1
00:01:12,789 --> 00:01:10,870
why we explore mars

2
00:01:15,429 --> 00:01:12,799
the mysteries of the red planet the

3
00:01:16,230 --> 00:01:15,439
history of water the possibilities of

4
00:01:17,910 --> 00:01:16,240
life

5
00:01:20,070 --> 00:01:17,920
you learn something and then you design

6
00:01:22,550 --> 00:01:20,080
the next mission based on what you learn

7
00:01:25,190 --> 00:01:22,560
has allowed us to literally go back in

8
00:01:31,030 --> 00:01:28,469
the first mars will cover an area of 176

9
00:01:34,230 --> 00:01:31,040
miles mariner 4 began transmitting back

10
00:01:37,030 --> 00:01:34,240
images the first photograph that a human

11
00:01:40,630 --> 00:01:37,040
being has ever seen from the surface of

12
00:01:42,950 --> 00:01:40,640
another planet on august 20th 1975 the

13
00:01:45,590 --> 00:01:42,960

first viking spaceship was launched you

14
00:01:48,950 --> 00:01:45,600
were seeing something that no other

15
00:01:56,550 --> 00:01:48,960
human has ever seen before former seas

16
00:02:01,109 --> 00:01:58,550
that sense of wonderment and achievement

17
00:02:05,109 --> 00:02:01,119
and always working towards your goal

18
00:02:12,510 --> 00:02:05,119
we can do and we will do

19
00:02:12,520 --> 00:02:18,869
[Music]

20
00:02:23,910 --> 00:02:21,750
together we did it but the attitude was

21
00:02:26,229 --> 00:02:23,920
together we can do it

22
00:02:29,290 --> 00:02:26,239
the future is what you make out of it

23
00:02:31,589 --> 00:02:29,300
you can make it real

24
00:02:34,470 --> 00:02:31,599
[Music]

