for those those very faint

1269
00:53:50,970 --> 00:53:48,020
biosignatures which Katie and other

1270
00:53:53,140 --> 00:53:50,980
people talked about we had to keep them

1271
00:53:56,080 --> 00:53:53,150
essentially sterile from a biological

1272
00:53:58,840 --> 00:53:56,090
perspective it's been exceptionally

1273
00:54:00,190 --> 00:53:58,850
clean especially organically clean which

1274
00:54:02,250 --> 00:54:00,200
are the signatures of chemical

1275
00:54:05,920 --> 00:54:02,260
signatures were most interested in so

1276
00:54:11,070 --> 00:54:05,930
that's a difficult thing to do when the

1277
00:54:14,680 --> 00:54:11,080
rest of your spacecraft is is really

1278
00:54:16,960 --> 00:54:14,690
designed and inherited from the systems

1279
00:54:20,620 --> 00:54:16,970
that we have to use in the aerospace

1280
00:54:22,840 --> 00:54:20,630
industry and in civil space so we had to

1281
00:54:26,050 --> 00:54:22,850
isolate a lot of the key critical

1282
00:54:28,180 --> 00:54:26,060
components from from the other parts of

1283
00:54:30,550 --> 00:54:28,190
the spacecraft from a contamination

1284
00:54:33,090 --> 00:54:30,560
perspective and that was I think the

1285
00:54:35,320 --> 00:54:33,100
biggest challenge for for this mission

1286
00:54:38,140 --> 00:54:35,330
you know once we get on the surface of

1287
00:54:40,330 --> 00:54:38,150
Mars we have a responsibility to put

1288
00:54:42,190 --> 00:54:40,340

together a cache of samples that is

1289
00:54:44,860 --> 00:54:42,200
compelling enough and worthy enough to

1290
00:54:46,780 --> 00:54:44,870
return to Earth and you know interesting

1291
00:54:49,150 --> 00:54:46,790
enough that it will propel and drive

1292
00:54:51,040 --> 00:54:49,160
future generations of Mars science and

1293
00:54:52,750 --> 00:54:51,050
planetary science and we take that

1294
00:54:54,310 --> 00:54:52,760
responsibility very seriously and we

1295
00:54:56,200 --> 00:54:54,320
know that we have a tough job to do on

1296
00:54:57,550 --> 00:54:56,210
the surface to put that sample cache

1297
00:54:59,440 --> 00:54:57,560
together and so I think that's going to

1298
00:55:01,150 --> 00:54:59,450
be a challenge that we have to put

1299
00:55:03,100 --> 00:55:01,160
together diverse samples those that have

1300
00:55:04,900 --> 00:55:03,110
potential bio signatures and enough

1301
00:55:06,880 --> 00:55:04,910
samples that we cover cover the ground

1302
00:55:08,710 --> 00:55:06,890
to get that job done so we take that

1303
00:55:10,690 --> 00:55:08,720
very seriously and I think that's going

1304
00:55:13,140 --> 00:55:10,700
to be a big challenge for our team once

1305
00:55:15,700 --> 00:55:13,150
we get on Mars

1306
00:55:17,860 --> 00:55:15,710
thanks Katie and Matt you kind of

1307
00:55:20,680 --> 00:55:17,870
touched on this nas on Twitter is asking

1308
00:55:24,100 --> 00:55:20,690
is there any level of autonomy included

1309
00:55:24,960 --> 00:55:24,110
on this Mars rover there's a lot of

1310
00:55:27,040 --> 00:55:24,970
autonomy

1311
00:55:29,530 --> 00:55:27,050
again just starting with the entry

1312
00:55:32,290 --> 00:55:29,540
descent and landing activity you know

1313
00:55:34,480 --> 00:55:32,300

one-way light time to Mars is about 10

1314
00:55:37,290 --> 00:55:34,490
minutes and from the time we hit the

1315
00:55:40,090 --> 00:55:37,300
outer atmosphere of Mars to the time

1316
00:55:42,940 --> 00:55:40,100
we're safely on the ground it's about

1317
00:55:44,420 --> 00:55:42,950
seven minutes we refer to it as the

1318
00:55:46,610 --> 00:55:44,430
seven minutes of Terror

1319
00:55:48,260 --> 00:55:46,620
there is absolutely no interaction with

1320
00:55:50,800 --> 00:55:48,270
this spacecraft during that period of

1321
00:55:52,100 --> 00:55:50,810
time it has to do that entire process

1322
00:55:54,770 --> 00:55:52,110
itself

1323
00:55:56,810 --> 00:55:54,780
yes to understand you know where it is

1324
00:55:59,030 --> 00:55:56,820
from the navigation perspective it has

1325
00:56:01,160 --> 00:55:59,040
to know when to jettison the cruise

1326
00:56:04,400 --> 00:56:01,170
stage and deploy the parachute it has to

1327
00:56:06,260 --> 00:56:04,410
understand where it is in jezero I

1328
00:56:09,140 --> 00:56:06,270
talked about this terrain relative

1329
00:56:11,030 --> 00:56:09,150
navigation system this is really again

1330
00:56:14,630 --> 00:56:11,040
another level of autonomy that we're

1331
00:56:15,920 --> 00:56:14,640
laying on top of our historical autonomy

1332
00:56:17,930 --> 00:56:15,930
on these missions and this is a

1333
00:56:20,480 --> 00:56:17,940
feed-forward capability that these

1334
00:56:22,160 --> 00:56:20,490
future human missions as well as the

1335
00:56:24,520 --> 00:56:22,170
sample return mission which Larry talked

1336
00:56:26,930 --> 00:56:24,530
about will need and will want to use

1337
00:56:29,390 --> 00:56:26,940
trying to understand where those hazards

1338
00:56:31,400 --> 00:56:29,400

are and divert away from them all of

1339
00:56:34,100 --> 00:56:31,410
that requires the spacecraft to

1340
00:56:36,410 --> 00:56:34,110
understand to do those things on its own

1341
00:56:36,950 --> 00:56:36,420
and that's before we even get to the

1342
00:56:40,310 --> 00:56:36,960
surface

1343
00:56:44,150 --> 00:56:40,320
really are only able to command the

1344
00:56:45,980 --> 00:56:44,160
vehicle once a day and so it'll sleep

1345
00:56:48,920 --> 00:56:45,990
and conserve power over night it'll wake

1346
00:56:50,960 --> 00:56:48,930
up in the morning we'll send a sequence

1347
00:56:53,660 --> 00:56:50,970
of commands give it its daily set of

1348
00:56:55,760 --> 00:56:53,670
activities to do and then it has to

1349
00:56:57,710 --> 00:56:55,770
carry them out pretty much by itself you

1350
00:56:59,900 --> 00:56:57,720
know it has to it has to make the

1351
00:57:01,970 --> 00:56:59,910
decisions on how to drive to the target

1352
00:57:03,530 --> 00:57:01,980
and how to do a lot of that sampling

1353
00:57:05,900 --> 00:57:03,540
work that we talked about as well as

1354
00:57:08,330 --> 00:57:05,910
keeping it safe under keeping itself

1355
00:57:10,580 --> 00:57:08,340
safe under adverse anomalous conditions

1356
00:57:12,230 --> 00:57:10,590
and so there's a tremendous amount of

1357
00:57:13,520 --> 00:57:12,240
autonomy in the vehicles and it's one of

1358
00:57:16,940 --> 00:57:13,530
the things that makes the system so

1359
00:57:19,670 --> 00:57:16,950
complex thanks Matt I'm gonna head back

1360
00:57:25,160 --> 00:57:19,680
to the phone lines now we have Gina

1361
00:57:28,010 --> 00:57:25,170
Sunseri from ABC my questions been asked

1362
00:57:30,470 --> 00:57:28,020
and answered thank you thanks Gina

1363
00:57:35,390 --> 00:57:30,480

all right we'll go next to a mic wall

1364