25
00:02:36,470 --> 00:02:34,480
and here we are with mars perseverance

26
00:02:39,350 --> 00:02:36,480
51 years later getting ready to do the

27
00:02:41,270 --> 00:02:39,360
first ever mars return mission

28
00:02:43,350 --> 00:02:41,280
eventually we can bring those samples

29
00:02:44,630 --> 00:02:43,360
back to earth and determine for the very

30
00:02:53,270 --> 00:02:44,640
first time

31
00:02:57,750 --> 00:02:55,750
hello and welcome to nasa's kennedy

32
00:03:00,309 --> 00:02:57,760
space center in florida where we are

33
00:03:03,190 --> 00:03:00,319
just days away from launching nasa's

34
00:03:05,270 --> 00:03:03,200
next mars rover perseverance now

35
00:03:07,509 --> 00:03:05,280
perseverance is just one part of a

36
00:03:09,830 --> 00:03:07,519
larger strategy to understand the red

37
00:03:12,070 --> 00:03:09,840
planet scientists have been waiting for

38
00:03:14,309 --> 00:03:12,080

generations to bring back samples from

39
00:03:16,070 --> 00:03:14,319
the surface of mars so we're here today

40
00:03:17,990 --> 00:03:16,080
to talk about why scientists want to

41
00:03:19,830 --> 00:03:18,000
bring those samples back to earth and

42
00:03:22,309 --> 00:03:19,840
how we're going to do it starting with

43
00:03:24,390 --> 00:03:22,319
the perseverance rover i'm jari cook

44
00:03:26,390 --> 00:03:24,400
from nasa's jet propulsion laboratory in

45
00:03:28,309 --> 00:03:26,400
southern california and i'm here today

46
00:03:30,949 --> 00:03:28,319
with a panel of experts who can talk

47
00:03:33,350 --> 00:03:30,959
about our plans for mars sample return

48
00:03:35,430 --> 00:03:33,360
with our key international partner the

49
00:03:37,270 --> 00:03:35,440
european space agency so i'm going to

50
00:03:40,229 --> 00:03:37,280
introduce our panelists today starting

51
00:03:42,470 --> 00:03:40,239
with thomas zurbukin he is the associate

52
00:03:44,470 --> 00:03:42,480
administrator for nasa's science mission

53
00:03:48,070 --> 00:03:44,480
directorate he's going to talk about the

54
00:03:51,190 --> 00:03:48,080
overall strategy for mars sample return

55
00:03:53,429 --> 00:03:51,200
next we have from the uk david parker he

56
00:03:55,350 --> 00:03:53,439
is the director of human and robotic

57
00:03:57,750 --> 00:03:55,360
exploration from the european space

58
00:04:00,149 --> 00:03:57,760
agency dave is going to talk about why

59
00:04:02,309 --> 00:04:00,159
esa is partnering with nasa and also

60
00:04:04,470 --> 00:04:02,319
what their role is

61
00:04:07,030 --> 00:04:04,480
next we have at nasa headquarters jeff

62
00:04:08,949 --> 00:04:07,040
grambling he is the mars sample return

63
00:04:10,630 --> 00:04:08,959

program director and he's going to talk

64
00:04:12,470 --> 00:04:10,640
about the nasa components to this

65
00:04:14,630 --> 00:04:12,480
campaign

66
00:04:16,550 --> 00:04:14,640
next we have julie townsend at the jet

67
00:04:18,949 --> 00:04:16,560
propulsion laboratory she is the

68
00:04:21,509 --> 00:04:18,959
sampling and caching operations lead for

69
00:04:23,110 --> 00:04:21,519
the mars 2020 perseverance rover and

70
00:04:26,150 --> 00:04:23,120
she's going to talk about what the rover

71
00:04:29,189 --> 00:04:26,160
is going to do on the surface of mars

72
00:04:31,110 --> 00:04:29,199
next we have chris heard he is a return

73
00:04:33,590 --> 00:04:31,120
sample scientist and he comes to us from

74
00:04:35,270 --> 00:04:33,600
the university of alberta in canada and

75
00:04:37,030 --> 00:04:35,280
he's going to talk about what can what

76
00:04:38,790 --> 00:04:37,040
kinds of samples we want to collect from

77
00:04:41,270 --> 00:04:38,800
the surface of mars

78
00:04:43,030 --> 00:04:41,280
and then we have lisa pratt so she has

79
00:04:45,189 --> 00:04:43,040
probably one of the coolest titles at

80
00:04:47,350 --> 00:04:45,199
nasa she is the planetary protection

81
00:04:48,790 --> 00:04:47,360
officer at nasa headquarters and she's

82
00:04:51,350 --> 00:04:48,800
going to talk about how we're going to

83
00:04:53,110 --> 00:04:51,360
do this all safely

84
00:04:55,270 --> 00:04:53,120
so we're going to get started by first

85
00:04:57,270 --> 00:04:55,280
talking to thomas who recently was just

86
00:05:00,310 --> 00:04:57,280
back from the launch pad

87
00:05:01,909 --> 00:05:00,320
uh it's very cool you know i was just uh

88
00:05:04,710 --> 00:05:01,919

standing out there in the sun it's

89
00:05:07,590 --> 00:05:04,720
pretty warm and i saw

90
00:05:10,310 --> 00:05:07,600
the launch vehicle go from its vertical

91
00:05:12,230 --> 00:05:10,320
integration facility about a thousand

92
00:05:14,629 --> 00:05:12,240
yards over to the place from where it's

93
00:05:17,270 --> 00:05:14,639
going to go in less than 48 hours into

94
00:05:19,510 --> 00:05:17,280
space and i was there with some of our

95
00:05:21,029 --> 00:05:19,520
leaders from jpl

96
00:05:22,950 --> 00:05:21,039
some of our leaders from nasa

97
00:05:24,950 --> 00:05:22,960
headquarters but especially the leaders

98
00:05:26,870 --> 00:05:24,960
from ula and i just couldn't uh tell you

99
00:05:28,230 --> 00:05:26,880
how proud we are to get to this

100
00:05:29,430 --> 00:05:28,240
important moment of course the most

101
00:05:31,430 --> 00:05:29,440
important thing

102
00:05:34,310 --> 00:05:31,440
is yet ahead which is to take off this

103
00:05:37,510 --> 00:05:34,320
planet and go to its destination uh the

104
00:05:38,469 --> 00:05:37,520
red planet uh our neighborhood planet

105
00:05:41,670 --> 00:05:38,479
mars

106
00:05:43,749 --> 00:05:41,680
employee tournaments i want to tell you

107
00:05:46,150 --> 00:05:43,759
how excited i am to have

108
00:05:48,629 --> 00:05:46,160
dave parker on the phone

109
00:05:51,749 --> 00:05:48,639
really our friend a personal friend of

110
00:05:54,150 --> 00:05:51,759
mine an international collaborator and a

111
00:05:55,749 --> 00:05:54,160
really critical part of our sample

112
00:05:56,629 --> 00:05:55,759
return campaign that we're going to talk

113
00:05:58,469 --> 00:05:56,639

about

114
00:06:00,550 --> 00:05:58,479
today

115
00:06:03,670 --> 00:06:00,560
dave and i are talking on a regular

116
00:06:06,150 --> 00:06:03,680
basis because so often our relationship

117
00:06:07,189 --> 00:06:06,160
really is one of the many ingredients

118
00:06:12,070 --> 00:06:07,199
that

119
00:06:13,830 --> 00:06:12,080
successful with mars sample return

120
00:06:15,909 --> 00:06:13,840
jeff grambling is on

121
00:06:18,070 --> 00:06:15,919
the phone as well he just uh introduced

122
00:06:21,670 --> 00:06:18,080
them and i just want to just say how

123
00:06:23,909 --> 00:06:21,680
happy i am that he joined as the first

124
00:06:26,390 --> 00:06:23,919
director of the newly created mars

125
00:06:28,309 --> 00:06:26,400
sample return program at headquarters

126
00:06:30,150 --> 00:06:28,319
the way we're organizing that includes

127
00:06:31,990 --> 00:06:30,160
all the lessons learned from complex

128
00:06:35,029 --> 00:06:32,000
programs that we've had whether it's

129
00:06:37,110 --> 00:06:35,039
mars 2020 the james webb space telescope

130
00:06:38,710 --> 00:06:37,120
or other programs and he's going to have

131
00:06:40,230 --> 00:06:38,720
a really critical

132
00:06:43,189 --> 00:06:40,240
role in this and i just couldn't be more

133
00:06:45,670 --> 00:06:43,199
happy to have him on board what we want

134
00:06:48,390 --> 00:06:45,680
to talk about today though is shown here

135
00:06:51,430 --> 00:06:48,400
in the first image

136
00:06:53,830 --> 00:06:51,440
is the samples we talk a lot about uh

137
00:06:55,589 --> 00:06:53,840
mars 2020 and instruments and so forth

138
00:06:58,070 --> 00:06:55,599

but it's all about these samples you see

139
00:07:00,710 --> 00:06:58,080
these sample tubes that are right there

140
00:07:03,189 --> 00:07:00,720
on the ground on on on this martian soil

141
00:07:05,110 --> 00:07:03,199
in this artist's depiction

142
00:07:06,790 --> 00:07:05,120
that we're going to talk about and of

143
00:07:08,629 --> 00:07:06,800
course the goal is to not keep them

144
00:07:10,629 --> 00:07:08,639
there on the surface but to get them

145
00:07:12,710 --> 00:07:10,639
back into the best laboratories that we

146
00:07:15,270 --> 00:07:12,720
have that humanity has which are of

147
00:07:17,270 --> 00:07:15,280
course all the labs here on earth

148
00:07:20,550 --> 00:07:17,280
and the next

149
00:07:22,390 --> 00:07:20,560
video provided by isa is telling us how

150
00:07:23,589 --> 00:07:22,400
we're doing that of course the first

151
00:07:25,990 --> 00:07:23,599
element

152
00:07:28,950 --> 00:07:26,000
is to go with mars 2020

153
00:07:30,710 --> 00:07:28,960
to the surface of mars and create those

154
00:07:32,230 --> 00:07:30,720
get those samples

155
00:07:34,309 --> 00:07:32,240
there's another

156
00:07:36,390 --> 00:07:34,319
spacecraft that is landing and it's

157
00:07:38,950 --> 00:07:36,400
landing launching from the united states

158
00:07:41,029 --> 00:07:38,960
and it's landing a launch vehicle and a

159
00:07:43,510 --> 00:07:41,039
fetch row where that's collecting

160
00:07:46,710 --> 00:07:43,520
those samples and bringing it back to

161
00:07:49,189 --> 00:07:46,720
that mars ascent vehicle a map as we

162
00:07:51,990 --> 00:07:49,199
call it and that takes off in this kind

163
00:07:55,670 --> 00:07:52,000

of game-like assimilation and and drops

164
00:07:57,670 --> 00:07:55,680
off uh this orbiting red container that

165
00:07:59,749 --> 00:07:57,680
is orbiting

166
00:08:01,510 --> 00:07:59,759
mars and you see melee a european-built

167
00:08:04,950 --> 00:08:01,520
spacecraft that had taken off from

168
00:08:07,749 --> 00:08:04,960
europe is catching it and is bringing it

169
00:08:10,390 --> 00:08:07,759
back to earth uh in a long orbit much

170
00:08:11,350 --> 00:08:10,400
longer than can be depicted here back to

171
00:08:12,710 --> 00:08:11,360
earth

172
00:08:21,029 --> 00:08:12,720
into

173
00:08:23,830 --> 00:08:21,039
and so these pieces you know four

174
00:08:26,070 --> 00:08:23,840
launches multiple spacecraft together

175
00:08:28,309 --> 00:08:26,080
make the mars sample return campaign

176
00:08:30,390 --> 00:08:28,319
which frankly is the manifestation of a

177
00:08:32,550 --> 00:08:30,400
lot of dreams and aspirations of the

178
00:08:34,949 --> 00:08:32,560
science community in fact the highest

179
00:08:37,110 --> 00:08:34,959
priority of the national academies the

180
00:08:39,509 --> 00:08:37,120
cattle that we're working under and

181
00:08:40,630 --> 00:08:39,519
we're so excited to make progress

182
00:08:42,949 --> 00:08:40,640
on it

183
00:08:45,030 --> 00:08:42,959
now the samples from us have potential

184
00:08:48,070 --> 00:08:45,040
of profound change of our understanding

185
00:08:49,990 --> 00:08:48,080
in the origin evolution and distribution

186
00:08:53,030 --> 00:08:50,000
of life on earth and elsewhere in the

187
00:08:55,190 --> 00:08:53,040
solar system and even now nasa continues

188
00:08:57,670 --> 00:08:55,200

to study moon samples that were brought

189
00:09:00,070 --> 00:08:57,680
back from the apollo program with new

190
00:09:03,509 --> 00:09:00,080
questions and more profound insights

191
00:09:05,670 --> 00:09:03,519
that still uh fill journals today and we

192
00:09:07,590 --> 00:09:05,680
just can learn from that how important

193
00:09:09,030 --> 00:09:07,600
these samples are going to be not just

194
00:09:11,110 --> 00:09:09,040
for the questions that we're currently

195
00:09:13,350 --> 00:09:11,120
imagining which are profound by

196
00:09:15,110 --> 00:09:13,360
themselves but also for questions that

197
00:09:17,110 --> 00:09:15,120
frankly not going to come up because we

198
00:09:19,590 --> 00:09:17,120
look at these samples and because we

199
00:09:21,829 --> 00:09:19,600
make progress of martian science

200
00:09:23,590 --> 00:09:21,839
elsewhere and so the implications of

201
00:09:25,910 --> 00:09:23,600
what we know about mars and the search

202
00:09:28,310 --> 00:09:25,920
of life are enormous and even after

203
00:09:30,630 --> 00:09:28,320
perseverance accomplishes all the things

204
00:09:32,470 --> 00:09:30,640
on its science list and

205
00:09:35,190 --> 00:09:32,480
it only sets it up

206
00:09:38,630 --> 00:09:35,200
for this important part of this uh

207
00:09:40,630 --> 00:09:38,640
return of these samples uh to uh to

208
00:09:42,150 --> 00:09:40,640
earth which is really uh the subject of

209
00:09:47,030 --> 00:09:42,160
this uh

210
00:09:49,509 --> 00:09:47,040
gonna do now uh dave parker is kick it

211
00:09:51,590 --> 00:09:49,519
over to you and just have you uh talk

212
00:09:53,590 --> 00:09:51,600
about uh your excitement and the role

213
00:09:55,829 --> 00:09:53,600

that our important partner european

214
00:09:58,230 --> 00:09:55,839
space agency has in this day forward to

215
00:10:02,710 --> 00:10:00,550
hi there thomas uh it's great to hear

216
00:10:04,630 --> 00:10:02,720
you and see you i'm really sorry i'm not

217
00:10:07,110 --> 00:10:04,640
there with you at the cape for the

218
00:10:08,710 --> 00:10:07,120
launch indeed i'm not even in my office

219
00:10:10,550 --> 00:10:08,720
at the european technology space

220
00:10:12,630 --> 00:10:10,560
technology center i'm working from home

221
00:10:15,350 --> 00:10:12,640
during the current situation but we're

222
00:10:17,750 --> 00:10:15,360
persevering we're keeping going and even

223
00:10:19,829 --> 00:10:17,760
over here we're working hard on our mars

224
00:10:21,190 --> 00:10:19,839
programme and i'm really super excited

225
00:10:22,870 --> 00:10:21,200
to join you at this press conference

226
00:10:25,430 --> 00:10:22,880
thank you for the invitation

227
00:10:27,110 --> 00:10:25,440
uh being just days away from the launch

228
00:10:30,550 --> 00:10:27,120
of perseverance

229
00:10:34,069 --> 00:10:30,560
any launch to mars is exciting but for

230
00:10:36,470 --> 00:10:34,079
me this is excitement times 10 because

231
00:10:38,550 --> 00:10:36,480
it is the first part of my sample return

232
00:10:45,110 --> 00:10:38,560
msr

233
00:10:49,509 --> 00:10:47,590
uh i'm 20 years of studies in

234
00:10:51,590 --> 00:10:49,519
preparation to this moment where we're

235
00:10:53,990 --> 00:10:51,600
going to start the real campaign now

236
00:10:56,710 --> 00:10:54,000
hopefully you know that esa is a club of

237
00:10:58,710 --> 00:10:56,720
22 european countries who cool their

238
00:11:01,269 --> 00:10:58,720

efforts in exploring and using space for

239
00:11:03,750 --> 00:11:01,279
everyday life and i should add that

240
00:11:05,910 --> 00:11:03,760
canada is an associate member and you'll

241
00:11:07,990 --> 00:11:05,920
see the canadian flag on some of my

242
00:11:11,030 --> 00:11:08,000
graphics and this is important because

243
00:11:12,310 --> 00:11:11,040
canada is also part of the msr story via

244
00:11:14,150 --> 00:11:12,320
esa

245
00:11:16,710 --> 00:11:14,160
so within the huge range of different

246
00:11:18,870 --> 00:11:16,720
projects that isa undertakes from

247
00:11:21,430 --> 00:11:18,880
monitoring our changing climate with the

248
00:11:23,590 --> 00:11:21,440
copernicus constellation uh providing

249
00:11:26,069 --> 00:11:23,600
global navigation with galileo and

250
00:11:28,790 --> 00:11:26,079
mapping the positions of a billion stars

251
00:11:31,190 --> 00:11:28,800
in our galaxy with the gaia mission

252
00:11:33,269 --> 00:11:31,200
msr is part of the exploration program

253
00:11:35,670 --> 00:11:33,279
which i'm responsible and we're able to

254
00:11:39,350 --> 00:11:35,680
work day by day with nasa on that

255
00:11:41,110 --> 00:11:39,360
program so have the next graphic please

256
00:11:44,470 --> 00:11:41,120
i would say our space exploration

257
00:11:46,870 --> 00:11:44,480
program uh focuses on destinations where

258
00:11:48,870 --> 00:11:46,880
humans will one day live and work this

259
00:11:50,310 --> 00:11:48,880
means low earth orbit where we've been

260
00:11:52,389 --> 00:11:50,320
living and working on the space station

261
00:11:55,110 --> 00:11:52,399
for nearly 20 years now

262
00:11:57,430 --> 00:11:55,120
and the moon where we are partner of

263
00:11:59,110 --> 00:11:57,440

nasa in the artemis program going

264
00:12:02,230 --> 00:11:59,120
forward to the moon

265
00:12:04,629 --> 00:12:02,240
and then finally mars the horizon goal

266
00:12:06,790 --> 00:12:04,639
for humans where we already have two

267
00:12:09,350 --> 00:12:06,800
robotic missions there circling the

268
00:12:11,670 --> 00:12:09,360
planet understanding this this other

269
00:12:13,910 --> 00:12:11,680
world and to emphasize this

270
00:12:16,310 --> 00:12:13,920
international cooperation aspect i point

271
00:12:19,269 --> 00:12:16,320
out that today we've announced that two

272
00:12:21,670 --> 00:12:19,279
of our easter astronauts will fly on the

273
00:12:24,790 --> 00:12:21,680
nasa new commercial crew vehicles to the

274
00:12:26,790 --> 00:12:24,800
space station starting next year

275
00:12:29,509 --> 00:12:26,800
and that's in exchange for us providing

276
00:12:32,629 --> 00:12:29,519
the power and propulsion for nasa's

277
00:12:35,190 --> 00:12:32,639
orion spaceship to go to the moon

278
00:12:36,870 --> 00:12:35,200
so uh as thomas has said

279
00:12:39,030 --> 00:12:36,880
there's going to be fantastic science

280
00:12:41,269 --> 00:12:39,040
out of msr

281
00:12:43,990 --> 00:12:41,279
but it's also truly an exploration

282
00:12:46,790 --> 00:12:44,000
mission in the grand tradition we have

283
00:12:49,030 --> 00:12:46,800
mars as our horizon goal for humans

284
00:12:51,750 --> 00:12:49,040
but before sending humans it makes sense

285
00:12:53,190 --> 00:12:51,760
to do a round trip with robots as scouts

286
00:12:55,750 --> 00:12:53,200
or precursors

287
00:12:58,790 --> 00:12:55,760
it'll tell us a great deal you can also

288
00:13:01,829 --> 00:12:58,800

almost imagine msr is kind of a scale

289
00:13:04,949 --> 00:13:01,839
model of an eventual human boots on the

290
00:13:07,829 --> 00:13:04,959
moon project next graphic please so

291
00:13:10,069 --> 00:13:07,839
explain where we are now uh at esa at

292
00:13:12,230 --> 00:13:10,079
the european space agency with our mars

293
00:13:14,550 --> 00:13:12,240
program i said we have two orbiters

294
00:13:17,590 --> 00:13:14,560
there today the little mars express has

295
00:13:19,110 --> 00:13:17,600
been there since christmas day 2003.

296
00:13:21,590 --> 00:13:19,120
the trace gas orbiter which is the

297
00:13:23,670 --> 00:13:21,600
biggest beast around the planet today is

298
00:13:27,030 --> 00:13:23,680
doing great science and also relaying

299
00:13:28,150 --> 00:13:27,040
data for nasa's curiosity and insight

300
00:13:30,069 --> 00:13:28,160
missions

301
00:13:32,310 --> 00:13:30,079
and even today there being two new

302
00:13:34,790 --> 00:13:32,320
papers published

303
00:13:36,629 --> 00:13:34,800
from the exomars trace castle but uh

304
00:13:39,030 --> 00:13:36,639
intriguing new results about the

305
00:13:41,430 --> 00:13:39,040
atmosphere of the red planet completely

306
00:13:42,790 --> 00:13:41,440
unexpected results and meanwhile we're

307
00:13:46,150 --> 00:13:42,800
working with our russian partner ross

308
00:13:48,150 --> 00:13:46,160
cosmos to prepare the launch in 2022 of

309
00:13:51,030 --> 00:13:48,160
the rosalind franklin rover which will

310
00:13:53,590 --> 00:13:51,040
search for the evidence of past life

311
00:13:55,430 --> 00:13:53,600
using a drill that can get six feet

312
00:13:56,470 --> 00:13:55,440
below the surface of mars and therefore

313
00:13:58,470 --> 00:13:56,480

below

314
00:14:00,790 --> 00:13:58,480
the damage that will be caused to any

315
00:14:02,550 --> 00:14:00,800
organic material by radiation the

316
00:14:04,710 --> 00:14:02,560
radiation on mars

317
00:14:07,430 --> 00:14:04,720
but here today we're here to talk about

318
00:14:09,430 --> 00:14:07,440
our contributions to my sample return

319
00:14:12,069 --> 00:14:09,440
and it comprises the earth return

320
00:14:14,150 --> 00:14:12,079
orbiter the sample fetch rover and some

321
00:14:16,949 --> 00:14:14,160
important robotics that will transfer

322
00:14:19,189 --> 00:14:16,959
those sample containers that thomas

323
00:14:21,269 --> 00:14:19,199
mentioned from one part of the system to

324
00:14:23,350 --> 00:14:21,279
the other it's kind of an interplanetary

325
00:14:25,110 --> 00:14:23,360
relay race we're doing so perhaps i

326
00:14:27,269 --> 00:14:25,120
should say more about some of our main

327
00:14:29,590 --> 00:14:27,279
elements the rover and the orbiter

328
00:14:30,470 --> 00:14:29,600
next slide starts with talking about the

329
00:14:31,910 --> 00:14:30,480
rover

330
00:14:36,389 --> 00:14:31,920
so the

331
00:14:38,710 --> 00:14:36,399
next slide please the sample fetch rover

332
00:14:41,269 --> 00:14:38,720
is much smaller than

333
00:14:43,350 --> 00:14:41,279
perseverance or exomars or any of the

334
00:14:45,509 --> 00:14:43,360
current advanced rovers because it has

335
00:14:48,069 --> 00:14:45,519
the sole task to scurry across the

336
00:14:50,310 --> 00:14:48,079
sample of the surface of mars to get

337
00:14:52,389 --> 00:14:50,320
those sample tubes and bring them back

338
00:14:54,389 --> 00:14:52,399

and it's a race against time we only

339
00:14:56,710 --> 00:14:54,399
have about eight months on the surface

340
00:15:00,470 --> 00:14:56,720
of mars to do this to bring the sample

341
00:15:02,470 --> 00:15:00,480
tubes uh collected by perseverance back

342
00:15:04,470 --> 00:15:02,480
to the mars ascent vehicle and get them

343
00:15:05,910 --> 00:15:04,480
off the surface of the planet

344
00:15:08,069 --> 00:15:05,920
and i think you'll see more about these

345
00:15:09,189 --> 00:15:08,079
sample tubes later in this press

346
00:15:11,030 --> 00:15:09,199
conference

347
00:15:13,269 --> 00:15:11,040
so compared to current rovers it's got

348
00:15:15,750 --> 00:15:13,279
to go a lot faster about maybe up to 10

349
00:15:17,590 --> 00:15:15,760
times faster it's got to go autonomously

350
00:15:18,629 --> 00:15:17,600
it's got to navigate its way there and

351
00:15:20,870 --> 00:15:18,639
back

352
00:15:23,590 --> 00:15:20,880
and it includes some clever robotics to

353
00:15:24,949 --> 00:15:23,600
do the transfer of these amplitudes

354
00:15:27,189 --> 00:15:24,959
now we've already placed a

355
00:15:29,350 --> 00:15:27,199
pre-development contract with airbus

356
00:15:30,150 --> 00:15:29,360
defense and space in the uk

357
00:15:32,710 --> 00:15:30,160
to

358
00:15:35,110 --> 00:15:32,720
prepare for the sample fetch rover and

359
00:15:36,550 --> 00:15:35,120
this builds on their heritage of exomars

360
00:15:38,230 --> 00:15:36,560
and this is a message we're building on

361
00:15:39,430 --> 00:15:38,240
the heritage of capability that we

362
00:15:42,230 --> 00:15:39,440
already have

363
00:15:44,310 --> 00:15:42,240

in this international partnership so we

364
00:15:45,990 --> 00:15:44,320
have to deliver the rover to nasa in

365
00:15:49,110 --> 00:15:46,000
2025

366
00:15:51,430 --> 00:15:49,120
for launch perhaps as early as 2026

367
00:15:53,269 --> 00:15:51,440
on the sample retrieve lander

368
00:15:54,470 --> 00:15:53,279
our other contribution shown on the next

369
00:15:56,790 --> 00:15:54,480
slide please

370
00:15:59,269 --> 00:15:56,800
is the earth return orbiter

371
00:16:03,189 --> 00:15:59,279
ero for short so this is we launched on

372
00:16:05,430 --> 00:16:03,199
a european arianes 64 rocket uh from our

373
00:16:06,829 --> 00:16:05,440
european space center at kuru

374
00:16:09,350 --> 00:16:06,839
and it's an amazing beast of a

375
00:16:11,110 --> 00:16:09,360
spacecraft uh the first interplanetary

376
00:16:13,910 --> 00:16:11,120
cargo ship if you like

377
00:16:16,310 --> 00:16:13,920
and on its cargo deck will be the nasa

378
00:16:18,629 --> 00:16:16,320
sample containment system

379
00:16:20,629 --> 00:16:18,639
and the earth entry vehicle that will

380
00:16:22,470 --> 00:16:20,639
actually land back on earth

381
00:16:24,870 --> 00:16:22,480
so the key job of the orbiter as you've

382
00:16:26,949 --> 00:16:24,880
seen from the little cartoon earlier is

383
00:16:29,829 --> 00:16:26,959
to scoop up the sample container that's

384
00:16:31,189 --> 00:16:29,839
been thrown overboard by the uh mars

385
00:16:33,670 --> 00:16:31,199
ascent vehicle

386
00:16:34,550 --> 00:16:33,680
it's only the size of a about a football

387
00:16:36,949 --> 00:16:34,560
uh

388
00:16:38,150 --> 00:16:36,959

yeah a football a rugby ball if you're

389
00:16:39,670 --> 00:16:38,160
british

390
00:16:43,030 --> 00:16:39,680
and then we have to load it into the

391
00:16:44,389 --> 00:16:43,040
nasa containment system and fly it home

392
00:16:47,430 --> 00:16:44,399
and also the orbiter does all the

393
00:16:49,590 --> 00:16:47,440
telecoms relay and data communications

394
00:16:51,189 --> 00:16:49,600
during all the operations on the ground

395
00:16:54,470 --> 00:16:51,199
to give you a sense of scale this

396
00:16:55,350 --> 00:16:54,480
spacecraft has a wingspan of about 120

397
00:16:57,590 --> 00:16:55,360
feet

398
00:17:00,710 --> 00:16:57,600
it weighs six and a half metric tons at

399
00:17:03,990 --> 00:17:00,720
launch it uses chemical rockets to go

400
00:17:07,350 --> 00:17:04,000
into orbit around mars the most powerful

401
00:17:09,350 --> 00:17:07,360
iron drive electric propulsion system

402
00:17:12,470 --> 00:17:09,360
to do the spiraling down to mars to

403
00:17:15,270 --> 00:17:12,480
spiral back up and come back to earth

404
00:17:18,230 --> 00:17:15,280
and uh the news today i can give you our

405
00:17:20,949 --> 00:17:18,240
intense commercial competition i can

406
00:17:23,270 --> 00:17:20,959
announce that a contract will be placed

407
00:17:25,909 --> 00:17:23,280
subject to negotiation with airbus

408
00:17:28,390 --> 00:17:25,919
defense and space of france to build the

409
00:17:30,870 --> 00:17:28,400
ero and that their team includes

410
00:17:32,390 --> 00:17:30,880
talismania space of italy

411
00:17:34,150 --> 00:17:32,400
together they're kind of the european

412
00:17:35,590 --> 00:17:34,160
dream team because between them these

413
00:17:37,750 --> 00:17:35,600

companies have built

414
00:17:40,070 --> 00:17:37,760
our rosetta comic mission the becky

415
00:17:42,630 --> 00:17:40,080
colombo spacecraft that's on its way to

416
00:17:44,789 --> 00:17:42,640
mercury and also the exomars trace gas

417
00:17:46,870 --> 00:17:44,799
orbiter so coming to my conclusion

418
00:17:48,070 --> 00:17:46,880
really and i'll uh hand off to jeff in a

419
00:17:50,390 --> 00:17:48,080
moment

420
00:17:53,029 --> 00:17:50,400
my last slide i hope i've given you a

421
00:17:54,710 --> 00:17:53,039
few hints as to why perseverance is such

422
00:17:56,710 --> 00:17:54,720
an important launch

423
00:18:00,470 --> 00:17:56,720
why my sample return is going to be a

424
00:18:02,470 --> 00:18:00,480
flagship project for the 2020s and why

425
00:18:04,310 --> 00:18:02,480
we at the european space agency are

426
00:18:06,310 --> 00:18:04,320
humble and proud to have the chance to

427
00:18:07,909 --> 00:18:06,320
be a partner of nasa

428
00:18:09,390 --> 00:18:07,919
in delivering this

429
00:18:11,990 --> 00:18:09,400
extraordinary

430
00:18:14,870 --> 00:18:12,000
mind-bendingly challenging and

431
00:18:16,630 --> 00:18:14,880
history-making exploration mission so

432
00:18:21,190 --> 00:18:16,640
thank you and i'll hand over to jeff to

433
00:18:25,350 --> 00:18:23,430
well thank you david hi i'm jeff

434
00:18:27,430 --> 00:18:25,360
grambling and i'm really excited to be

435
00:18:29,190 --> 00:18:27,440
part of this amazing international team

436
00:18:31,750 --> 00:18:29,200
and looking to accomplish one of the

437
00:18:33,029 --> 00:18:31,760
most complex things humanity has ever

438
00:18:34,630 --> 00:18:33,039

attempted

439
00:18:36,549 --> 00:18:34,640
with the launch of perseverance this

440
00:18:38,230 --> 00:18:36,559
week will be the first step in the

441
00:18:40,390 --> 00:18:38,240
mission to bring back the first samples

442
00:18:42,549 --> 00:18:40,400
from another planet

443
00:18:44,549 --> 00:18:42,559
mars sample return is a collaboration as

444
00:18:46,230 --> 00:18:44,559
you heard david described between esa

445
00:18:47,830 --> 00:18:46,240
and nasa and we're already working

446
00:18:49,909 --> 00:18:47,840
closely with our partners on this

447
00:18:51,830 --> 00:18:49,919
historic undertaking

448
00:18:53,270 --> 00:18:51,840
within nasa many centers are applying

449
00:18:56,070 --> 00:18:53,280
their scientific and engineering

450
00:18:58,230 --> 00:18:56,080
expertise to ensure we're successful

451
00:19:00,230 --> 00:18:58,240
as david and thomas have described the

452
00:19:02,470 --> 00:19:00,240
planned campaign architecture breaks up

453
00:19:04,230 --> 00:19:02,480
this round-trip mission into three

454
00:19:06,950 --> 00:19:04,240
manageable elements that all work

455
00:19:09,029 --> 00:19:06,960
together in a synchronized manner

456
00:19:10,710 --> 00:19:09,039
first the perseverance rover rover

457
00:19:12,470 --> 00:19:10,720
launching this week will drill and

458
00:19:14,070 --> 00:19:12,480
prepare samples and cash them on the

459
00:19:15,590 --> 00:19:14,080
surface of mars

460
00:19:17,750 --> 00:19:15,600
perseverance will be followed by the

461
00:19:20,549 --> 00:19:17,760
launch of the remaining two elements

462
00:19:22,789 --> 00:19:20,559
as early as 2026

463
00:19:25,110 --> 00:19:22,799

the sample retrieval retrieval lander

464
00:19:26,789 --> 00:19:25,120
carrying the sample fetch rover will be

465
00:19:28,549 --> 00:19:26,799
launched to collect those samples and to

466
00:19:29,510 --> 00:19:28,559
put bring them to the mars ascent

467
00:19:31,110 --> 00:19:29,520
vehicle

468
00:19:32,150 --> 00:19:31,120
which will put them into orbit around

469
00:19:33,909 --> 00:19:32,160
mars

470
00:19:36,310 --> 00:19:33,919
this rocket will be the first to launch

471
00:19:37,830 --> 00:19:36,320
from the surface of another planet

472
00:19:40,630 --> 00:19:37,840
and we're also working on cool new

473
00:19:43,110 --> 00:19:40,640
wheels for the fetch rover

474
00:19:44,789 --> 00:19:43,120
the earth return orbiter will rendezvous

475
00:19:47,350 --> 00:19:44,799
and capture those samples using a

476
00:19:49,669 --> 00:19:47,360
sophisticated capture containment and

477
00:19:51,110 --> 00:19:49,679
return system and then bring them safely

478
00:19:52,870 --> 00:19:51,120
back to earth

479
00:19:54,870 --> 00:19:52,880
so now i'd like to show you an animation

480
00:19:58,549 --> 00:19:54,880
on how all of these pieces work together

481
00:20:02,870 --> 00:20:01,029
so it all begins with perseverance rover

482
00:20:05,270 --> 00:20:02,880
drilling and collecting samples and then

483
00:20:07,430 --> 00:20:05,280
caching them on the surface of mars

484
00:20:09,270 --> 00:20:07,440
with the sample fetch rover collecting

485
00:20:11,190 --> 00:20:09,280
them and bringing them back to the mars

486
00:20:12,549 --> 00:20:11,200
ascent vehicle for launch into orbit

487
00:20:14,470 --> 00:20:12,559
around mars

488
00:20:16,549 --> 00:20:14,480

and then as you heard david described

489
00:20:18,789 --> 00:20:16,559
the earth return orbiter

490
00:20:21,190 --> 00:20:18,799
will capture that sample

491
00:20:23,990 --> 00:20:21,200
and bring it back to earth putting it

492
00:20:26,549 --> 00:20:24,000
into the earth returned vehicle

493
00:20:28,630 --> 00:20:26,559
to bring it back and and land in in on

494
00:20:30,950 --> 00:20:28,640
earth in utah

495
00:20:32,630 --> 00:20:30,960
all right

496
00:20:35,350 --> 00:20:32,640
the engineering needed to return the

497
00:20:37,190 --> 00:20:35,360
samples perseverance collects is

498
00:20:39,350 --> 00:20:37,200
maturing and it's built upon the past

499
00:20:41,590 --> 00:20:39,360
two decades of investment in autonomous

500
00:20:42,710 --> 00:20:41,600
robots and landing large payloads on

501
00:20:44,549 --> 00:20:42,720
mars

502
00:20:46,830 --> 00:20:44,559
this is why we're confident the time is

503
00:20:48,789 --> 00:20:46,840
right for successful sample return

504
00:20:50,789 --> 00:20:48,799
campaign

505
00:20:53,110 --> 00:20:50,799
just as perseverance itself as a result

506
00:20:55,270 --> 00:20:53,120