00:57:38,420 --> 00:57:35,400
from space comm thank you all for doing

1365
00:57:40,670 --> 00:57:38,430
this um this one's probably for actually

1366
00:57:42,950 --> 00:57:40,680
Matt and it's about the helicopter and

1367
00:57:44,720 --> 00:57:42,960
ice but I got like a few details maybe

1368
00:57:46,760 --> 00:57:44,730
about what you would consider mission

1369
00:57:48,710 --> 00:57:46,770
success for the helicopter like how many

1370
00:57:51,350 --> 00:57:48,720
flights do you hope to make how far will

1371
00:57:52,880 --> 00:57:51,360
this place be and also is there a

1372
00:57:55,880 --> 00:57:52,890
possibility that we'll get kind of

1373
00:57:58,160 --> 00:57:55,890
perseverance I use of the helicopter

1374
00:57:59,150 --> 00:57:58,170
going up and exploring Mars skies

1375
00:58:01,990 --> 00:57:59,160
because that would be pretty fantastic

1376
00:58:04,640 --> 00:58:02,000
if you can pull that off thank you

1377
00:58:07,280 --> 00:58:04,650
sure I'll say a few words about the

1378
00:58:09,650 --> 00:58:07,290
helicopter in that this this is really

1379
00:58:11,840 --> 00:58:09,660
something that's cutting-edge you know

1380
00:58:13,520 --> 00:58:11,850
this is as the administrator said

1381
00:58:16,640 --> 00:58:13,530
something that's never been attempted

1382
00:58:19,310 --> 00:58:16,650
before and flying in Martian atmospheric

1383
00:58:21,470 --> 00:58:19,320
conditions which you know the the

1384
00:58:23,870 --> 00:58:21,480
atmosphere on Mars is only 1% the

1385
00:58:25,790 --> 00:58:23,880
density that we have here on the earth

1386
00:58:28,640 --> 00:58:25,800
and trying to control a system like this

1387
00:58:31,580 --> 00:58:28,650
under those those conditions is is not

1388
00:58:34,370 --> 00:58:31,590

easy in flight and then you have to land

1389
00:58:36,500 --> 00:58:34,380
it safely and then unknown terrain you

1390
00:58:37,820 --> 00:58:36,510
know these are all big challenges and

1391
00:58:40,310 --> 00:58:37,830
that's why this is a this is a

1392
00:58:42,590 --> 00:58:40,320
technology demonstration payload this is

1393
00:58:44,840 --> 00:58:42,600
something that you know that we're

1394
00:58:49,180 --> 00:58:44,850
taking with us so that we can learn how

1395
00:58:51,800 --> 00:58:49,190
to do this for future missions and so

1396
00:58:54,650 --> 00:58:51,810
you know that that's really that's

1397
00:58:56,780 --> 00:58:54,660
really the objective is is to get get

1398
00:58:59,090 --> 00:58:56,790
the helicopter just to be able to

1399
00:58:59,570 --> 00:58:59,100
accommodate it on the vehicle was a big

1400
00:59:01,760 --> 00:58:59,580
step

1401
00:59:04,340 --> 00:59:01,770
getting it to Mars getting it safely off

1402
00:59:06,980 --> 00:59:04,350
the vehicle we're gonna learn a lot and

1403
00:59:09,200 --> 00:59:06,990
really just the very first flight where

1404
00:59:12,800 --> 00:59:09,210
this helicopter spins its rotors and and

1405
00:59:14,810 --> 00:59:12,810
lifts up off the ground it's gonna be

1406
00:59:19,280 --> 00:59:14,820
both historic and we're going to learn a

1407
00:59:21,290 --> 00:59:19,290
lot and so we are not you know we we are

1408
00:59:24,110 --> 00:59:21,300
not looking for an extensive and

1409
00:59:26,330 --> 00:59:24,120
ambitious return from this technology

1410
00:59:28,370 --> 00:59:26,340
we're looking to learn those first few

1411
00:59:31,670 --> 00:59:28,380
things that we need to learn with the

1412
00:59:34,400 --> 00:59:31,680
technology we should be able to image

1413
00:59:36,290 --> 00:59:34,410

the helicopter while it's flying from

1414
00:59:39,560 --> 00:59:36,300
from the rover we're gonna have a safe

1415
00:59:42,170 --> 00:59:39,570
standoff distance of 50 to 100 meters or

1416
00:59:43,400 --> 00:59:42,180
so but we have pretty powerful cameras

1417
00:59:45,700 --> 00:59:43,410
that we should be able to zoom in and

1418
00:59:48,800 --> 00:59:45,710
and we're hoping to be able to catch

1419
00:59:51,050 --> 00:59:48,810
catch that catch that flight whether or

1420
00:59:54,230 --> 00:59:51,060
not the helicopter will actually see the

1421
00:59:56,180 --> 00:59:54,240
vehicle the perseverance rover will

1422
00:59:58,100 --> 00:59:56,190
depend a little bit on orientation and

1423
01:00:00,920 --> 00:59:58,110
and how high it goes and those sorts of

1424
01:00:07,839 --> 01:00:03,230
great thanks Matt and now on the line we

1425
01:00:12,950 --> 01:00:10,250
thank you so much for taking my question

1426
01:00:15,319 --> 01:00:12,960
I think this is for Katie possibly

1427
01:00:18,230 --> 01:00:15,329
seeing as how perseverance is all about

1428
01:00:20,720 --> 01:00:18,240
deciding whether or not Mars's had past

1429
01:00:23,599 --> 01:00:20,730
life I'm curious to know what you are

1430
01:00:25,880 --> 01:00:23,609
considering a bio signature and how you

1431
01:00:28,160 --> 01:00:25,890
will make the distinction whether or not

1432
01:00:30,410 --> 01:00:28,170
you have actually found evidence of past

1433
01:00:32,390 --> 01:00:30,420
life on Mars thank you yes thank you

1434
01:00:34,190 --> 01:00:32,400
that's a great question and it's one

1435
01:00:37,160 --> 01:00:34,200
that we think a lot about on the science

1436
01:00:39,079 --> 01:00:37,170
team you know I think our our bar is is

1437
01:00:41,030 --> 01:00:39,089
high for the identification of a sign of

1438
01:00:42,740 --> 01:00:41,040

life on another planet as it should be

1439
01:00:46,460 --> 01:00:42,750
because we don't want to make that

1440
01:00:48,440 --> 01:00:46,470
discovery lightly but at the same time

1441
01:00:50,240 --> 01:00:48,450
with with perseverance and its goal of

1442
01:00:51,950 --> 01:00:50,250
seeking signs of ancient life I think we

1443
01:00:53,960 --> 01:00:51,960
also have to open our minds to the

1444
01:00:56,030 --> 01:00:53,970
possibilities of what life could look

1445
01:00:58,280 --> 01:00:56,040
like on another planet and and looking

1446
01:01:00,020 --> 01:00:58,290
for you know examples of you know if

1447
01:01:02,089 --> 01:01:00,030
something that is similar to what we we

1448
01:01:03,710 --> 01:01:02,099
see in bio signatures on our own earth

1449
01:01:06,079 --> 01:01:03,720
record and so I think what we're looking

1450
01:01:08,299 --> 01:01:06,089
for are really the patterns and textures

1451
01:01:09,589 --> 01:01:08,309
where we have a hard time explaining how

1452
01:01:11,420 --> 01:01:09,599
that could have formed without the

1453
01:01:13,460 --> 01:01:11,430
influence of life and I think every time

1454
01:01:14,900 --> 01:01:13,470
we see something on the surface of Mars

1455
01:01:16,370 --> 01:01:14,910
that kind of gets us asking those

1456
01:01:18,079 --> 01:01:16,380
questions we go through the list of

1457
01:01:20,569 --> 01:01:18,089