of many nations work the spirit of mars

507
00:20:57,590 --> 00:20:55,280
exploration and bringing samples of mars

508
00:20:59,270 --> 00:20:57,600
back to our home labs is something we do

509
00:21:01,110 --> 00:20:59,280
with the whole world

510
00:21:03,750 --> 00:21:01,120
we look forward to this next step

511
00:21:07,510 --> 00:21:03,760
leading to a tremendous leap forward

512
00:21:16,149 --> 00:21:08,950
hand it over to julie and she's going to

513
00:21:20,630 --> 00:21:18,310

collecting samples of martian rocks and

514
00:21:21,510 --> 00:21:20,640
soils and preserving them for return to

515
00:21:23,110 --> 00:21:21,520
earth

516
00:21:25,430 --> 00:21:23,120
is one of the most complex things we've

517
00:21:27,270 --> 00:21:25,440
tried to do with the mars rover yet

518
00:21:29,270 --> 00:21:27,280
this is a sample tube

519
00:21:31,510 --> 00:21:29,280
on board the perseverance rover are over

520
00:21:33,750 --> 00:21:31,520
40 of these and the objective is to fill

521
00:21:35,750 --> 00:21:33,760
each one with a sample of martian soil

522
00:21:38,710 --> 00:21:35,760
or martian rock core

523
00:21:40,950 --> 00:21:38,720
i have here an example of a martian rock

524
00:21:43,590 --> 00:21:40,960
or a rock core not a martian rock core

525
00:21:47,029 --> 00:21:43,600
collected in one of our test activities

526
00:21:48,710 --> 00:21:47,039
to me it reminds me of a

527
00:21:49,990 --> 00:21:48,720
piece of classroom chalk for those of us

528
00:21:52,310 --> 00:21:50,000
who are old enough to remember when

529
00:21:55,190 --> 00:21:52,320
classrooms had chalkboards

530
00:21:57,350 --> 00:21:55,200
this is a pretty good example of a core

531
00:21:59,190 --> 00:21:57,360
it is a it's largely one piece it's

532
00:22:00,789 --> 00:21:59,200
broken into a couple of large chunks but

533
00:22:02,710 --> 00:22:00,799
it's not pulverized

534
00:22:04,950 --> 00:22:02,720
to achieve this kind of core we

535
00:22:06,549 --> 00:22:04,960
developed a new coring drill for the

536
00:22:07,830 --> 00:22:06,559
perseverance mission

537
00:22:10,310 --> 00:22:07,840
different from the one we sent on the

538
00:22:12,549 --> 00:22:10,320

curiosity mission curiosity's

539
00:22:14,390 --> 00:22:12,559
objective was to pulverize rocks into a

540
00:22:18,549 --> 00:22:14,400
powder so they could be analyzed by the

541
00:22:21,830 --> 00:22:19,990
one of the most complex pieces of

542
00:22:23,990 --> 00:22:21,840
robotic choreography that we do with the

543
00:22:25,510 --> 00:22:24,000
sampling system is what's required to

544
00:22:27,669 --> 00:22:25,520
take this sample tube from where it's

545
00:22:30,230 --> 00:22:27,679
stored inside the belly of the rover and

546
00:22:32,149 --> 00:22:30,240
pass it out to the coring drill on the

547
00:22:33,990 --> 00:22:32,159
end of a robotic arm so that a sample

548
00:22:35,270 --> 00:22:34,000
can be acquired

549
00:22:38,070 --> 00:22:35,280
this requires

550
00:22:39,909 --> 00:22:38,080
use of robotics inside outside the rope

551
00:22:42,310 --> 00:22:39,919
inside the rover outside the rover and

552
00:22:44,630 --> 00:22:42,320
in between in between we have the bit

553
00:22:46,630 --> 00:22:44,640
carousel the big carousel

554
00:22:50,310 --> 00:22:46,640
is a dual purpose mechanism

555
00:22:52,549 --> 00:22:50,320
first it carries all of perseverance's

556
00:22:54,549 --> 00:22:52,559
assortment of drill bits that can be

557
00:22:56,710 --> 00:22:54,559
used for collecting core samples

558
00:22:57,830 --> 00:22:56,720
collecting regolith samples and abrading

559
00:22:59,750 --> 00:22:57,840
rocks

560
00:23:01,830 --> 00:22:59,760
in addition it provides the mechanism

561
00:23:03,510 --> 00:23:01,840
for moving these tubes from the inside

562
00:23:05,590 --> 00:23:03,520
of the rover to the outside where it can

563
00:23:07,669 --> 00:23:05,600

be accessed by the robotic arm

564
00:23:09,430 --> 00:23:07,679
first the sample handling assembly a

565
00:23:11,990 --> 00:23:09,440
small robotic manipulator inside the

566
00:23:14,070 --> 00:23:12,000
rover removes this tube from its storage

567
00:23:16,070 --> 00:23:14,080
location and inserts it into the lower

568
00:23:17,830 --> 00:23:16,080
door of the bit carousel directly into

569
00:23:18,789 --> 00:23:17,840
one of our coring or regolith collection

570
00:23:21,350 --> 00:23:18,799
bits

571
00:23:24,070 --> 00:23:21,360
the big carousel then rotates

572
00:23:25,270 --> 00:23:24,080
up and presents that bit at the upper

573
00:23:27,830 --> 00:23:25,280
door

574
00:23:30,070 --> 00:23:27,840
where it's where it's accessible by our

575
00:23:32,310 --> 00:23:30,080
robotic arm and coring drill the robotic

576
00:23:35,750 --> 00:23:32,320
arm and coring drill dock to the big

577
00:23:38,310 --> 00:23:35,760
carousel and extract this bit and go

578
00:23:40,070 --> 00:23:38,320
fill it with a sample once it's full we

579
00:23:41,430 --> 00:23:40,080
insert it back into the big carousel

580
00:23:43,430 --> 00:23:41,440
where it's rotated back down to the

581
00:23:45,590 --> 00:23:43,440
lower door and the sample handling

582
00:23:47,669 --> 00:23:45,600
assembly takes over again removing it

583
00:23:49,830 --> 00:23:47,679
from the big carousel and removing it

584
00:23:52,470 --> 00:23:49,840
from the bit and sending it through a

585
00:23:53,510 --> 00:23:52,480
series of processing stations inside the

586
00:23:55,830 --> 00:23:53,520
rover

587
00:23:57,830 --> 00:23:55,840
the core sample is measured

588
00:23:59,510 --> 00:23:57,840

pictures are taken of it and then a seal

589
00:24:00,470 --> 00:23:59,520
is dispensed into the top of

590
00:24:02,710 --> 00:24:00,480
the

591
00:24:05,029 --> 00:24:02,720
tube and activated

592
00:24:06,710 --> 00:24:05,039
once the seal is once the tube is sealed

593
00:24:08,950 --> 00:24:06,720
it's placed back into storage where it

594
00:24:10,470 --> 00:24:08,960
will ride along with the rover until we

595
00:24:11,669 --> 00:24:10,480
reach our caching location at which

596
00:24:14,149 --> 00:24:11,679
point we'll drop it on the ground for

597
00:24:16,470 --> 00:24:14,159
the fetch rover to retrieve

598
00:24:17,669 --> 00:24:16,480
so now i'll show you an animation so you

599
00:24:21,350 --> 00:24:17,679
can see

600
00:24:23,029 --> 00:24:21,360
what our system looks like in action

601
00:24:24,549 --> 00:24:23,039
so here you see the perseverance rover

602
00:24:26,630 --> 00:24:24,559
having just collected a sample from the

603
00:24:28,630 --> 00:24:26,640
surface docking the

604
00:24:30,789 --> 00:24:28,640
the core with the filled bit to the big

605
00:24:32,870 --> 00:24:30,799
carousel and the big carousel rotating

606
00:24:36,070 --> 00:24:32,880
the fill bit down to where the sample

607
00:24:37,190 --> 00:24:36,080
handling assembly will extract it

608
00:24:39,350 --> 00:24:37,200
and

609
00:24:40,870 --> 00:24:39,360
move it into a processing station

610
00:24:42,870 --> 00:24:40,880
after it's done this with all of the

611
00:24:45,510 --> 00:24:42,880
necessary processing stations

612
00:24:47,830 --> 00:24:45,520
the sealed tube will be placed back into

613
00:24:49,750 --> 00:24:47,840

the storage location in the sample tube

614
00:24:51,430 --> 00:24:49,760
rack

615
00:24:54,710 --> 00:24:51,440
and it'll stay there for safe keeping

616
00:24:56,630 --> 00:24:54,720
until we're ready to drop it off

617
00:24:58,549 --> 00:24:56,640
now i'm going to hand over to dr chris

618
00:25:00,310 --> 00:24:58,559
heard a member of the perseverance

619
00:25:02,789 --> 00:25:00,320
science team who will tell you more

620
00:25:06,390 --> 00:25:02,799
about the types of rocks we hope to fill

621
00:25:10,149 --> 00:25:08,310
thanks julie for that great overview of

622
00:25:11,590 --> 00:25:10,159
the really awesome

623
00:25:13,669 --> 00:25:11,600
robotic system that we'll use for

624
00:25:15,269 --> 00:25:13,679
collecting these samples well i'm

625
00:25:17,190 --> 00:25:15,279
personally really excited to be involved

626
00:25:18,950 --> 00:25:17,200
in this endeavor in fact i've wanted to

627
00:25:20,470 --> 00:25:18,960
study rocks from mars since i was about

628
00:25:22,390 --> 00:25:20,480
13 years old

629
00:25:24,390 --> 00:25:22,400
my role on perseverance is that of a

630
00:25:26,390 --> 00:25:24,400
return sample scientist

631
00:25:28,870 --> 00:25:26,400
i'm one of 15 such scientists supported

632
00:25:31,269 --> 00:25:28,880
by nasa the european space agency and in

633
00:25:33,430 --> 00:25:31,279
my case the canadian space agency

634
00:25:35,430 --> 00:25:33,440
all of us are experts on teasing out

635
00:25:36,870 --> 00:25:35,440
details from rocks in the lab whether

636
00:25:38,549 --> 00:25:36,880
they're meteorites

637
00:25:40,230 --> 00:25:38,559
samples of the moon or ancient rocks

638
00:25:42,470 --> 00:25:40,240

from the earth that may hold evidence

639
00:25:44,470 --> 00:25:42,480
for early life on the earth

640
00:25:46,470 --> 00:25:44,480
we are trained in the analyses required

641
00:25:48,230 --> 00:25:46,480
to answer the fundamental questions

642
00:25:50,630 --> 00:25:48,240
about mars including whether life ever

643
00:25:52,390 --> 00:25:50,640
existed in our landing site of jezreel

644
00:25:53,750 --> 00:25:52,400
crater the site of a crater lake and

645
00:25:55,510 --> 00:25:53,760
river system some three and a half

646
00:25:57,110 --> 00:25:55,520
billion years ago

647
00:25:58,950 --> 00:25:57,120
so our role on the mission is to help

648
00:26:01,190 --> 00:25:58,960
decide exactly where we want to collect

649
00:26:03,190 --> 00:26:01,200
samples from within the landing site and

650
00:26:04,390 --> 00:26:03,200
to document the context for those

651
00:26:06,630 --> 00:26:04,400
samples we are essentially the

652
00:26:08,149 --> 00:26:06,640
documentarians for each and every sample

653
00:26:10,149 --> 00:26:08,159
that gets collected

654
00:26:12,789 --> 00:26:10,159
and our goal is to collect at least 20

655
00:26:14,710 --> 00:26:12,799
ideally more like 30 or 35 samples that

656
00:26:17,029 --> 00:26:14,720
not only have the potential to show

657
00:26:19,430 --> 00:26:17,039
evidence of ancient life but to reflect

658
00:26:22,230 --> 00:26:19,440
a variety of different types of rocks to

659
00:26:23,909 --> 00:26:22,240
make a truly compelling suite of samples

660
00:26:25,430 --> 00:26:23,919
once brought back to earth such a suite

661
00:26:27,350 --> 00:26:25,440
of samples would keep generations of

662
00:26:29,830 --> 00:26:27,360
researchers busy unraveling the secrets

663
00:26:31,590 --> 00:26:29,840

of mars for decades in the same way that

664
00:26:33,669 --> 00:26:31,600
the apollo samples have done and still

665
00:26:35,590 --> 00:26:33,679
do for the moon

666
00:26:37,350 --> 00:26:35,600
in the meantime it's interesting that we

667
00:26:39,750 --> 00:26:37,360
already have samples of mars in the form

668
00:26:41,510 --> 00:26:39,760
of meteorites over 140 of them

669
00:26:43,990 --> 00:26:41,520
and i have a graphic that shows one of

670
00:26:47,110 --> 00:26:45,590
some of these meteorites have evidence

671
00:26:49,110 --> 00:26:47,120
for liquid water having flowed through

672
00:26:50,870 --> 00:26:49,120
them at some point in their past but

673
00:26:53,269 --> 00:26:50,880
importantly the vast majority are

674
00:26:55,110 --> 00:26:53,279
igneous rocks essentially lava flows

675
00:26:57,190 --> 00:26:55,120
that were erupted within the last few

676
00:26:59,269 --> 00:26:57,200
hundred million years relatively

677
00:27:01,990 --> 00:26:59,279
recently and much more recently than

678
00:27:03,510 --> 00:27:02,000
when the rocks at jezreel crater formed

679
00:27:05,430 --> 00:27:03,520
the meteorites don't get me wrong have

680
00:27:07,909 --> 00:27:05,440
provided some fantastic insights into

681
00:27:10,549 --> 00:27:07,919
mars history however the martian

682
00:27:11,830 --> 00:27:10,559
meteorite delivery service only delivers

683
00:27:13,510 --> 00:27:11,840
certain rocks

684
00:27:15,590 --> 00:27:13,520
because the process involves something

685
00:27:16,630 --> 00:27:15,600
impacting mars and rocks near the point

686
00:27:18,310 --> 00:27:16,640
of impact

687
00:27:20,710 --> 00:27:18,320
being accelerated fast enough to leave

688
00:27:23,110 --> 00:27:20,720

mars gravity and this is a very violent

689
00:27:24,870 --> 00:27:23,120
process and it effectively filters out

690
00:27:27,029 --> 00:27:24,880
the weaker rocks that won't make the

691
00:27:29,830 --> 00:27:27,039
trip so we only really get the strong

692
00:27:30,950 --> 00:27:29,840
rocks like the young igneous rocks the

693
00:27:32,549 --> 00:27:30,960
other thing is that we don't know

694
00:27:35,350 --> 00:27:32,559
exactly where on mars these rocks come

695
00:27:37,830 --> 00:27:35,360
from they're from random surf

696
00:27:39,669 --> 00:27:37,840
locations and so they lack the context

697
00:27:41,669 --> 00:27:39,679
so the great thing about perseverance is

698
00:27:43,190 --> 00:27:41,679
that instead of nature choosing for us

699
00:27:44,789 --> 00:27:43,200
we will get to choose

700
00:27:46,389 --> 00:27:44,799
which rocks come back to earth along

701
00:27:48,470 --> 00:27:46,399
with our careful documentation about

702
00:27:50,070 --> 00:27:48,480
where and why they were collected so

703
00:27:53,909 --> 00:27:50,080
i'll turn it over to lisa now to tell us

704
00:27:58,870 --> 00:27:56,230
hey chris thanks for that cross-border

705
00:28:02,230 --> 00:27:58,880
handoff from canada i'm lisa pratt

706
00:28:04,630 --> 00:28:02,240
nasa's planetary protection officer the

707
00:28:07,190 --> 00:28:04,640
overarching goal of planetary protection

708
00:28:10,070 --> 00:28:07,200
is to comply with the outer space treaty

709
00:28:11,350 --> 00:28:10,080
and do no harm to a future scientific

710
00:28:14,389 --> 00:28:11,360
discovery

711
00:28:16,630 --> 00:28:14,399
thus we carefully limited biological

712
00:28:19,430 --> 00:28:16,640
contamination of other worlds with

713
00:28:21,190 --> 00:28:19,440

terrestrial organisms and we carefully

714
00:28:23,430 --> 00:28:21,200
prevent backward contamination of

715
00:28:25,909 --> 00:28:23,440
earth's environment with potentially

716
00:28:28,470 --> 00:28:25,919
harmful extraterrestrial matter during

717
00:28:30,789 --> 00:28:28,480
return of samples either robotically or

718
00:28:32,310 --> 00:28:30,799
in the future with astronauts coming

719
00:28:35,110 --> 00:28:32,320
back from mars

720
00:28:38,070 --> 00:28:35,120
for the current mars sample return

721
00:28:40,630 --> 00:28:38,080
nasa and esa will implement forward

722
00:28:42,950 --> 00:28:40,640
planetary protection based on knowing

723
00:28:45,510 --> 00:28:42,960
the microbial bio burden when the

724
00:28:48,230 --> 00:28:45,520
spacecraft launches from earth

725
00:28:50,950 --> 00:28:48,240
in this first photo you can see the

726
00:28:53,669 --> 00:28:50,960
perseverance rover has been cleaned

727
00:28:56,389 --> 00:28:53,679
relentlessly using heat treatment of

728
00:28:58,870 --> 00:28:56,399
parts and then wiping the assembled

729
00:29:01,269 --> 00:28:58,880
systems and instruments with isopropyl

730
00:29:02,630 --> 00:29:01,279
alcohol as you can see an engineer doing

731
00:29:05,110 --> 00:29:02,640
in this photo

732
00:29:07,750 --> 00:29:05,120
by international agreement

733
00:29:10,950 --> 00:29:07,760
we monitor biological contamination of

734
00:29:13,590 --> 00:29:10,960
spacecraft by sampling either wiping or

735
00:29:15,830 --> 00:29:13,600
swabbing with a small stick that looks

736
00:29:17,029 --> 00:29:15,840
like an oversized q-tip and then

737
00:29:20,389 --> 00:29:17,039
culturing

738
00:29:23,830 --> 00:29:20,399

the hearty spores which are tiny dormant

739
00:29:26,070 --> 00:29:23,840
cells produced by some bacteria

740
00:29:28,630 --> 00:29:26,080
in this second photo you can see that

741
00:29:32,389 --> 00:29:28,640
once a critical part of the spacecraft

742
00:29:34,710 --> 00:29:32,399
is heat sterilized then bio barriers

743
00:29:37,430 --> 00:29:34,720
like these shiny wheel covers can be

744
00:29:39,350 --> 00:29:37,440
used to maintain the cleanliness of that

745
00:29:41,110 --> 00:29:39,360
part during assembly and launch

746
00:29:44,630 --> 00:29:41,120
preparation

747
00:29:47,990 --> 00:29:44,640
the tubes for caching samples on mars

748
00:29:50,710 --> 00:29:48,000
are the most stringently cleaned part of

749
00:29:52,789 --> 00:29:50,720
the perseverance rover you saw julie

750
00:29:53,750 --> 00:29:52,799
holding one of these tubes a few minutes

751
00:29:56,230 --> 00:29:53,760
ago

752
00:29:59,430 --> 00:29:56,240
and in this video you can see the

753
00:30:02,470 --> 00:29:59,440
titanium tubes are being examined in an

754
00:30:06,870 --> 00:30:02,480
ultra clean room setting prior to heat

755
00:30:10,389 --> 00:30:06,880
exposure for many hours at 150 degrees

756
00:30:12,710 --> 00:30:10,399
celsius in order to reach a high level

757
00:30:14,950 --> 00:30:12,720
of sterility assurance

758
00:30:16,870 --> 00:30:14,960
so scientists studying the samples back

759
00:30:19,269 --> 00:30:16,880
on earth like chris

760
00:30:21,750 --> 00:30:19,279
know that any evidence of life

761
00:30:24,310 --> 00:30:21,760
found in the return samples originated

762
00:30:25,350 --> 00:30:24,320
from mars and not as a round trip from

763
00:30:27,350 --> 00:30:25,360

earth

764
00:30:28,149 --> 00:30:27,360
in addition to cleaning treatments on

765
00:30:30,630 --> 00:30:28,159
earth

766
00:30:32,710 --> 00:30:30,640
viable terrestrial organisms that manage

767
00:30:34,950 --> 00:30:32,720
to get on the spacecraft despite

768
00:30:36,710 --> 00:30:34,960
everything we do

769
00:30:38,789 --> 00:30:36,720
we'll travel through deep space

770
00:30:40,149 --> 00:30:38,799
conditions for seven months on the way

771
00:30:42,470 --> 00:30:40,159
to mars

772
00:30:44,630 --> 00:30:42,480
after landing on mars the martian

773
00:30:47,750 --> 00:30:44,640
surface environment will present

774
00:30:50,389 --> 00:30:47,760
additional lethality factors for

775
00:30:51,669 --> 00:30:50,399
terrestrial organisms including damaging

776
00:30:54,870 --> 00:30:51,679
radiation

777
00:30:56,950 --> 00:30:54,880
aggressive atmospheric oxidation

778
00:30:59,110 --> 00:30:56,960
and bitter cold

779
00:31:00,710 --> 00:30:59,120
for backward planetary protection of

780
00:31:03,509 --> 00:31:00,720
earth's environment

781
00:31:06,789 --> 00:31:03,519
nasa and the european space agency will

782
00:31:09,909 --> 00:31:06,799
adhere to three fundamental rules

783
00:31:12,230 --> 00:31:09,919
number one break the chain of contact

784
00:31:14,389 --> 00:31:12,240
with airborne martian dust

785
00:31:17,669 --> 00:31:14,399
seals barriers

786
00:31:19,909 --> 00:31:17,679
microscopic tortuous paths and scour

787
00:31:22,149 --> 00:31:19,919
from solar winds will be used to first

788
00:31:24,470 --> 00:31:22,159

limit and then reduce the number of

789
00:31:27,350 --> 00:31:24,480
particles on the exterior of the sample

790
00:31:30,310 --> 00:31:27,360
return canister number two

791
00:31:32,389 --> 00:31:30,320
robust and redundant containment in the

792
00:31:33,990 --> 00:31:32,399
case of mars sample return

793
00:31:35,190 --> 00:31:34,000
the strategy is

794
00:31:42,389 --> 00:31:35,200
contain

795
00:31:45,750 --> 00:31:42,399
there are three rugged exterior

796
00:31:48,549 --> 00:31:45,760
containers with impact resistant

797
00:31:51,750 --> 00:31:48,559
wrapped around the hermetically sealed

798
00:31:53,350 --> 00:31:51,760
titanium tubes you can see again in this

799
00:31:55,110 --> 00:31:53,360
video

800
00:31:56,549 --> 00:31:55,120
number three

801
00:31:59,590 --> 00:31:56,559
inspect

802
00:32:00,389 --> 00:31:59,600
and remove the layers containment one by

803
00:32:03,509 --> 00:32:00,399
one

804
00:32:04,870 --> 00:32:03,519
inside a specially designed receiving

805
00:32:07,590 --> 00:32:04,880
facility

806
00:32:10,149 --> 00:32:07,600
where nasa and esa and the whole world

807
00:32:12,950 --> 00:32:10,159
can be assured of the highest levels of

808
00:32:15,269 --> 00:32:12,960
biosafety protocols

809
00:32:18,710 --> 00:32:15,279
the decision to to land a sample

810
00:32:20,870 --> 00:32:18,720
container is no sooner than 2031 and

811
00:32:23,750 --> 00:32:20,880
that gives us another decade to continue

812
00:32:26,710 --> 00:32:23,760
planning and learning about mars

813
00:32:29,029 --> 00:32:26,720

at the landing site we'll be joined by

814
00:32:32,070 --> 00:32:29,039
health and environmental agencies to

815
00:32:35,430 --> 00:32:32,080
ensure the highest possible level of

816
00:32:38,630 --> 00:32:35,440
biological safety during that critical

817
00:32:40,549 --> 00:32:38,640
first inspection of the canister

818
00:32:43,110 --> 00:32:40,559
lifting of the canister into a shipping

819
00:32:45,830 --> 00:32:43,120
container and transportation to that

820
00:32:47,990 --> 00:32:45,840
very special receiving facility

821
00:32:49,590 --> 00:32:48,000
scientific experts from many nations

822
00:32:51,990 --> 00:32:49,600
will collaborate on initial

823
00:32:54,710 --> 00:32:52,000
characterization of the samples while

824
00:32:57,190 --> 00:32:54,720
still inside those many layers of

825
00:32:59,830 --> 00:32:57,200
containment using various forms of

826
00:33:01,590 --> 00:32:59,840
penetrating radiation

827
00:33:03,990 --> 00:33:01,600
decisions about whether or not there's

828
00:33:07,190 --> 00:33:04,000
evidence of a biological threat from

829
00:33:08,830 --> 00:33:07,200
mars samples will again be made in an

830
00:33:12,310 --> 00:33:08,840
international

831
00:33:15,110 --> 00:33:12,320
collaboration let me just close this way

832
00:33:16,950 --> 00:33:15,120
this is the right time for this mission

833
00:33:19,190 --> 00:33:16,960
we've learned enough about mars from

834
00:33:20,789 --> 00:33:19,200
prior missions to design a safe

835
00:33:22,870 --> 00:33:20,799
architecture

836
00:33:25,750 --> 00:33:22,880
this is the right mission

837
00:33:28,870 --> 00:33:25,760
500 grams of martian material with

838
00:33:31,669 --> 00:33:28,880

multiple layers of containment is a very

839
00:33:33,750 --> 00:33:31,679
safe strategy and finally

840
00:33:36,310 --> 00:33:33,760
this is the right team

841
00:33:39,269 --> 00:33:36,320
nasa and issa are fully committed to

842
00:33:41,669 --> 00:33:39,279
safety at each step during landing and

843
00:33:44,470 --> 00:33:41,679
transfer to a biologically secured

844
00:33:46,549 --> 00:33:44,480
receiving facility i'll now turn it back

845
00:33:48,549 --> 00:33:46,559
over to xiaori

846
00:33:50,230 --> 00:33:48,559
from jpl

847
00:33:52,470 --> 00:33:50,240
thank you lisa

848
00:33:54,549 --> 00:33:52,480
all right so we have some media on the

849
00:33:56,310 --> 00:33:54,559
phone um and we're also just so that

850
00:33:58,950 --> 00:33:56,320
everyone knows we're taking questions on

851
00:34:00,710 --> 00:33:58,960
social media with the hashtag countdown

852
00:34:03,269 --> 00:34:00,720
to mars so we're going to start with the

853
00:34:07,110 --> 00:34:03,279
media first and we have paul brinkman

854
00:34:09,829 --> 00:34:07,120
from upi on the phone lines go ahead

855
00:34:10,629 --> 00:34:09,839
uh hello yes thanks for taking my call

856
00:34:14,230 --> 00:34:10,639
um

857
00:34:15,589 --> 00:34:14,240
have a lot of confidence in the

858
00:34:17,669 --> 00:34:15,599
technology

859
00:34:20,069 --> 00:34:17,679
uh and the instruments that are that are

860
00:34:21,270 --> 00:34:20,079
going up to identify rock samples i'd

861
00:34:22,950 --> 00:34:21,280
just like to hear a little bit more

862
00:34:25,190 --> 00:34:22,960
about what kind of challenges or

863
00:34:30,310 --> 00:34:25,200

difficulties you expect in identifying

864
00:34:34,869 --> 00:34:33,109
let's uh i think for the difficulties we

865
00:34:42,950 --> 00:34:34,879
might face and the challenges we face

866
00:34:46,389 --> 00:34:44,550
well there are two different kinds of

867
00:34:48,869 --> 00:34:46,399
difficulties that we'll encounter those

868
00:34:50,629 --> 00:34:48,879
are going to be difficulties uh

869
00:34:53,349 --> 00:34:50,639
acquiring the samples which from an

870
00:34:55,750 --> 00:34:53,359
engineering standpoint which can be

871
00:34:57,750 --> 00:34:55,760
range from you know whether the rock is

872
00:35:00,390 --> 00:34:57,760
accessible whether it is within the

873
00:35:01,990 --> 00:35:00,400
capabilities of our coring drill

874
00:35:04,310 --> 00:35:02,000
but i think that a lot of the

875
00:35:05,510 --> 00:35:04,320
difficulties that the

876
00:35:07,270 --> 00:35:05,520
um

877
00:35:09,030 --> 00:35:07,280
that were referred to in this question

878
00:35:10,950 --> 00:35:09,040
are actually maybe the scientific

879
00:35:12,790 --> 00:35:10,960
difficulties of figuring out which rocks

880
00:35:14,230 --> 00:35:12,800
are the right rocks to collect and so i

881
00:35:16,390 --> 00:35:14,240
think that maybe we should also toss

882
00:35:25,030 --> 00:35:16,400
this over to chris so that he can give

883
00:35:29,190 --> 00:35:28,069
absolutely i can uh i can speak to that

884
00:35:36,790 --> 00:35:29,200
the

885
00:35:38,390 --> 00:35:36,800
jezreel crater to come up with a uh a

886
00:35:41,109 --> 00:35:38,400
sort of a nominal traverse that we're

887
00:35:42,950 --> 00:35:41,119
going to take and really pin down those

888
00:35:45,270 --> 00:35:42,960

locations that we're really especially

889
00:35:47,109 --> 00:35:45,280
interested in so we'll have a general

890
00:35:49,589 --> 00:35:47,119
plan of course we're ready to sort of

891
00:35:51,349 --> 00:35:49,599
deviate from that plan if necessary

892
00:35:53,510 --> 00:35:51,359
depending on what exciting discoveries

893
00:35:56,870 --> 00:35:53,520
we we make but the idea is to actually

894
00:35:59,430 --> 00:35:56,880
have a series of locations that we want

895
00:36:01,829 --> 00:35:59,440
to get to and of course potentially

896
00:36:04,310 --> 00:36:01,839
sample as well but explore

897
00:36:06,470 --> 00:36:04,320
prior to prior to landing the actual

898
00:36:08,310 --> 00:36:06,480
decision whether to sample is going to

899
00:36:09,910 --> 00:36:08,320
be i think a fascinating one when

900
00:36:11,990 --> 00:36:09,920
involving the entire science team not

901
00:36:13,910 --> 00:36:12,000
just the 15 return simple scientists but

902
00:36:16,230 --> 00:36:13,920
the over 300 scientists involved in the

903
00:36:17,670 --> 00:36:16,240
mission uh it'll be a question of

904
00:36:19,670 --> 00:36:17,680
exactly why we want to collect that

905
00:36:21,430 --> 00:36:19,680
sample and then not another one and to

906
00:36:24,310 --> 00:36:21,440
make sure that we have all that context

907
00:36:26,150 --> 00:36:24,320
that i mentioned before

908
00:36:30,310 --> 00:36:26,160
great okay we have another media

909
00:36:33,109 --> 00:36:30,320
question ivan quran from afp

910
00:36:36,230 --> 00:36:33,119
thank you very much do you expect that

911
00:36:38,870 --> 00:36:36,240
the science team uh will maybe be able

912
00:36:41,430 --> 00:36:38,880
to say that there was life on mars based

913
00:36:44,390 --> 00:36:41,440

only on the on the instruments on board

914
00:36:46,950 --> 00:36:44,400
or is it very likely that we will have

915
00:36:48,710 --> 00:36:46,960
to wait for the returns of the sample

916
00:36:52,230 --> 00:36:48,720
and uh can you confirm that that should

917
00:36:57,349 --> 00:36:55,349
take this one

918
00:36:58,950 --> 00:36:57,359
i'm not sure i 100 understood the

919
00:37:01,910 --> 00:36:58,960
question do you mind uh quickly just

920
00:37:04,310 --> 00:37:01,920
repeating it to me jerry yeah i'm sorry

921
00:37:05,420 --> 00:37:04,320
will we have to wait for the return of

922
00:37:06,550 --> 00:37:05,430
the samples to

923
00:37:08,790 --> 00:37:06,560
[Music]