possibilities you know could it have

1458
01:01:22,549 --> 01:01:20,579
formed in an abiotic way and I think if

1459
01:01:25,640 --> 01:01:22,559
we get to the point where we are really

1460
01:01:27,770 --> 01:01:25,650
struggling to explain a phenomenon or

1461
01:01:29,510 --> 01:01:27,780
something that we see with abiotic

1462
01:01:30,829 --> 01:01:29,520
processes I think that's when we start

1463
01:01:32,839 --> 01:01:30,839

to say you know I think this could be a

1464
01:01:35,329 --> 01:01:32,849
potential bio signature but I think it's

1465
01:01:37,579 --> 01:01:35,339
also important to realize that very

1466
01:01:39,470 --> 01:01:37,589
likely we'll have to return those

1467
01:01:41,059 --> 01:01:39,480
samples to earth to make that definitive

1468
01:01:43,309 --> 01:01:41,069
conclusion about whether these samples

1469
01:01:44,870 --> 01:01:43,319
contain life in them so I think on for

1470
01:01:47,180 --> 01:01:44,880
the perseverance side we see it as our

1471
01:01:49,010 --> 01:01:47,190
our job to identify potential bio

1472
01:01:50,870 --> 01:01:49,020
signatures things that are worthy of

1473
01:01:52,760 --> 01:01:50,880
additional study here on earth with a

1474
01:01:53,690 --> 01:01:52,770
full arsenal of analytical capabilities

1475
01:01:55,280 --> 01:01:53,700
that we have here in our own

1476
01:01:56,299 --> 01:01:55,290
laboratories and I think that's how

1477
01:02:00,349 --> 01:01:56,309
we're going to approach that that

1478
01:02:02,960 --> 01:02:00,359
question on the surface of Mars and up

1479
01:02:07,190 --> 01:02:02,970
next we have Antonia had Amelia with

1480
01:02:09,620 --> 01:02:07,200
Florida today oh hey thanks for taking

1481
01:02:12,170 --> 01:02:09,630
my question I was just wondering as

1482
01:02:14,630 --> 01:02:12,180
cases of coronavirus in Florida continue

1483
01:02:17,089 --> 01:02:14,640
to rise will NASA be asking the public

1484
01:02:18,769 --> 01:02:17,099
to watch this launch from home and if so

1485
01:02:20,839 --> 01:02:18,779
will it also provide a virtual

1486
01:02:26,109 --> 01:02:20,849
experience show like it did for demo -

1487
01:02:29,809 --> 01:02:26,119
thanks so for this particular mission

1488
01:02:34,009 --> 01:02:29,819

we're asking people to follow the

1489
01:02:36,229 --> 01:02:34,019
guidelines of the governor of we want

1490
01:02:39,559 --> 01:02:36,239
everybody to practice social distancing

1491
01:02:41,239 --> 01:02:39,569
and and if if you're within six feet

1492
01:02:44,450 --> 01:02:41,249
make sure you're wearing a mask those

1493
01:02:48,019 --> 01:02:44,460
kind of things though we're you know we

1494
01:02:49,880 --> 01:02:48,029
we we're not telling people not to not

1495
01:02:52,519 --> 01:02:49,890
to visit for the launch we're not saying

1496
01:02:54,200 --> 01:02:52,529
that what we do have to make sure we do

1497
01:02:55,670 --> 01:02:54,210
is we protect the workforce at the

1498
01:02:57,410 --> 01:02:55,680
Kennedy Space Center because we have a

1499
01:02:59,989 --> 01:02:57,420
lot of work ahead of us especially this

1500
01:03:03,470 --> 01:02:59,999
summer we've got the entry descent and

1501
01:03:05,180 --> 01:03:03,480
landing of the crew Dragon that took our

1502
01:03:08,599 --> 01:03:05,190
astronauts to the International Space

1503
01:03:10,849 --> 01:03:08,609
Station we have just a lot of other

1504
01:03:12,319 --> 01:03:10,859
activities we have to make sure so we're

1505
01:03:16,099 --> 01:03:12,329
not going to open up the Kennedy Space

1506
01:03:17,660 --> 01:03:16,109
Center but certainly people are people

1507
01:03:21,319 --> 01:03:17,670
are going to travel we ask people not to

1508
01:03:23,359 --> 01:03:21,329
travel for four dm2 which was of course

1509
01:03:26,599 --> 01:03:23,369
the the launch of the Falcon 9 rocket

1510
01:03:29,079 --> 01:03:26,609
with the crew dragon and I'm Doug Hurley

1511
01:03:32,960 --> 01:03:29,089
and Bob Behnken in the in the capsule

1512
01:03:36,950 --> 01:03:32,970
and it appears they didn't listen to us

1513
01:03:38,989 --> 01:03:36,960

so we're asking people to follow all of

1514
01:03:44,260 --> 01:03:38,999
the necessary guidelines to keep

1515
01:03:52,190 --> 01:03:48,020
thanks Jim up next is Dave Moser with

1516
01:03:53,560 --> 01:03:52,200
business insider thank you for taking my

1517
01:03:56,150 --> 01:03:53,570
question and good luck with the launch

1518
01:03:57,770 --> 01:03:56,160
Matt you mentioned the EDL video cameras

1519
01:04:00,050 --> 01:03:57,780
I'd like to know more about those what

1520
01:04:02,390 --> 01:04:00,060
resolution will they film in when might

1521
01:04:04,970 --> 01:04:02,400
be expect that seven minutes of Terror

1522
01:04:06,710 --> 01:04:04,980
footage to get back to earth and will

1523
01:04:08,570 --> 01:04:06,720
you have any use for them after landing

1524
01:04:10,820 --> 01:04:08,580
and then I also understand that this is

1525
01:04:12,500 --> 01:04:10,830
a discretionary payload did these

1526
01:04:16,790 --> 01:04:12,510
cameras sort of beat out any other idea

1527
01:04:18,290 --> 01:04:16,800
that the team had thank you yeah those

1528
01:04:20,600 --> 01:04:18,300
are all good questions I'll try to

1529
01:04:25,280 --> 01:04:20,610
answer them and in some sort of order

1530
01:04:29,660 --> 01:04:25,290
but just to start with your last

1531
01:04:31,550 --> 01:04:29,670
question these were not these were not

1532
01:04:33,620 --> 01:04:31,560
in competition with any other payload on

1533
01:04:37,670 --> 01:04:33,630
this on the spacecraft our payloads were

1534
01:04:40,790 --> 01:04:37,680
selected via the normal process and and

1535
01:04:43,250 --> 01:04:40,800
as we got further down the road and got

1536
01:04:45,130 --> 01:04:43,260
more mature we realized we you know that

1537
01:04:50,180 --> 01:04:45,140
we had an opportunity we had some

1538
01:04:52,900 --> 01:04:50,190

residual some residual capability to to

1539
01:04:55,430 --> 01:04:52,910
install these they take very very little

1540
01:04:58,010 --> 01:04:55,440
mass and and volume I don't have the

1541
01:05:01,970 --> 01:04:58,020
numbers exactly but they're there

1542
01:05:04,250 --> 01:05:01,980
essentially you know unnoticeable at the

1543
01:05:07,700 --> 01:05:04,260
spacecraft level as far as resource

1544
01:05:09,230 --> 01:05:07,710
requirements go and that's because we

1545
01:05:11,540 --> 01:05:09,240
didn't build something new we didn't

1546
01:05:13,790 --> 01:05:11,550
build something you know that was

1547
01:05:16,340 --> 01:05:13,800
particularly sophisticated we were able

1548
01:05:22,130 --> 01:05:16,350
to go out and use commercial

1549
01:05:26,120 --> 01:05:22,140
off-the-shelf available products and and

1550
01:05:29,900 --> 01:05:26,130