924
00:37:10,069 --> 00:37:08,800
be able to say that there was life on

925
00:37:11,750 --> 00:37:10,079
mars or

926
00:37:13,190 --> 00:37:11,760
you know does perseverance have the

927
00:37:14,710 --> 00:37:13,200
capacity

928
00:37:16,069 --> 00:37:14,720
to thank you to

929
00:37:18,630 --> 00:37:16,079
to see it

930
00:37:21,349 --> 00:37:18,640
so i'm interested in chris's opinion but

931
00:37:22,870 --> 00:37:21,359
uh my personal feeling is that uh even

932
00:37:25,109 --> 00:37:22,880
though there will be

933
00:37:26,710 --> 00:37:25,119
in the case that uh it's really starting

934
00:37:28,310 --> 00:37:26,720
to move in that direction supporting

935
00:37:29,990 --> 00:37:28,320
evidence that's coming from remote

936
00:37:32,390 --> 00:37:30,000
sensing observations and some of these

937
00:37:34,230 --> 00:37:32,400
sophisticated instruments i do believe

938
00:37:36,790 --> 00:37:34,240

that the ultimate proof

939
00:37:38,550 --> 00:37:36,800
uh and the ultimate analyses that are

940
00:37:40,470 --> 00:37:38,560
really critical to that question at the

941
00:37:43,030 --> 00:37:40,480
level of standard that we need to answer

942
00:37:45,670 --> 00:37:43,040
this will come from laboratory analysis

943
00:37:47,750 --> 00:37:45,680
on earth so i believe this this will be

944
00:37:50,870 --> 00:37:47,760
a process that will extend over 10 years

945
00:37:52,790 --> 00:37:50,880
or so that where evidence is mounting

946
00:37:55,589 --> 00:37:52,800
from uh remote sensing and in-situ

947
00:37:58,069 --> 00:37:55,599
measurements up there uh but then uh

948
00:38:00,230 --> 00:37:58,079
really culminating in in uh really uh

949
00:38:02,069 --> 00:38:00,240
bringing these samples back and actually

950
00:38:03,829 --> 00:38:02,079
if you want unwrapped depressants once

951
00:38:05,030 --> 00:38:03,839
they're really back from a long long

952
00:38:07,030 --> 00:38:05,040
trip but uh

953
00:38:08,950 --> 00:38:07,040
chris uh anything you want to add to

954
00:38:11,750 --> 00:38:08,960
this

955
00:38:14,310 --> 00:38:11,760
i i agree completely absolutely i think

956
00:38:16,950 --> 00:38:14,320
that that as capable as a rover is that

957
00:38:18,069 --> 00:38:16,960
we'll have it really ideally if

958
00:38:20,390 --> 00:38:18,079
everything goes well we'll have really

959
00:38:22,710 --> 00:38:20,400
intriguing evidence potentially for in

960
00:38:25,030 --> 00:38:22,720
the form of organic molecules detected

961
00:38:27,190 --> 00:38:25,040
or or even certain structures in the

962
00:38:28,870 --> 00:38:27,200
rock that could be indicative that life

963
00:38:30,470 --> 00:38:28,880

was there but to have that definitive

964
00:38:32,630 --> 00:38:30,480
proof we need to bring those samples

965
00:38:35,510 --> 00:38:32,640
back and see them in the lab and look at

966
00:38:37,990 --> 00:38:35,520
essentially the the the not only the the

967
00:38:39,589 --> 00:38:38,000
biosignatures in broad sense not only

968
00:38:41,670 --> 00:38:39,599
the uh you know whether there's any

969
00:38:43,589 --> 00:38:41,680
fossil bacteria which is pretty unlikely

970
00:38:45,750 --> 00:38:43,599
but whether there's any sort of chemical

971
00:38:47,430 --> 00:38:45,760
signature organic chemical signature

972
00:38:49,510 --> 00:38:47,440
that would truly indicate

973
00:38:56,310 --> 00:38:49,520
that life was there

974
00:38:59,910 --> 00:38:58,630
i think uh dr zabukin can comment on

975
00:39:01,829 --> 00:38:59,920
that but i think the current plans are

976
00:39:03,990 --> 00:39:01,839
for the samples to come back no earlier

977
00:39:07,190 --> 00:39:04,000
than 2031 yeah

978
00:39:08,150 --> 00:39:07,200
yeah that's correct thank you yeah

979
00:39:10,390 --> 00:39:08,160
hey

980
00:39:11,750 --> 00:39:10,400
next question is from marcia dunn of the

981
00:39:13,670 --> 00:39:11,760
ap

982
00:39:16,790 --> 00:39:13,680
yes hi i just wanted to review the

983
00:39:18,870 --> 00:39:16,800
timeline for the sample returns um it's

984
00:39:21,510 --> 00:39:18,880
not clear to me whether the mars ascent

985
00:39:24,550 --> 00:39:21,520
vehicle launches with the fetch rover or

986
00:39:28,390 --> 00:39:24,560
does it launch separately and if so when

987
00:39:30,870 --> 00:39:28,400
and what is the um

988
00:39:34,470 --> 00:39:30,880

prospective launch date for the return

989
00:39:38,710 --> 00:39:36,390
dave did you want to take this and just

990
00:39:41,270 --> 00:39:38,720
talk about the details on timing i could

991
00:39:42,550 --> 00:39:41,280
do it too but go ahead

992
00:39:46,550 --> 00:39:42,560
yeah sure

993
00:39:48,390 --> 00:39:46,560
thank you um yes so the uh intention is

994
00:39:50,310 --> 00:39:48,400
well the first thing to say is going to

995
00:39:52,470 --> 00:39:50,320
mars is challenging and particularly

996
00:39:55,510 --> 00:39:52,480
during this mission is challenging

997
00:39:57,430 --> 00:39:55,520
uh you'll only launch every 26 months

998
00:39:59,990 --> 00:39:57,440
and one of the things you want to avoid

999
00:40:01,510 --> 00:40:00,000
doing is arriving at mars in the middle

1000
00:40:03,109 --> 00:40:01,520
of winter because in the middle of

1001
00:40:05,030 --> 00:40:03,119
winter you can have

1002
00:40:06,630 --> 00:40:05,040
huge quantities of dust thrown up into

1003
00:40:08,870 --> 00:40:06,640
the atmosphere

1004
00:40:11,990 --> 00:40:08,880
which can really disrupt operations and

1005
00:40:14,470 --> 00:40:12,000
making a safe landing so the trick is we

1006
00:40:16,550 --> 00:40:14,480
want to arrive with the

1007
00:40:17,910 --> 00:40:16,560
sample retrieve lander carrying the

1008
00:40:20,309 --> 00:40:17,920
fetch rover

1009
00:40:22,630 --> 00:40:20,319
at the beginning of spring and have all

1010
00:40:25,030 --> 00:40:22,640
of spring and summer on mars to do our

1011
00:40:27,670 --> 00:40:25,040
work and then get back off before the

1012
00:40:29,589 --> 00:40:27,680
next winter season arrives

1013
00:40:33,670 --> 00:40:29,599

so the way it works out

1014
00:40:37,030 --> 00:40:33,680
is that if we uh launch in latter part

1015
00:40:39,109 --> 00:40:37,040
of 2026 with both of the nasa mission

1016
00:40:42,230 --> 00:40:39,119
and the esa spacecraft

1017
00:40:44,470 --> 00:40:42,240
we end up doing most of the on surface

1018
00:40:47,910 --> 00:40:44,480
operations during the latter half of

1019
00:40:49,910 --> 00:40:47,920
2028 and the beginning of 2029 and that

1020
00:40:52,150 --> 00:40:49,920
may sound like a big gap

1021
00:40:54,870 --> 00:40:52,160
it's because we will take a route to

1022
00:40:57,670 --> 00:40:54,880
mars for both of the the launches that

1023
00:41:00,069 --> 00:40:57,680
is not the usual short traverse but is

1024
00:41:01,589 --> 00:41:00,079
actually a bit longer than normal that's

1025
00:41:03,829 --> 00:41:01,599
both to make it

1026
00:41:07,190 --> 00:41:03,839
very efficient but also to ensure that

1027
00:41:09,829 --> 00:41:07,200
we arrive at the right time in fact our

1028
00:41:11,910 --> 00:41:09,839
orbiter the earth return orbiter arrived

1029
00:41:13,670 --> 00:41:11,920
takes about a year to get get into

1030
00:41:15,109 --> 00:41:13,680
initial mars orbit

1031
00:41:17,750 --> 00:41:15,119
and then we'll use that electric

1032
00:41:19,589 --> 00:41:17,760
propulsion system i mentioned to spiral

1033
00:41:22,309 --> 00:41:19,599
its way down to a very

1034
00:41:24,470 --> 00:41:22,319
relatively low mars orbit

1035
00:41:26,790 --> 00:41:24,480
uh where it can oversee operations and

1036
00:41:29,510 --> 00:41:26,800
be ready then to rendezvous with the

1037
00:41:30,390 --> 00:41:29,520
mars ascent vehicle towards the end of

1038
00:41:31,510 --> 00:41:30,400

the

1039
00:41:34,390 --> 00:41:31,520
autumn

1040
00:41:36,710 --> 00:41:34,400
which in our years is early 2029

1041
00:41:38,710 --> 00:41:36,720
and then again it takes about two years

1042
00:41:41,670 --> 00:41:38,720
to get home again because we have to

1043
00:41:43,910 --> 00:41:41,680
spiral out of mars orbit and then make

1044
00:41:47,270 --> 00:41:43,920
the return trip long answer but i hope

1045
00:41:49,190 --> 00:41:47,280
that gives you what you want

1046
00:41:54,309 --> 00:41:49,200
okay jeff did you have anything else to

1047
00:41:57,430 --> 00:41:55,510
no if

1048
00:42:00,230 --> 00:41:57,440
just to follow on over david said yes if

1049
00:42:03,030 --> 00:42:00,240
we launch uh if if we launch as early as

1050
00:42:05,510 --> 00:42:03,040
2026 then uh for the reasons to avoid

1051
00:42:07,990 --> 00:42:05,520
the dust storms during winter

1052
00:42:09,910 --> 00:42:08,000
and to gain the efficiencies in both

1053
00:42:14,470 --> 00:42:09,920
getting there and returning the earliest

1054
00:42:18,150 --> 00:42:16,630
we're going to go to social media now so

1055
00:42:20,230 --> 00:42:18,160
since we started talking about dust

1056
00:42:22,950 --> 00:42:20,240
storms i'm going to hit that question

1057
00:42:25,030 --> 00:42:22,960
singh on twitter asks perseverance will

1058
00:42:27,990 --> 00:42:25,040
leave samples in test tubes will they

1059
00:42:29,910 --> 00:42:28,000
not be lost in the storms of mars so i'm

1060
00:42:35,589 --> 00:42:29,920
going to ask julie how do you guys keep

1061
00:42:39,750 --> 00:42:38,230
well over our experience on the surface

1062
00:42:41,109 --> 00:42:39,760
of mars the past

1063
00:42:42,710 --> 00:42:41,119

many years that we've been traveling

1064
00:42:45,270 --> 00:42:42,720
there with our rovers we've developed

1065
00:42:47,589 --> 00:42:45,280
good mapping capabilities and so we will

1066
00:42:50,710 --> 00:42:47,599
be localizing the location of each of

1067
00:42:51,589 --> 00:42:50,720
the samples that we drop to within a

1068
00:42:53,750 --> 00:42:51,599
couple

1069
00:42:56,069 --> 00:42:53,760
dozen centimeters

1070
00:42:57,589 --> 00:42:56,079
relative to the orbital map and so we

1071
00:43:00,950 --> 00:42:57,599
will know exactly where these things are

1072
00:43:01,910 --> 00:43:00,960
they'll be mapped relative to local

1073
00:43:05,990 --> 00:43:01,920
features

1074
00:43:08,550 --> 00:43:06,000
buried in a dust storm and they'll be

1075
00:43:13,190 --> 00:43:08,560
mapped relative to the orbital features

1076
00:43:19,030 --> 00:43:15,589
okay thank you julie okay so then we

1077
00:43:21,510 --> 00:43:19,040
have another question from de juan du on

1078
00:43:24,550 --> 00:43:21,520
facebook he asks how does the mission

1079
00:43:26,150 --> 00:43:24,560
team decide and prioritize which sample

1080
00:43:27,109 --> 00:43:26,160
to collect so chris you were talking

1081
00:43:29,109 --> 00:43:27,119
about how this is going to be a

1082
00:43:31,190 --> 00:43:29,119
difficult process but do you guys have

1083
00:43:33,030 --> 00:43:31,200
any initial thoughts as to which samples

1084
00:43:34,390 --> 00:43:33,040
you're most excited about or what kinds

1085
00:43:36,710 --> 00:43:34,400
of rocks you think you might get at

1086
00:43:38,550 --> 00:43:36,720
jezero

1087
00:43:41,190 --> 00:43:38,560
oh absolutely i think the the key

1088
00:43:42,630 --> 00:43:41,200

question here is is what what we can do

1089
00:43:45,349 --> 00:43:42,640
with the rover to

1090
00:43:47,589 --> 00:43:45,359
identify those environments or the rocks

1091
00:43:49,990 --> 00:43:47,599
that record the ancient environment that

1092
00:43:52,630 --> 00:43:50,000
was potentially habitable by life so

1093
00:43:54,870 --> 00:43:52,640
those will be prioritized absolutely

1094
00:43:56,870 --> 00:43:54,880
that involves exploring you know these

1095
00:43:57,750 --> 00:43:56,880
are these previously identified sort of

1096
00:43:59,750 --> 00:43:57,760
uh

1097
00:44:02,550 --> 00:43:59,760
regions of interest or locations that we

1098
00:44:03,910 --> 00:44:02,560
want to focus our attention on um and

1099
00:44:05,990 --> 00:44:03,920
then

1100
00:44:07,829 --> 00:44:06,000
with that we are already establishing a

1101
00:44:09,270 --> 00:44:07,839
whole series of scientific questions

1102
00:44:10,870 --> 00:44:09,280
that can be answered

1103
00:44:13,109 --> 00:44:10,880
by the the samples and the

1104
00:44:15,829 --> 00:44:13,119
investigations that we do so if we come

1105
00:44:17,829 --> 00:44:15,839
across a particular sample type we know

1106
00:44:20,309 --> 00:44:17,839
we want a particular type of sample like

1107
00:44:22,470 --> 00:44:20,319
that we come across that sample and

1108
00:44:24,710 --> 00:44:22,480
we're almost certainly going to

1109
00:44:26,230 --> 00:44:24,720
to sample it within the constraints of

1110
00:44:27,430 --> 00:44:26,240
the engineering of course so we're going

1111
00:44:29,589 --> 00:44:27,440
to uh

1112
00:44:32,150 --> 00:44:29,599
really uh we already will already have

1113
00:44:35,829 --> 00:44:32,160

an idea of kind of a wish list if you

1114
00:44:37,430 --> 00:44:35,839
will of samples before we get there

1115
00:44:38,710 --> 00:44:37,440
okay great

1116
00:44:40,150 --> 00:44:38,720
it's always good to know what you're

1117
00:44:41,829 --> 00:44:40,160
looking for

1118
00:44:44,150 --> 00:44:41,839
all right we're going to go back to the

1119
00:44:47,829 --> 00:44:44,160
phone lines with media questions irene

1120
00:44:50,790 --> 00:44:47,839
klotz of aviation week go ahead

1121
00:44:54,470 --> 00:44:50,800
thanks uh my questions for dr parker

1122
00:44:55,589 --> 00:44:54,480
what is the esa monetary contribution

1123
00:44:59,510 --> 00:44:55,599
for the

1124
00:45:04,390 --> 00:45:02,790
sure uh happy to answer that so the uh

1125
00:45:06,710 --> 00:45:04,400
milestone return was one of the main

1126
00:45:08,790 --> 00:45:06,720
elements that we put to ministers at the

1127
00:45:11,829 --> 00:45:08,800
conference at the end of last year

1128
00:45:14,150 --> 00:45:11,839
and uh what we requested was the first

1129
00:45:15,430 --> 00:45:14,160
uh roughly third of the funding for my

1130
00:45:17,670 --> 00:45:15,440
sample return

1131
00:45:20,630 --> 00:45:17,680
and the overall budget over the whole

1132
00:45:23,990 --> 00:45:20,640
decay dissolved the order of 1.5 billion

1133
00:45:26,550 --> 00:45:24,000
euros and we secured basically the first

1134
00:45:29,829 --> 00:45:26,560
third of that at the ministerial last

1135
00:45:32,790 --> 00:45:29,839
year in seville in 2019 and the next

1136
00:45:36,069 --> 00:45:32,800
part will be required at the ministerial

1137
00:45:38,790 --> 00:45:36,079
at the end of 2022.