so and so that that made a lot easier to

1551
01:05:32,920 --> 01:05:29,910
to go both develop them quickly at low

1552
01:05:35,900 --> 01:05:32,930
cost and and to accommodate them

1553
01:05:38,680 --> 01:05:35,910
resolution wise I'll have to check I

1554
01:05:42,560 --> 01:05:38,690
believe they're 10 megapixel cameras

1555
01:05:46,010 --> 01:05:42,570
frame rates as high as 40 i think frames

1556
01:05:48,230 --> 01:05:46,020
per second but

1557
01:05:50,690 --> 01:05:48,240
we can get the exact we can get the

1558
01:05:52,910 --> 01:05:50,700
exact numbers they produce a lot of data

1559
01:05:54,260 --> 01:05:52,920
the data is not going to come back in

1560
01:05:57,170 --> 01:05:54,270
real time during entry descent and

1561
01:05:59,030 --> 01:05:57,180
landing we have very limited telemetry

1562
01:06:01,640 --> 01:05:59,040
during that period and so we'll bring

1563
01:06:04,870 --> 01:06:01,650

that that imagery back over the first

1564
01:06:07,820 --> 01:06:04,880
couple weeks on the surface

1565
01:06:13,600 --> 01:06:07,830
thanks Matt up next is Paul Brinkman

1566
01:06:16,640 --> 01:06:13,610
with UPI yes hello thanks for doing this

1567
01:06:20,630 --> 01:06:16,650
obviously the Mars rovers have surprised

1568
01:06:22,940 --> 01:06:20,640
in the past in terms of how long they

1569
01:06:26,360 --> 01:06:22,950
stayed operational I'm wondering you

1570
01:06:31,610 --> 01:06:26,370
know what is the outside length of time

1571
01:06:35,120 --> 01:06:31,620
that both for severance and ingenuity

1572
01:06:38,960 --> 01:06:35,130
could be operational and also regarding

1573
01:06:41,390 --> 01:06:38,970
the helicopter to what extent have have

1574
01:06:48,490 --> 01:06:41,400
do you know like how many flights there

1575
01:06:53,030 --> 01:06:48,500
might be for that thanks so I can I can

1576
01:06:55,520 --> 01:06:53,040
respond to the longevity question we we

1577
01:06:57,920 --> 01:06:55,530
have a primary mission defined for the

1578
01:07:01,760 --> 01:06:57,930
vehicle of one Mars year which is is

1579
01:07:04,820 --> 01:07:01,770
roughly you know 2 to earth years and

1580
01:07:09,440 --> 01:07:04,830
that's similar to the design requirement

1581
01:07:12,710 --> 01:07:09,450
for for curiosity as you know curiosity

1582
01:07:15,800 --> 01:07:12,720
is is is still operating on the surface

1583
01:07:19,430 --> 01:07:15,810
here about eight years or so since we we

1584
01:07:22,340 --> 01:07:19,440
landed the good news about these systems

1585
01:07:24,290 --> 01:07:22,350
is that although they're they have to

1586
01:07:27,260 --> 01:07:24,300
operate in a harsh environment that

1587
01:07:30,920 --> 01:07:27,270
environment is relatively repeatable and

1588
01:07:34,070 --> 01:07:30,930

stable and so once you get past those

1589
01:07:37,220 --> 01:07:34,080
those initial issues those infant

1590
01:07:41,230 --> 01:07:37,230
mortality issues it's not unusual for

1591
01:07:44,579 --> 01:07:41,240
our spacecraft to continue on for

1592
01:07:47,470 --> 01:07:44,589
well beyond their design design lifetime

1593
01:07:50,950 --> 01:07:47,480
Voyager wanted to are the best examples

1594
01:07:53,470 --> 01:07:50,960
I can think of you know but but there's

1595
01:07:57,010 --> 01:07:53,480
no guarantee and so we try to operate

1596
01:07:58,599 --> 01:07:57,020
the system under the assumption that you

1597
01:08:02,740 --> 01:07:58,609
know that we'll only have so much time

1598
01:08:04,960 --> 01:08:02,750
to get the work done and and build it

1599
01:08:11,230 --> 01:08:04,970
robustly and and hope that we get more

1600
01:08:16,439 --> 01:08:11,240
time okay is anyone want to take on the

1601
01:08:21,070 --> 01:08:16,449
ingenuity question on ingenuity we have

1602
01:08:24,309 --> 01:08:21,080
three flights designed for the surface I

1603
01:08:26,890 --> 01:08:24,319
think you know kind of nominally however

1604
01:08:32,470 --> 01:08:26,900
as I said we're we're gonna take them

1605
01:08:37,689 --> 01:08:32,480
one flight at a time next is Tony rice

1606
01:08:40,329 --> 01:08:37,699
with WRAL thanks for taking my question

1607
01:08:42,400 --> 01:08:40,339
is this is from Mount Wallace one of the

1608
01:08:44,349 --> 01:08:42,410
few disappointments from the curiosity

1609
01:08:45,999 --> 01:08:44,359
entry descent landing was the damage

1610
01:08:48,309 --> 01:08:46,009
that occurred to the wind Center on the

1611
01:08:51,400 --> 01:08:48,319
wind REMS instrument how there been any

1612
01:08:52,990 --> 01:08:51,410
changes in the EDL procedure or in the

1613
01:08:54,249 --> 01:08:53,000

meted instrument itself to prevent

1614
01:08:56,320 --> 01:08:54,259
something similar from happening again

1615
01:08:59,680 --> 01:08:56,330
based on what you learned nearly eight

1616
01:09:01,030 --> 01:08:59,690
years ago you know one of one of the

1617
01:09:03,099 --> 01:09:01,040
things we learned with our sky crane

1618
01:09:05,650 --> 01:09:03,109
system is that we have the ability to

1619
01:09:09,160 --> 01:09:05,660
kick up some debris from the engines on

1620
01:09:11,709 --> 01:09:09,170
the descent stage and and we have taken

1621
01:09:13,990 --> 01:09:11,719
we had may have made some changes on

1622
01:09:15,579 --> 01:09:14,000
this project to protect things that are

1623
01:09:16,570 --> 01:09:15,589
sensitive to that or potentially

1624
01:09:20,320 --> 01:09:16,580
sensitive to that

1625
01:09:21,880 --> 01:09:20,330
optics wind sensors are good examples we

1626
01:09:23,590 --> 01:09:21,890
have a debris shield for instance around

1627
01:09:26,709 --> 01:09:23,600
the helicopter on the bottom of the

1628
01:09:30,450 --> 01:09:26,719
vehicle so the answer is yes we've we've

1629
01:09:32,620 --> 01:09:30,460
tried to adjust for for that environment

1630
01:09:34,599 --> 01:09:32,630
thanks again Matt we have a lot of

1631
01:09:39,450 --> 01:09:34,609
people on the lines right now up next is

1632
01:09:41,979 --> 01:09:39,460
Lee Hotz with the Wall Street Journal hi

1633
01:09:44,439 --> 01:09:41,989
thank you very much for taking a

1634
01:09:47,590 --> 01:09:44,449
question for the administrators I'm a

1635
01:09:48,370 --> 01:09:47,600
NASA is not alone in voyage into Mars

1636
01:09:51,249 --> 01:09:48,380
this summer

1637
01:09:53,650 --> 01:09:51,259
China expects to launch its first Mars

1638
01:09:55,100 --> 01:09:53,660

Lander I guess the United Arab Emirates

1639
01:09:58,780 --> 01:09:55,110
is launching its first

1640
01:10:01,450 --> 01:09:58,790
interplanetary mission destination Mars

1641
01:10:05,930 --> 01:10:01,460
European Space Agency in Russia or

1642
01:10:08,300 --> 01:10:05,940
putting their blender together for 2022

1643
01:10:10,550 --> 01:10:08,310
now I guess and of course SpaceX keeps

1644
01:10:12,950 --> 01:10:10,560