1138
00:45:45,270 --> 00:45:41,030

thanks dave okay next question comes

1139
00:45:48,550 --> 00:45:47,109
thank you all um

1140
00:45:50,630 --> 00:45:48,560
just a quick question about the sample

1141
00:45:52,710 --> 00:45:50,640
receiving facility what what's the

1142
00:45:54,710 --> 00:45:52,720
timeline do you reckon for the selection

1143
00:45:56,550 --> 00:45:54,720
of that site and sort of how will it be

1144
00:45:59,190 --> 00:45:56,560
chosen it seems like there will be a lot

1145
00:46:01,109 --> 00:45:59,200
of likely sort of factors going into it

1146
00:46:04,069 --> 00:46:01,119
and what what will it resemble will it

1147
00:46:06,470 --> 00:46:04,079
resemble like a cdc facility that that

1148
00:46:08,230 --> 00:46:06,480
sort of works on ebola what are what are

1149
00:46:09,750 --> 00:46:08,240
the the sort of criteria that will go

1150
00:46:12,710 --> 00:46:09,760
into the selection let's what's the

1151
00:46:17,030 --> 00:46:12,720
timeline for the selection of that site

1152
00:46:21,670 --> 00:46:19,430
it's uh it's a very good question it's a

1153
00:46:24,230 --> 00:46:21,680
question on everybody's mind now that

1154
00:46:26,550 --> 00:46:24,240
we've committed to the architecture

1155
00:46:29,109 --> 00:46:26,560
and we have the funding from uh from

1156
00:46:32,069 --> 00:46:29,119
both the u.s and european side we need

1157
00:46:33,990 --> 00:46:32,079
to start to make plans uh to get ready

1158
00:46:37,270 --> 00:46:34,000
for that receiving facility it's a long

1159
00:46:39,829 --> 00:46:37,280
process because it will require

1160
00:46:41,510 --> 00:46:39,839
the nepa uh the nepa process in the

1161
00:46:43,430 --> 00:46:41,520
united states and that starts with an

1162
00:46:46,870 --> 00:46:43,440
environmental impact statement and it

1163
00:46:48,470 --> 00:46:46,880

will involve many agencies in fact just

1164
00:46:51,349 --> 00:46:48,480
in the last few weeks an

1165
00:46:53,190 --> 00:46:51,359
inter-governmental working group was

1166
00:46:55,990 --> 00:46:53,200
established to start thinking about a

1167
00:46:58,150 --> 00:46:56,000
national policy for planetary protection

1168
00:47:00,710 --> 00:46:58,160
and clearly the receiving facility is a

1169
00:47:03,030 --> 00:47:00,720
big part of that so i think you'll see

1170
00:47:05,349 --> 00:47:03,040
over the next couple of years

1171
00:47:08,309 --> 00:47:05,359
we'll we'll continue to study what the

1172
00:47:10,309 --> 00:47:08,319
options are for

1173
00:47:12,950 --> 00:47:10,319
essentially rehabbing an existing

1174
00:47:16,390 --> 00:47:12,960
facility uh building a new facility i

1175
00:47:18,630 --> 00:47:16,400
think that's unlikely or using a more a

1176
00:47:21,270 --> 00:47:18,640
more contemporary modular structure

1177
00:47:23,349 --> 00:47:21,280
which is uh uh used in many cases

1178
00:47:25,829 --> 00:47:23,359
particularly uh for particularly

1179
00:47:28,790 --> 00:47:25,839
hazardous material and yes

1180
00:47:29,990 --> 00:47:28,800
we sometimes refer to this as a bsl4

1181
00:47:32,870 --> 00:47:30,000
plus

1182
00:47:34,950 --> 00:47:32,880
so something where we will certainly

1183
00:47:38,150 --> 00:47:34,960
learn from how we handle the most

1184
00:47:40,309 --> 00:47:38,160
dangerous contagious pathogens on earth

1185
00:47:43,829 --> 00:47:40,319
not that we really think there will be

1186
00:47:46,309 --> 00:47:43,839
anything um pathogenic or or

1187
00:47:48,549 --> 00:47:46,319
highly dangerous from mars but we're

1188
00:47:50,630 --> 00:47:48,559

we're going to be extremely cautious

1189
00:47:52,630 --> 00:47:50,640
and and as i said

1190
00:47:55,349 --> 00:47:52,640
that process that process is just

1191
00:47:57,750 --> 00:47:55,359
getting started um it it'll be several

1192
00:48:00,630 --> 00:47:57,760
years while we will we work on the

1193
00:48:02,230 --> 00:48:00,640
design work on site selection clear the

1194
00:48:03,270 --> 00:48:02,240
nepa hurdles

1195
00:48:06,150 --> 00:48:03,280
and then

1196
00:48:08,309 --> 00:48:06,160
then we'll be certainly ready to go a

1197
00:48:09,670 --> 00:48:08,319
decade from now which as we've all been

1198
00:48:13,270 --> 00:48:09,680
pointing out

1199
00:48:15,750 --> 00:48:13,280
2031 is the soonest that these samples

1200
00:48:17,109 --> 00:48:15,760
can be returned to earth and i think

1201
00:48:21,190 --> 00:48:17,119
we'll be

1202
00:48:23,990 --> 00:48:21,200
ready and waiting and so so eager to get

1203
00:48:27,030 --> 00:48:24,000
that canister uh back on the ground here

1204
00:48:28,549 --> 00:48:27,040
so that the scientists can begin to

1205
00:48:30,630 --> 00:48:28,559
address uh

1206
00:48:32,309 --> 00:48:30,640
address the exciting process of for the

1207
00:48:34,630 --> 00:48:32,319
first time ever

1208
00:48:38,470 --> 00:48:34,640
being able to examine materials that

1209
00:48:41,510 --> 00:48:38,480
were scientifically selected um on mars

1210
00:48:44,549 --> 00:48:41,520
and not just uh the the random gift of

1211
00:48:49,990 --> 00:48:47,270
thanks lisa okay we're gonna go to jeff

1212
00:48:52,870 --> 00:48:50,000
faust of space news

1213
00:48:53,829 --> 00:48:52,880

it's a question for thomas or maybe for

1214
00:48:55,750 --> 00:48:53,839
jeff

1215
00:48:57,510 --> 00:48:55,760
now that we've heard from issa about

1216
00:48:58,950 --> 00:48:57,520
their contracting plans and budget can

1217
00:49:00,870 --> 00:48:58,960
you give us at least sort of a rough

1218
00:49:02,309 --> 00:49:00,880
order of magnitude cost

1219
00:49:05,190 --> 00:49:02,319
for the remainder of nasa's

1220
00:49:07,270 --> 00:49:05,200
contributions to mars sample return and

1221
00:49:10,069 --> 00:49:07,280
when will the uh contracting start to

1222
00:49:12,950 --> 00:49:10,079
take place for the uh the lander mission

1223
00:49:15,670 --> 00:49:12,960
in 2026 thanks

1224
00:49:16,390 --> 00:49:15,680
thanks jeff thomas here

1225
00:49:18,390 --> 00:49:16,400
the

1226
00:49:20,470 --> 00:49:18,400
uh budget that we

1227
00:49:22,710 --> 00:49:20,480
submitted to congress and that is

1228
00:49:24,870 --> 00:49:22,720
currently under consideration has of

1229
00:49:26,790 --> 00:49:24,880
course an estimate i just want to remind

1230
00:49:28,549 --> 00:49:26,800
everybody that this is an estimate that

1231
00:49:30,710 --> 00:49:28,559
is the first gas

1232
00:49:32,950 --> 00:49:30,720
and that first gas is kind of off of the

1233
00:49:35,349 --> 00:49:32,960
order uh three billion dollars two and a

1234
00:49:38,069 --> 00:49:35,359
half uh to three billion dollars and

1235
00:49:40,950 --> 00:49:38,079
that does not include yet uh all the

1236
00:49:42,950 --> 00:49:40,960
uh kind of sophisticated equipment that

1237
00:49:44,470 --> 00:49:42,960
will be part of that receiving facility

1238
00:49:47,430 --> 00:49:44,480

as well as the analysis

1239
00:49:49,910 --> 00:49:47,440
methodologies that be around that and so

1240
00:49:52,230 --> 00:49:49,920
so uh i remind everybody of course that

1241
00:49:53,829 --> 00:49:52,240
the way we're assessing the costs for

1242
00:49:55,270 --> 00:49:53,839
these things is to actually go through a

1243
00:49:58,790 --> 00:49:55,280
rigorous set of

1244
00:50:01,990 --> 00:49:58,800
uh analysis and uh

1245
00:50:04,069 --> 00:50:02,000
design cycles and uh will culminate with

1246
00:50:06,790 --> 00:50:04,079
uh what we call in the u.s as a

1247
00:50:09,109 --> 00:50:06,800
confirmation or key decision point c at

1248
00:50:11,910 --> 00:50:09,119
which point uh the cost will be given

1249
00:50:14,069 --> 00:50:11,920
but where we are right now is uh two and

1250
00:50:15,990 --> 00:50:14,079
a half to three billion dollars uh

1251
00:50:18,950 --> 00:50:16,000
without uh these uh

1252
00:50:20,630 --> 00:50:18,960
uh these uh ground uh uh equipments

1253
00:50:23,910 --> 00:50:20,640
needless to say by the way

1254
00:50:25,829 --> 00:50:23,920
uh that that uh or that facility that

1255
00:50:28,390 --> 00:50:25,839
lisa's talking about this very much a

1256
00:50:30,870 --> 00:50:28,400
facility that we want uh the community

1257
00:50:33,109 --> 00:50:30,880
internationally involved and it uh

1258
00:50:36,950 --> 00:50:33,119
we welcome and we're really excited

1259
00:50:40,710 --> 00:50:36,960
about uh really that facility be uh

1260
00:50:43,030 --> 00:50:40,720
to be a kind of a meeting point of uh

1261
00:50:45,190 --> 00:50:43,040
international science community uh of

1262
00:50:47,510 --> 00:50:45,200
the united states of europe and beyond

1263
00:50:49,750 --> 00:50:47,520

and i really believe that uh that that

1264
00:50:51,829 --> 00:50:49,760
will be one of those uh

1265
00:50:53,349 --> 00:50:51,839
places that uh you know a lot of the

1266
00:50:55,109 --> 00:50:53,359
innovation will come from and a lot of

1267
00:50:57,910 --> 00:50:55,119
the signs will come from

1268
00:50:59,510 --> 00:50:57,920
so i hope that answered a question jeff

1269
00:51:00,950 --> 00:50:59,520
thanks

1270
00:51:04,069 --> 00:51:00,960
okay we're going to go back to social

1271
00:51:06,069 --> 00:51:04,079
media so siobhan on facebook asks how

1272
00:51:08,230 --> 00:51:06,079
did you propose the mission and who came

1273
00:51:10,069 --> 00:51:08,240
up with the ideas so i think maybe

1274
00:51:13,510 --> 00:51:10,079
thomas do you know the the conception of

1275
00:51:15,670 --> 00:51:13,520
this whole mars sample return campaign

1276
00:51:17,030 --> 00:51:15,680
it's a really interesting to uh think

1277
00:51:18,710 --> 00:51:17,040
about this so first of all the more

1278
00:51:20,549 --> 00:51:18,720
sample return that we're doing is not

1279
00:51:21,670 --> 00:51:20,559
the first one

1280
00:51:23,349 --> 00:51:21,680
the first

1281
00:51:26,150 --> 00:51:23,359
single mission that was designed to do

1282
00:51:28,230 --> 00:51:26,160
that this is perhaps the third or fourth

1283
00:51:30,150 --> 00:51:28,240
iteration that good teams uh really

1284
00:51:31,990 --> 00:51:30,160
great teams over time have tried to do

1285
00:51:33,589 --> 00:51:32,000
that this is the right time because

1286
00:51:37,670 --> 00:51:33,599
we're ready and we have

1287
00:51:40,309 --> 00:51:37,680
in fact uh perseverance there uh what

1288
00:51:42,630 --> 00:51:40,319

really uh mattered and what's just as

1289
00:51:45,430 --> 00:51:42,640
important as uh two things first of all

1290
00:51:48,230 --> 00:51:45,440
uh we got uh from the national academies

1291
00:51:50,150 --> 00:51:48,240
in the united states uh uh if you want

1292
00:51:52,950 --> 00:51:50,160
uh

1293
00:51:54,870 --> 00:51:52,960
rating of this important mission that is

1294
00:51:56,470 --> 00:51:54,880
actually was rated by them as the most

1295
00:51:59,349 --> 00:51:56,480
important in that

1296
00:52:01,670 --> 00:51:59,359
in that cost bracket and so that

1297
00:52:04,309 --> 00:52:01,680
basically means for us we need to invest

1298
00:52:06,630 --> 00:52:04,319
our time and our efforts towards that

1299
00:52:09,670 --> 00:52:06,640
the second thing is uh this system

1300
00:52:12,549 --> 00:52:09,680
engineering team at jpl you know the the

1301
00:52:15,109 --> 00:52:12,559
team that i would argue has brought us

1302
00:52:17,750 --> 00:52:15,119
actually curiosity has brought us

1303
00:52:19,990 --> 00:52:17,760
perseverance is a team you know and of

1304
00:52:22,549 --> 00:52:20,000
course uh strengthened now with uh

1305
00:52:24,870 --> 00:52:22,559
systems engineers from all over uh

1306
00:52:26,309 --> 00:52:24,880
europe as well you know and other

1307
00:52:28,630 --> 00:52:26,319
centers that are coming together and

1308
00:52:31,349 --> 00:52:28,640
bringing everything to bear that we have

1309
00:52:34,069 --> 00:52:31,359
nasa centers and industrial partners are

1310
00:52:36,230 --> 00:52:34,079
coming together and really the first uh

1311
00:52:38,790 --> 00:52:36,240
you know iteration that you see here as

1312
00:52:41,589 --> 00:52:38,800
an end-to-end system is what we

1313
00:52:43,589 --> 00:52:41,599

discussed uh both dave and i and

1314
00:52:45,670 --> 00:52:43,599
actually jeff talked about it too i make

1315