talking about starting to cache supplies

1645
01:10:16,490 --> 01:10:12,960
for future colonists I mean this is very

1646
01:10:18,950 --> 01:10:16,500
busy I wonder if you'd reflect for us on

1647
01:10:22,149 --> 01:10:18,960
the changing nature of interplanetary

1648
01:10:23,899 --> 01:10:22,159
exploration in this age of

1649
01:10:28,189 --> 01:10:23,909
internationalization what are the

1650
01:10:32,240 --> 01:10:28,199
operational and diplomatic effects from

1651
01:10:34,100 --> 01:10:32,250
your vantage thank you that's another

1652
01:10:35,990 --> 01:10:34,110
very important question the first thing

1653
01:10:38,090 --> 01:10:36,000
that we're going to need is additional

1654
01:10:39,890 --> 01:10:38,100
communication through but that's the

1655
01:10:43,939 --> 01:10:39,900
number one thing that that we're gonna

1656
01:10:47,180 --> 01:10:43,949
need and we're already at the limits of

1657
01:10:48,919 --> 01:10:47,190
of our communication capabilities for

1658
01:10:51,020 --> 01:10:48,929
for deep space so we're going to need to

1659
01:10:52,879 --> 01:10:51,030
really close up the architecture for

1660
01:10:54,740 --> 01:10:52,889
that but to your point a lot of these

1661
01:10:57,410 --> 01:10:54,750
countries that do these activities they

1662
01:11:00,169 --> 01:10:57,420
they they want to use the deep space

1663
01:11:05,120 --> 01:11:00,179

network that that NASA has established

1664
01:11:07,370 --> 01:11:05,130
and we're very willing to support in

1665
01:11:11,390 --> 01:11:07,380
that effort this is about science and

1666
01:11:13,340 --> 01:11:11,400
discovery exploitation and and I think

1667
01:11:16,010 --> 01:11:13,350
when people see countries doing these

1668
01:11:19,160 --> 01:11:16,020
stunning things on other worlds it

1669
01:11:20,930 --> 01:11:19,170
inspires all of us and so certainly we

1670
01:11:24,859 --> 01:11:20,940
are we are supportive of these

1671
01:11:26,149 --> 01:11:24,869
activities and and ultimately you know

1672
01:11:28,129 --> 01:11:26,159
remember what we're trying to do we're

1673
01:11:31,129 --> 01:11:28,139
trying to get humans to Mars that's

1674
01:11:33,649 --> 01:11:31,139
that's the objective and these robotic

1675
01:11:36,709 --> 01:11:33,659
precursor missions I think kind of

1676
01:11:38,149 --> 01:11:36,719
opened the eyes of the American people

1677
01:11:40,100 --> 01:11:38,159
and people all around the world as to

1678
01:11:43,490 --> 01:11:40,110
what the possibilities are and it helps

1679
01:11:46,060 --> 01:11:43,500
inspire that next generation in fact

1680
01:11:49,280 --> 01:11:46,070
maybe even our generation where we see

1681
01:11:53,030 --> 01:11:49,290
humans living and working on the surface

1682
01:11:55,160 --> 01:11:53,040
of Mars so there's there's a there's a

1683
01:11:57,200 --> 01:11:55,170
lot that goes into this you know I'm

1684
01:11:59,530 --> 01:11:57,210
very excited about the United Arab

1685
01:12:03,070 --> 01:11:59,540
Emirates and they're their hope mission

1686
01:12:05,810 --> 01:12:03,080
we have done a lot to support them and

1687
01:12:06,680 --> 01:12:05,820
they want to be big supporters of ours

1688
01:12:09,470 --> 01:12:06,690

in the art

1689
01:12:11,930 --> 01:12:09,480
this program and of course they're very

1690
01:12:14,260 --> 01:12:11,940
involved in you know they're gonna be

1691
01:12:17,780 --> 01:12:14,270
launching in a few short years their own

1692
01:12:19,910 --> 01:12:17,790
Rover to the surface of the Moon so a

1693
01:12:22,700 --> 01:12:19,920
lot of countries are stepping up in a

1694
01:12:25,700 --> 01:12:22,710
big way countries that historically have

1695
01:12:28,070 --> 01:12:25,710
not been you know exploration countries

1696
01:12:30,050 --> 01:12:28,080
are stepping up and not just not just

1697
01:12:32,330 --> 01:12:30,060
talking about it but backing it up with

1698
01:12:34,340 --> 01:12:32,340
budgets and so all of this is going to

1699
01:12:37,939 --> 01:12:34,350
be very helpful for us as we move

1700
01:12:40,610 --> 01:12:37,949
forward NASA is an is an institution

1701
01:12:43,640 --> 01:12:40,620
that is a tool of diplomacy and there is

1702
01:12:45,910 --> 01:12:43,650
no better diplomacy than exploring our

1703
01:12:50,620 --> 01:12:45,920
own solar system together and eventually

1704
01:12:54,290 --> 01:12:50,630
the rest of our galaxy and universe

1705
01:12:59,180 --> 01:12:54,300
great thanks Jim and now we have Chris

1706
01:13:01,820 --> 01:12:59,190
and Carlo with KFI news yeah thanks guys

1707
01:13:03,530 --> 01:13:01,830
for taking my question just going back

1708
01:13:04,880 --> 01:13:03,540
to Kovac here real quick use some

1709
01:13:07,430 --> 01:13:04,890
specific challenges you guys obviously

1710
01:13:09,320 --> 01:13:07,440
faced in working remotely NASA and JPL

1711
01:13:10,790 --> 01:13:09,330
are a bit famous for adapting and

1712
01:13:13,090 --> 01:13:10,800
building out new systems for those

1713
01:13:15,979 --> 01:13:13,100

adaptations I'm just curious about what

1714
01:13:17,630 --> 01:13:15,989
adaptations to workflow maybe carry

1715
01:13:21,520 --> 01:13:17,640
forward in the future what lessons did

1716
01:13:26,959 --> 01:13:23,780
I'll start there's there's so many

1717
01:13:30,260 --> 01:13:26,969
different things you know as right now

1718
01:13:32,140 --> 01:13:30,270
most of Bassett is working remotely NASA

1719
01:13:35,660 --> 01:13:32,150
has been for a long time very

1720
01:13:38,050 --> 01:13:35,670
forward-leaning on teleworking and so it

1721
01:13:40,760 --> 01:13:38,060
was really easy for us to actually go to

1722
01:13:43,640 --> 01:13:40,770
you know profile where most of us are

1723
01:13:47,060 --> 01:13:43,650
working remotely so that that really was

1724
01:13:49,160 --> 01:13:47,070
not terribly problematic at the same

1725
01:13:51,080 --> 01:13:49,170
time we still have to build hardware and

1726
01:13:52,520 --> 01:13:51,090
our contractors still have to build

1727
01:13:54,830 --> 01:13:52,530
hardware so we have to make sure that

1728
01:13:57,500 --> 01:13:54,840
you know we're doing what we can for

1729
01:13:59,630 --> 01:13:57,510
social distancing you know changing

1730
01:14:01,880 --> 01:13:59,640
shifts so that instead of having you

1731
01:14:03,380 --> 01:14:01,890
know twelve people working on a vehicle

1732
01:14:06,110 --> 01:14:03,390
at the same time we could divide it up

1733
01:14:08,090 --> 01:14:06,120
and instead have eight-hour shifts where

1734
01:14:10,790 --> 01:14:08,100
you've got three shifts of four people

1735
01:14:12,410 --> 01:14:10,800
working on a vehicle and of course

1736
01:14:13,910 --> 01:14:12,420
making sure everybody has their personal

1737
01:14:17,660 --> 01:14:13,920
protective equipment and those kind of

1738
01:14:19,070 --> 01:14:17,670

things you know as we move forward as we

1739
01:14:20,569 --> 01:14:19,080
start going you know we went all the way

1740
01:14:22,939 --> 01:14:20,579
to stage four at a lot of

1741
01:14:25,639 --> 01:14:22,949
centers which meant basically nobody can

1742
01:14:29,000 --> 01:14:25,649
come to work because some of our centers

1743
01:14:30,619 --> 01:14:29,010
there was some outbreaks of coronavirus

1744
01:14:32,899 --> 01:14:30,629
in the regions where those centers are

1745
01:14:35,000 --> 01:14:32,909
but now we're getting to a point where

1746
01:14:37,579 --> 01:14:35,010
we can go to stage 3 where we have

1747
01:14:40,099 --> 01:14:37,589
mission critical not mission essential

1748
01:14:42,919 --> 01:14:40,109
which is what Mars 2020 is but mission

1749
01:14:44,989 --> 01:14:42,929
critical functions which are still very

1750
01:14:48,409 --> 01:14:44,999
important fishes that we need to start

1751
01:14:49,819 --> 01:14:48,419
getting back underway and eventually we

1752
01:14:51,469 --> 01:14:49,829
want to get back to stage 2 and

1753
01:14:53,299 --> 01:14:51,479
eventually back to normal working a

1754
01:14:54,649 --> 01:14:53,309
normal working environment but I think

1755
01:14:56,629 --> 01:14:54,659
one of the things that we've taken away

1756
01:15:00,739 --> 01:14:56,639
is how much work you can actually do

1757
01:15:02,209 --> 01:15:00,749
when you're still at all and and so

1758
01:15:04,520 --> 01:15:02,219
there's different types of work that

1759
01:15:06,229 --> 01:15:04,530
you're able to do from home and I'll

1760
01:15:08,270 --> 01:15:06,239
tell you when I'm at home I'm doing a

1761
01:15:10,040 --> 01:15:08,280
lot more outreach than I've ever been

1762
01:15:11,599 --> 01:15:10,050
able to do before because everybody is

1763
01:15:14,270 --> 01:15:11,609

either a phone call or a teleconference

1764
01:15:16,009 --> 01:15:14,280
away we're not having to organize

1765
01:15:18,229 --> 01:15:16,019
schedules to get everybody schedules to

1766
01:15:19,549 --> 01:15:18,239
perfectly patching and travel and

1767
01:15:20,719 --> 01:15:19,559
everything else so there's there's

1768
01:15:22,939 --> 01:15:20,729
certain areas where you're more

1769
01:15:25,639 --> 01:15:22,949
productive and other areas where you're

1770
01:15:27,409 --> 01:15:25,649
less productive and I think when we get

1771
01:15:29,509 --> 01:15:27,419
back to a more normalized work

1772
01:15:32,659 --> 01:15:29,519
environment we're gonna have to take the

1773
01:15:35,389 --> 01:15:32,669
lessons learned and apply them and I

1774
01:15:38,779 --> 01:15:35,399
know I know JPL has been thinking about

1775
01:15:43,250 --> 01:15:38,789
these things as well so I don't know if

1776
01:15:45,619 --> 01:15:43,260
anybody else has anything yeah I mean

1777
01:15:47,239 --> 01:15:45,629
we're I'll just agree with the

1778
01:15:49,129 --> 01:15:47,249
administrator completely you know we're

1779
01:15:50,989 --> 01:15:49,139
carrying these lessons forward we're

1780
01:15:53,179 --> 01:15:50,999
starting to look as well into the at

1781
01:15:55,069 --> 01:15:53,189
least relative just relative to 2020

1782
01:15:57,409 --> 01:15:55,079
we're pulling the the lessons learned

1783
01:15:59,479 --> 01:15:57,419
that we've acquired over the last

1784
01:16:00,739 --> 01:15:59,489
several months into our operations we're

1785
01:16:03,049 --> 01:16:00,749
thinking about what it means with

1786
01:16:06,049 --> 01:16:03,059
respect to critical activities like

1787
01:16:09,409 --> 01:16:06,059
entry descent and landing and and we're

1788
01:16:12,139 --> 01:16:09,419

we're getting a lot better at everyday

1789
01:16:13,939 --> 01:16:12,149
really I think at operating remotely and

1790
01:16:17,419 --> 01:16:13,949
understanding how to safely bring people

1791
01:16:22,579 --> 01:16:17,429
and to get the work done as was

1792
01:16:24,949 --> 01:16:22,589
discussed thank you and next on the line

1793
01:16:30,139 --> 01:16:24,959
is jennifer Lerman with Popular

1794
01:16:33,439 --> 01:16:30,149
Mechanics hi thank you so much for

1795
01:16:37,459 --> 01:16:33,449
taking these questions a quick question

1796
01:16:39,439 --> 01:16:37,469
for maybe either Matt or Katie what do

1797
01:16:41,000 --> 01:16:39,449
you hope to learn by recording sound

1798
01:16:42,829 --> 01:16:41,010
during the mission and then Katie

1799
01:16:44,509 --> 01:16:42,839
actually another very quick question you

1800
01:16:46,250 --> 01:16:44,519
mentioned that you had you were a little

1801
01:16:48,979 --> 01:16:46,260
bit iffy about the name perseverance was

1802
01:16:52,399 --> 01:16:48,989
there another name that you also favored

1803
01:16:54,409 --> 01:16:52,409
perhaps thank you again maybe I'll start

1804
01:16:55,879 --> 01:16:54,419
off and to your first question you know

1805
01:16:57,679 --> 01:16:55,889
what we hope to use the microphones for

1806
01:17:00,559 --> 01:16:57,689
you know I think we're really excited to

1807
01:17:02,449 --> 01:17:00,569
hear the sounds of Mars and and the

1808
01:17:03,799 --> 01:17:02,459
sounds of the rover interacting with its

1809
01:17:07,369 --> 01:17:03,809
environment you know we'll hear the

1810
01:17:09,049 --> 01:17:07,379
wheels were and the gears turning and we

1811
01:17:11,869 --> 01:17:09,059
have a microphone on the super cam

1812
01:17:13,279 --> 01:17:11,879
instrument so when we basically zap the

1813
01:17:15,770 --> 01:17:13,289

rocks with the super cam laser we'll

1814
01:17:17,329 --> 01:17:15,780
hear that sound and that may tell us

1815
01:17:18,589 --> 01:17:17,339
some something about the properties of

1816
01:17:20,359 --> 01:17:18,599
the rocks themselves so there may be

1817
01:17:23,239 --> 01:17:20,369
some science to glean from that as well

1818
01:17:25,250 --> 01:17:23,249
so we're excited to use the rover's ears

1819
01:17:28,040 --> 01:17:25,260
to do that in terms of the the rover

1820
01:17:29,659 --> 01:17:28,050
names you know I there were nine

1821
01:17:31,729 --> 01:17:29,669
candidates there and I think everybody

1822
01:17:34,540 --> 01:17:31,739
had their favorite I don't know that I

1823
01:17:37,579 --> 01:17:34,550
had I had a particular favorite there

1824
01:17:40,309 --> 01:17:37,589
but you know in the end the rover name

1825
01:17:41,719 --> 01:17:40,319
just when the rover name is selected it

1826
01:17:44,239 --> 01:17:41,729
just really becomes part of the rover

1827
01:17:46,099 --> 01:17:44,249
and once that name is selected you can't

1828
01:17:47,389 --> 01:17:46,109
separate the rover from its name and so

1829
01:17:48,679 --> 01:17:47,399
you know I think those of us who've

1830
01:17:50,419 --> 01:17:48,689
worked on some previous River missions

1831
01:17:52,429 --> 01:17:50,429
it just happens and and once the name is