00:52:48,710 --> 00:52:45,680
no mistake this is

1316
00:52:50,390 --> 00:52:48,720
if history is a teacher not the final

1317
00:52:52,230 --> 00:52:50,400
kind of version of this we're going to

1318
00:52:53,349 --> 00:52:52,240
learn a lot as we go forward which is

1319
00:52:55,510 --> 00:52:53,359
precisely

1320
00:52:58,150 --> 00:52:55,520
why i gave the answer to jeff the way i

1321
00:53:00,069 --> 00:52:58,160
did so yes it is at the academies that

1322
00:53:02,630 --> 00:53:00,079
prioritized it the system engineering

1323
00:53:05,670 --> 00:53:02,640
teams at jpl that did all this but make

1324
00:53:07,589 --> 00:53:05,680
no mistake that design keeps on going

1325
00:53:08,710 --> 00:53:07,599
and uh and we're going to learn a lot in

1326
00:53:10,870 --> 00:53:08,720
the next

1327
00:53:13,030 --> 00:53:10,880
few uh months and years i don't know

1328
00:53:17,910 --> 00:53:13,040
jeff is there anything you wanted to add

1329
00:53:22,069 --> 00:53:20,309
certainly we're we're in the early

1330
00:53:23,829 --> 00:53:22,079
design phases we're approaching our

1331
00:53:25,670 --> 00:53:23,839
first lifecycle review in the nasa

1332
00:53:27,589 --> 00:53:25,680
process which is a mission concept

1333
00:53:29,910 --> 00:53:27,599
review that's going to happen this fall

1334
00:53:32,549 --> 00:53:29,920
so we're we're on our way we're refining

1335
00:53:35,270 --> 00:53:32,559
the design and and i think we're we're

1336
00:53:38,230 --> 00:53:35,280
working closely with the david and the

1337
00:53:40,069 --> 00:53:38,240
european partners to refine it and we're

1338
00:53:42,230 --> 00:53:40,079

looking forward to

1339
00:53:45,430 --> 00:53:42,240
hitting this and and having a design

1340
00:53:47,510 --> 00:53:45,440
that gets us to getting samples and as

1341
00:53:49,109 --> 00:53:47,520
soon as 31 so

1342
00:53:49,910 --> 00:53:49,119
i think we're on our on our path and we

1343
00:53:52,150 --> 00:53:49,920
have

1344
00:53:55,109 --> 00:53:52,160
a great team as as thomas described

1345
00:53:58,549 --> 00:53:55,119
we've got the right team

1346
00:54:01,030 --> 00:53:58,559
all right uh himanshu on facebook asks

1347
00:54:03,430 --> 00:54:01,040
are you sure you will be able to analyze

1348
00:54:06,150 --> 00:54:03,440
a huge planet almost half the size of

1349
00:54:11,349 --> 00:54:06,160
earth with only 40 samples

1350
00:54:15,270 --> 00:54:13,270
that's a great question i think one of

1351
00:54:18,309 --> 00:54:15,280
the key things about the landing site at

1352
00:54:20,790 --> 00:54:18,319
jezreel crater is that it it the rocks

1353
00:54:23,109 --> 00:54:20,800
there as far as we can tell from orbit

1354
00:54:25,109 --> 00:54:23,119
from the context that we know

1355
00:54:26,870 --> 00:54:25,119
are from a key time frame in mars

1356
00:54:30,069 --> 00:54:26,880
history between about three and a half

1357
00:54:32,309 --> 00:54:30,079
to four billion years ago and we know

1358
00:54:33,990 --> 00:54:32,319
from other studies other rovers and

1359
00:54:36,470 --> 00:54:34,000
orbiters

1360
00:54:39,190 --> 00:54:36,480
that that is a key time in mars history

1361
00:54:41,030 --> 00:54:39,200
when it transitioned from being a warmer

1362
00:54:43,670 --> 00:54:41,040
wetter environment at the surface with

1363
00:54:45,430 --> 00:54:43,680

nice neutral water to being more acidic

1364
00:54:47,670 --> 00:54:45,440
waters and then eventually drying out

1365
00:54:49,910 --> 00:54:47,680
and rusting and turning red like we see

1366
00:54:51,430 --> 00:54:49,920
it today so

1367
00:54:53,829 --> 00:54:51,440
even though we're looking at a local

1368
00:54:56,150 --> 00:54:53,839
area and a you know a crater and

1369
00:54:58,870 --> 00:54:56,160
associated sediments in the crater

1370
00:55:00,870 --> 00:54:58,880
we are also looking for other rocks that

1371
00:55:03,349 --> 00:55:00,880
may be superimposed in the crater or

1372
00:55:05,910 --> 00:55:03,359
just outside of the crater um

1373
00:55:08,950 --> 00:55:05,920
other other samples of opportunity

1374
00:55:11,109 --> 00:55:08,960
that will also be able to fill in those

1375
00:55:12,950 --> 00:55:11,119
those details fill in those gaps for

1376
00:55:15,349 --> 00:55:12,960
that key time frame in mars history and

1377
00:55:17,589 --> 00:55:15,359
really understanding why mars went from

1378
00:55:20,549 --> 00:55:17,599
being probably habitable over most of

1379
00:55:22,710 --> 00:55:20,559
its surface to being inhospitable as it

1380
00:55:24,309 --> 00:55:22,720
is today

1381
00:55:26,549 --> 00:55:24,319
all right we're going to take one last

1382
00:55:30,390 --> 00:55:26,559
question over the phone lines uh ken

1383
00:55:33,829 --> 00:55:32,150
thank you very much for for doing this

1384
00:55:34,950 --> 00:55:33,839
um i think the question is for david

1385
00:55:38,710 --> 00:55:34,960
parker

1386
00:55:40,470 --> 00:55:38,720
um the fetch rover can you talk about um

1387
00:55:42,470 --> 00:55:40,480
what's its capabilities going to be is

1388
00:55:44,069 --> 00:55:42,480

it going to be uh like rosalind franklin

1389
00:55:46,069 --> 00:55:44,079
or or are you going to have a completely

1390
00:55:49,829 --> 00:55:46,079
new design and can you tell us what what

1391
00:55:53,430 --> 00:55:49,839
it will be able to do thanks

1392
00:55:56,470 --> 00:55:53,440
sure uh thanks the the fetch rover the

1393
00:55:59,510 --> 00:55:56,480
the key thing about it is it is not a

1394
00:56:01,910 --> 00:55:59,520
science instrument itself so compared to

1395
00:56:03,990 --> 00:56:01,920
rosalind franklin the big challenges on

1396
00:56:05,910 --> 00:56:04,000
rosalind franklin are all about life

1397
00:56:08,309 --> 00:56:05,920
search instrumentation

1398
00:56:10,789 --> 00:56:08,319
uh about cleanliness in the similar way

1399
00:56:12,549 --> 00:56:10,799
that lisa talked about their planetary

1400
00:56:14,870 --> 00:56:12,559
protection issues

1401
00:56:17,109 --> 00:56:14,880
um so we don't have the challenge of

1402
00:56:19,030 --> 00:56:17,119
complex scientific instruments

1403
00:56:21,270 --> 00:56:19,040
on the other hand we have a different

1404
00:56:23,589 --> 00:56:21,280
set of challenges which is

1405
00:56:26,549 --> 00:56:23,599
it's a vehicle to go and get collect

1406
00:56:28,069 --> 00:56:26,559
those samples find them but to travel

1407
00:56:30,630 --> 00:56:28,079
rapidly

1408
00:56:32,710 --> 00:56:30,640
and so conceptually a lot of the

1409
00:56:34,950 --> 00:56:32,720
technology is based on roslyn franklin

1410
00:56:38,630 --> 00:56:34,960
but it is smaller it will be about half

1411
00:56:41,270 --> 00:56:38,640
the mass of uh the franklin rover

1412
00:56:42,950 --> 00:56:41,280
and uh but it has this ability to travel

1413
00:56:44,630 --> 00:56:42,960

more rapidly we've been doing a lot of

1414
00:56:48,150 --> 00:56:44,640
work on autonomous navigation

1415
00:56:50,549 --> 00:56:48,160
demonstrations on the earth and the

1416
00:56:52,470 --> 00:56:50,559
rosalind franklin rover has

1417
00:56:54,549 --> 00:56:52,480
some in fact two different versions of

1418
00:56:56,950 --> 00:56:54,559
autonomous software that illustrate on

1419
00:56:59,349 --> 00:56:56,960
the surface of mars

1420
00:57:01,589 --> 00:56:59,359
and so implementing that and relying on

1421
00:57:03,589 --> 00:57:01,599
this uh rapid traverse across the

1422
00:57:05,990 --> 00:57:03,599
surface is usually like the key

1423
00:57:08,309 --> 00:57:06,000
challenge and also the challenge that

1424
00:57:10,789 --> 00:57:08,319
we're doing it without radio isotope

1425
00:57:12,630 --> 00:57:10,799
devices so it's another part of the what

1426
00:57:15,829 --> 00:57:12,640
thomas called the kind of lean

1427
00:57:18,630 --> 00:57:15,839
architecture for msr that we are trying

1428
00:57:20,390 --> 00:57:18,640
to keep it as simple as possible uh in

1429
00:57:22,789 --> 00:57:20,400
order to make this whole project uh

1430
00:57:25,030 --> 00:57:22,799
deliverable so it's a small fast dune

1431
00:57:27,510 --> 00:57:25,040
buggy it's got four wheels instead of

1432
00:57:30,549 --> 00:57:27,520
the usual six and uh they're of a novel

1433
00:57:32,710 --> 00:57:30,559
design that nasa has been working on

1434
00:57:36,309 --> 00:57:32,720
and he's going to use solar power like

1435
00:57:38,230 --> 00:57:36,319
franklin uh to do its job and get back

1436
00:57:39,990 --> 00:57:38,240
basically its mission on the surface is

1437
00:57:42,150 --> 00:57:40,000
about five months so it's really up

1438
00:57:45,109 --> 00:57:42,160

against the clock

1439
00:57:46,710 --> 00:57:45,119
have the answering question

1440
00:57:48,309 --> 00:57:46,720
okay we're going to take actually one

1441
00:57:50,390 --> 00:57:48,319
more question from the phone lines we

1442
00:57:53,109 --> 00:57:50,400
have jake robbins of the we martians

1443
00:57:56,390 --> 00:57:54,470
hey there uh thanks for taking my

1444
00:57:58,789 --> 00:57:56,400
question um i just wanted to know about

1445
00:58:01,430 --> 00:57:58,799
the mars ascent vehicle i know that the

1446
00:58:03,349 --> 00:58:01,440
last decadal survey identified it as one

1447
00:58:05,190 --> 00:58:03,359
of the trickiest pieces of hardware to

1448
00:58:06,390 --> 00:58:05,200
develop and there's been some studies on

1449
00:58:09,190 --> 00:58:06,400
it so can you give us an update on where

1450
00:58:11,270 --> 00:58:09,200
we're at for developing that rocket

1451
00:58:14,950 --> 00:58:11,280
i'm going to throw that to jeff at nasa

1452
00:58:19,270 --> 00:58:16,710
sure thank you so

1453
00:58:21,270 --> 00:58:19,280
yes we're working the mars ascent

1454
00:58:22,710 --> 00:58:21,280
vehicle design where we're looking at

1455
00:58:24,390 --> 00:58:22,720
we're actually in the middle of doing

1456
00:58:27,270 --> 00:58:24,400
some trades to see what that's going to

1457
00:58:29,750 --> 00:58:27,280
look like but we're confident that we we

1458
00:58:32,230 --> 00:58:29,760
can get to a design that closes and

1459
00:58:35,190 --> 00:58:32,240
and uh and and does what we need to do

1460
00:58:37,670 --> 00:58:35,200
to to put the orbiting sample into orbit

1461
00:58:39,670 --> 00:58:37,680
around mars where it can be retrieved so

1462
00:58:42,069 --> 00:58:39,680
i'd say in the over the next few months

1463
00:58:43,270 --> 00:58:42,079

where we're going to converge on a final

1464
00:58:45,990 --> 00:58:43,280
concept that we're going to look at

1465
00:58:48,069 --> 00:58:46,000
going forward

1466
00:58:50,230 --> 00:58:48,079
right okay so we're going to wrap up our

1467
00:58:51,990 --> 00:58:50,240
show today but there's so much more

1468
00:58:54,549 --> 00:58:52,000
still to discuss and to watch we have

1469
00:58:56,950 --> 00:58:54,559
another news conference in about an hour

1470
00:58:58,870 --> 00:58:56,960
at 4 pm eastern time this is going to be

1471
00:59:00,630 --> 00:58:58,880
about the technology that's flying with

1472
00:59:03,270 --> 00:59:00,640
the perseverance rover and also the

1473
00:59:05,270 --> 00:59:03,280
future of human exploration and then of

1474
00:59:07,109 --> 00:59:05,280
course on july 30th that's going to be

1475
00:59:09,109 --> 00:59:07,119
the big day we are going to have live

1476
00:59:10,950 --> 00:59:09,119
launch coverage that's going to start at

1477
00:59:13,270 --> 00:59:10,960
7 00 a.m eastern time and it's going to

1478
00:59:15,910 --> 00:59:13,280
be a little bit painful at 4 a.m pacific

1479
00:59:18,870 --> 00:59:15,920
time where my jpl colleagues are at um

1480
00:59:20,069 --> 00:59:18,880
you can watch that on nasa.gov

1481
00:59:22,549 --> 00:59:20,079
if you want to learn more about the

1482
00:59:27,109 --> 00:59:22,559
mission we have the mission websites

1483
00:59:29,349 --> 00:59:27,119
nasa.gov perseverance and mars.nasa.gov

1484
00:59:31,510 --> 00:59:29,359
perseverance and please follow us on

1485
00:59:33,990 --> 00:59:31,520
social media to get updates you can find

1486
01:00:06,549 --> 00:59:34,000
us on facebook and twitter at nasa

1487
01:00:09,109 --> 01:00:07,910
wherever

1488
01:00:12,150 --> 01:00:09,119

however

1489
01:00:19,010 --> 01:00:16,069
we're here there