1832
01:17:54,199 --> 01:17:52,439
selected it just becomes and so I think

1833
01:17:55,790 --> 01:17:54,209
that's very much what's happened with

1834
01:17:57,109 --> 01:17:55,800
perseverance for me personally and I

1835
01:17:59,179 --> 01:17:57,119
think I know that that's true for

1836
01:18:03,770 --> 01:17:59,189
everyone else too so it is perseverance

1837
01:18:07,040 --> 01:18:03,780
and we're excited that it is great thank

1838
01:18:11,899 --> 01:18:07,050

you and up next is Leo Enright with

1839
01:18:14,359 --> 01:18:11,909
Irish television thanks Raquel I think

1840
01:18:17,270 --> 01:18:14,369
this is probably for Katie you talked

1841
01:18:20,059 --> 01:18:17,280
about the complexity of collecting

1842
01:18:21,559 --> 01:18:20,069
samples on the surface the the actor

1843
01:18:24,879 --> 01:18:21,569
Matt Damon famously

1844
01:18:27,409 --> 01:18:24,889
science the you-know-what out of Mars

1845
01:18:29,750 --> 01:18:27,419
and we can certainly say that the

1846
01:18:34,190 --> 01:18:29,760
Curiosity rover has done that

1847
01:18:37,060 --> 01:18:34,200
at Gale Crater but it does seem like the

1848
01:18:40,130 --> 01:18:37,070
Traverse there has been far far slower

1849
01:18:41,930 --> 01:18:40,140
than most people would have expected for

1850
01:18:44,720 --> 01:18:41,940
very good reasons

1851
01:18:47,360 --> 01:18:44,730
Yellowknife alone would delay you for

1852
01:18:50,120 --> 01:18:47,370
months and but I'm just wondering will

1853
01:18:53,090 --> 01:18:50,130
there be different time pressures on

1854
01:18:55,430 --> 01:18:53,100
this mission at each sample site just to

1855
01:18:57,950 --> 01:18:55,440
get the sample and move on to the next

1856
01:19:01,070 --> 01:18:57,960
to collect enough for the return cache

1857
01:19:04,430 --> 01:19:01,080
will it be more of us shoot and scoot

1858
01:19:06,200 --> 01:19:04,440
mission yes so that's that's a great

1859
01:19:08,810 --> 01:19:06,210
question and one that we are thinking a

1860
01:19:10,010 --> 01:19:08,820
lot about as we come up with notional

1861
01:19:11,750 --> 01:19:10,020
scenarios for the mission and what our

1862
01:19:13,250 --> 01:19:11,760
sample cache might look like one thing

1863
01:19:15,320 --> 01:19:13,260

that we know about that sample cache is

1864
01:19:17,300 --> 01:19:15,330
that we wanted to have diversity and we

1865
01:19:18,560 --> 01:19:17,310
wanted to cover the interval of time

1866
01:19:20,030 --> 01:19:18,570
that we think the rocks and Jezza

1867
01:19:23,570 --> 01:19:20,040
represent and that does require us

1868
01:19:26,180 --> 01:19:23,580
covering a substantial ground to put a

1869
01:19:28,160 --> 01:19:26,190
cache together like that but I think we

1870
01:19:30,950 --> 01:19:28,170
have a couple of advantages on our side

1871
01:19:32,780 --> 01:19:30,960
particularly in comparison to curiosity

1872
01:19:34,490 --> 01:19:32,790
and Gale Crater part of the reason we

1873
01:19:35,630 --> 01:19:34,500
picked jezero crater as a landing site

1874
01:19:37,670 --> 01:19:35,640
was because it has such a

1875
01:19:39,530 --> 01:19:37,680
well-understood environment that we

1876
01:19:42,229 --> 01:19:39,540
could see and understand from orbital

1877
01:19:44,630 --> 01:19:42,239
images alone and so in in curiosity

1878
01:19:46,190 --> 01:19:44,640
curiosity's case and Gale Crater you

1879
01:19:48,830 --> 01:19:46,200
know you have a five kilometer thick

1880
01:19:50,630 --> 01:19:48,840
Mound and an uncertainty of what that

1881
01:19:52,220 --> 01:19:50,640
mound actually represents geologically

1882
01:19:55,280 --> 01:19:52,230
so we've had to spend a lot of time with

1883
01:19:56,960 --> 01:19:55,290
that mission doing the the science to

1884
01:19:59,180 --> 01:19:56,970
understand what rocks were even looking

1885
01:20:01,040 --> 01:19:59,190
at with jezero we know already that we

1886
01:20:03,560 --> 01:20:01,050
have a delta we know that we had a lake

1887
01:20:06,200 --> 01:20:03,570
in jezero crater and we know that this

1888
01:20:09,320 --> 01:20:06,210

crater is perched on the the the rim of

1889
01:20:11,690 --> 01:20:09,330
a giant impact basin so we expect things

1890
01:20:13,610 --> 01:20:11,700
like impact mega breccia sampling some

1891
01:20:15,470 --> 01:20:13,620
of that ancient noachian crust on Mars

1892
01:20:17,060 --> 01:20:15,480
so I think the fact that we have such a

1893
01:20:19,700 --> 01:20:17,070
good understanding of this landing site

1894
01:20:21,440 --> 01:20:19,710
already really helps us plan and plot

1895
01:20:23,600 --> 01:20:21,450
out the course of our sampling

1896
01:20:25,610 --> 01:20:23,610
exploration so I think that really helps

1897
01:20:27,320 --> 01:20:25,620
us and so I think we will feel some

1898
01:20:28,670 --> 01:20:27,330
pressure to cover that ground simply

1899
01:20:31,400 --> 01:20:28,680
because we want to put together the best

1900
01:20:32,990 --> 01:20:31,410
cache of samples that we can but but we

1901
01:20:34,610 --> 01:20:33,000
have some advantages I think over some

1902
01:20:37,850 --> 01:20:34,620
previous missions in terms of how well

1903
01:21:50,129 --> 01:20:37,860
we understand our landing site already

1904
01:21:51,689 --> 01:21:50,139
great one more question from the tackle

1905
01:21:53,459 --> 01:21:51,699
your first question and and that's where

1906
01:21:54,959 --> 01:21:53,469
I think we really get to some of the

1907
01:21:56,879 --> 01:21:54,969
instruments in the scientific payload

1908
01:21:58,470 --> 01:21:56,889
that we have on perseverance and those

1909
01:22:00,419 --> 01:21:58,480
those instruments on the end of the

1910
01:22:04,140 --> 01:22:00,429
rover's arm that have the ability to map

1911
01:22:06,450 --> 01:22:04,150
in very fine detail chemical composition

1912
01:22:08,580 --> 01:22:06,460
mineralogy and the presence of organic

1913
01:22:10,919 --> 01:22:08,590

carbon in a way that that we've never

1914
01:22:12,780 --> 01:22:10,929
been able to do before as you may know

1915
01:22:14,430 --> 01:22:12,790
curiosity has the ability to detect

1916
01:22:16,379 --> 01:22:14,440
organic carbon and it has detected

1917
01:22:18,089 --> 01:22:16,389
organic carbon but we haven't been able

1918
01:22:20,790 --> 01:22:18,099
to necessarily link the presence of that

1919
01:22:22,919 --> 01:22:20,800
carbon organic organic carbon in

1920
01:22:25,200 --> 01:22:22,929
organics to a particular textures or

1921
01:22:26,700 --> 01:22:25,210
patterns that we see in the rock that we

1922
01:22:29,160 --> 01:22:26,710
think could have been left behind by

1923
01:22:31,979 --> 01:22:29,170
life and so it's really that connection

1924
01:22:34,589 --> 01:22:31,989
of the textures and the composition that

1925
01:22:36,629 --> 01:22:34,599
allow us to make a compelling case for a

1926
01:22:38,430 --> 01:22:36,639
bio signature and the instruments on

1927
01:22:39,780 --> 01:22:38,440
perseverance allow us to do that really

1928
01:22:42,930 --> 01:22:39,790
for the first time on the surface of

1929
01:22:44,220 --> 01:22:42,940
Mars in in a non-destructive way also in

1930
01:22:45,510 --> 01:22:44,230
the way that we collect our samples

1931
01:22:46,979 --> 01:22:45,520
instead of grinding the rocks into

1932
01:22:49,319 --> 01:22:46,989
powders were actually collecting

1933
01:22:50,339 --> 01:22:49,329
preserved cores of rock that we can

1934
01:22:51,899 --> 01:22:50,349
bring back to earth and

1935
01:22:54,959 --> 01:22:51,909
so I think that's really how we

1936
01:22:56,669 --> 01:22:54,969
distinguish ourselves in advancing the

1937
01:22:58,140 --> 01:22:56,679
search for potential bio signatures on

1938
01:23:00,899 --> 01:22:58,150

on the planet Mars

1939
01:23:03,240 --> 01:23:00,909
and maybe I'll toss it to Laurie or

1940
01:23:08,280 --> 01:23:03,250
someone else in the panel to answer the

1941
01:23:10,319 --> 01:23:08,290
second part yeah I'm happy to take the

1942
01:23:12,300 --> 01:23:10,329
second part of that question Thanks so

1943
01:23:14,669 --> 01:23:12,310
yes as you mentioned there will be

1944
01:23:16,290 --> 01:23:14,679
several missions headed to Mars

1945
01:23:18,209 --> 01:23:16,300
several this summer and then of course

1946
01:23:20,399 --> 01:23:18,219
European Space Agency in two years as

1947
01:23:23,790 --> 01:23:20,409
they postpone the launch of the ExoMars

1948
01:23:26,010 --> 01:23:23,800
Rover but this summer of course China is

1949
01:23:27,990 --> 01:23:26,020
going to be sending their first Lander

1950
01:23:29,729 --> 01:23:28,000
to Mars we're all going to be watching

1951
01:23:31,560 --> 01:23:29,739
that very very carefully this is an

1952
01:23:33,390 --> 01:23:31,570
incredibly difficult thing to do to land

1953
01:23:35,399 --> 01:23:33,400
safely on Mars we know how challenging

1954
01:23:37,979 --> 01:23:35,409
it is we've had our own struggles in the

1955
01:23:41,010 --> 01:23:37,989
past we've been very lucky and been and

1956
01:23:42,270 --> 01:23:41,020
learned a lot from those and our you

1957
01:23:44,220 --> 01:23:42,280
know we've been successful the last

1958
01:23:45,600 --> 01:23:44,230
several times so you know I've full

1959
01:23:46,919 --> 01:23:45,610
confidence in our team this year but

1960
01:23:49,680 --> 01:23:46,929
it'll be interesting to watch us as

1961
01:23:51,229 --> 01:23:49,690
China attempts this as well so that

1962
01:23:54,180 --> 01:23:51,239
that'll be an interesting thing to watch

1963
01:23:55,830 --> 01:23:54,190

the United Arab emmitt Arab Emirates of

1964
01:23:57,780 --> 01:23:55,840
course are sending their orbiter the

1965
01:23:59,729 --> 01:23:57,790
hope orbiter this will be their first

1966
01:24:02,129 --> 01:23:59,739
foray really into this interplanetary

1967
01:24:04,050 --> 01:24:02,139
flight so trying to build something that

1968
01:24:05,669 --> 01:24:04,060
can do science in orbit around Mars I

1969
01:24:07,140 --> 01:24:05,679
think will be very complimentary to the

1970
01:24:09,390 --> 01:24:07,150
other orbital missions that we already

1971
01:24:11,669 --> 01:24:09,400
have at Mars as well to complement those

1972
01:24:14,100 --> 01:24:11,679
activities and then of course the

1973
01:24:17,430 --> 01:24:14,110
European ExoMars Rover when it arrives

1974
01:24:18,750 --> 01:24:17,440
is very complimentary to to what

1975
01:24:21,120 --> 01:24:18,760
perseverance will be doing on the

1976
01:24:24,330 --> 01:24:21,130
surface one of the things that the

1977
01:24:25,350 --> 01:24:24,340
ExoMars Rover will be doing that is a

1978
01:24:27,240 --> 01:24:25,360
little different than what we're doing

1979
01:24:29,939 --> 01:24:27,250
with with perseverance is it has the

1980
01:24:31,919 --> 01:24:29,949
capability to actually drill a couple

1981
01:24:33,930 --> 01:24:31,929
meters below the surface to pull up a

1982
01:24:37,080 --> 01:24:33,940
sample and this is really important

1983
01:24:39,330 --> 01:24:37,090
because the samples that the surface

1984
01:24:42,060 --> 01:24:39,340
have been exposed to radiation and if

1985
01:24:44,100 --> 01:24:42,070
there were actually life present on Mars

1986
01:24:45,600 --> 01:24:44,110
at the surface it may not it may have

1987
01:24:47,939 --> 01:24:45,610
been destroyed through that radiation

1988
01:24:49,770 --> 01:24:47,949

but samples beneath the surface may

1989
01:24:52,379 --> 01:24:49,780
actually still have a potential to

1990
01:24:53,970 --> 01:24:52,389
contain some actual extant life so

1991
01:24:56,069 --> 01:24:53,980
they're going to be a very interesting

1992
01:24:58,050 --> 01:24:56,079
complimentary the complementarity there

1993
01:25:01,950 --> 01:24:58,060
between the ExoMars Rover and and

1994
01:25:03,810 --> 01:25:01,960
perseverance great thank you Laurie and

1995
01:25:05,879 --> 01:25:03,820
unfortunately we can't answer

1996
01:25:07,709 --> 01:25:05,889
all the media questions on-air for those

1997
01:25:11,189 --> 01:25:07,719
of you with additional questions please

1998
01:25:13,020 --> 01:25:11,199
call JPL's digital news and media office

1999
01:25:15,450 --> 01:25:13,030
and we'll also continue to answer

2000
01:25:17,760 --> 01:25:15,460
questions of social media online right

2001
01:25:19,800 --> 01:25:17,770
now so thank you for your questions and

2002
01:25:20,729 --> 01:25:19,810
thank you to our panelists for joining

2003
01:25:23,220 --> 01:25:20,739
us today

2004
01:25:25,890 --> 01:25:23,230
perseverance is targeted to launch from

2005
01:25:29,100 --> 01:25:25,900
Cape Canaveral Florida on July 20th it

2006
01:25:32,729 --> 01:25:29,110
will land on Mars in February of 2021

2007
01:25:34,919 --> 01:25:32,739
you can follow at NASA persevere to keep

2008
01:25:37,410 --> 01:25:34,929
up with its launch and journey to the

2009
01:25:41,040 --> 01:25:37,420
Red Planet and join our conversation by

2010
01:25:43,430 --> 01:25:41,050
using the hashtag countdown to Mars you

2011
01:25:46,879 --> 01:25:43,440
can also visit nasa.gov slash

2012
01:25:49,260 --> 01:25:46,889
perseverance and mars nasa.gov slash

2013
01:25:52,260 --> 01:25:49,270

perseverance for all of you who's

2014
01:25:55,109 --> 01:25:52,270
interested in a deeper dive we also have

2015
01:25:56,970 --> 01:25:55,119
a new press kit available online and it

2016
01:25:59,069 --> 01:25:56,980
is filled with information and graphics

2017
01:26:01,290 --> 01:25:59,079
describing the rover and mission and can

2018
01:26:03,660 --> 01:26:01,300
help ask answer any questions you might

2019
01:26:06,689 --> 01:26:03,670
have all the images you saw today will