1
00:00:07,349 --> 00:00:04,950
good morning i'm stephanie shearholds

2
00:00:08,870 --> 00:00:07,359
from nasa's office of communications we

3
00:00:11,270 --> 00:00:08,880
are here at the kennedy space center

4
00:00:13,030 --> 00:00:11,280
today to talk with senior nasa leaders

5
00:00:15,030 --> 00:00:13,040
they will share with us not only the

6
00:00:16,790 --> 00:00:15,040
significance of the fourth spacex

7
00:00:19,429 --> 00:00:16,800
commercial resupply services mission

8
00:00:22,550 --> 00:00:19,439
launching tonight but also how it fits

9
00:00:24,390 --> 00:00:22,560
in with nasa's broader exploration goals

10
00:00:27,429 --> 00:00:24,400
here to talk with us today from nasa

11
00:00:29,269 --> 00:00:27,439
headquarters are sam shimimi

12
00:00:31,589 --> 00:00:29,279
international space station division

13
00:00:33,670 --> 00:00:31,599

director for the human exploration and

14
00:00:36,790 --> 00:00:33,680
operations mission directorate

15
00:00:39,830 --> 00:00:36,800
dr jeff shihai senior technologist for

16
00:00:42,630 --> 00:00:39,840
the space technology mission directorate

17
00:00:45,029 --> 00:00:42,640
and dr ellen stofan nasa's chief

18
00:00:47,029 --> 00:00:45,039
scientist

19
00:00:48,790 --> 00:00:47,039
it's nasa's international space station

20
00:00:51,830 --> 00:00:48,800
program that brings us here today for

21
00:00:54,310 --> 00:00:51,840
this mission and sam shamimi is here to

22
00:00:56,869 --> 00:00:54,320
talk to us about how the research this

23
00:00:58,630 --> 00:00:56,879
and future missions will enable humans

24
00:00:59,830 --> 00:00:58,640
to travel farther than we have in

25
00:01:01,750 --> 00:00:59,840
decades

26
00:01:03,910 --> 00:01:01,760
this mission really shows the breadth of

27
00:01:06,230 --> 00:01:03,920
nasa's work and how all the directorates

28
00:01:08,789 --> 00:01:06,240
are working together sam can you tell us

29
00:01:09,590 --> 00:01:08,799
a little bit more about it

30
00:01:12,390 --> 00:01:09,600
sure

31
00:01:14,070 --> 00:01:12,400
be here back here in florida for the

32
00:01:16,149 --> 00:01:14,080
tonight's launch

33
00:01:18,149 --> 00:01:16,159
it's really exciting a few weeks here in

34
00:01:21,510 --> 00:01:18,159
human space flight we've had the rollout

35
00:01:23,670 --> 00:01:21,520
of the orion spacecraft for eft-1 that's

36
00:01:25,190 --> 00:01:23,680
coming up in december

37
00:01:28,149 --> 00:01:25,200
we've also had the announcement of our

38
00:01:30,469 --> 00:01:28,159

commercial crew development partners of

39
00:01:33,270 --> 00:01:30,479
spacex and boeing

40
00:01:34,950 --> 00:01:33,280
to expand our commercial utilization of

41
00:01:37,270 --> 00:01:34,960
low earth orbit and development of not

42
00:01:37,910 --> 00:01:37,280
only the the supply side but also you'll

43
00:01:39,749 --> 00:01:37,920
see

44
00:01:41,190 --> 00:01:39,759
talk a little bit later but also on the

45
00:01:42,950 --> 00:01:41,200
utilization and demand side of the

46
00:01:45,510 --> 00:01:42,960
commercialization

47
00:01:47,510 --> 00:01:45,520
and also this this launch this evening

48
00:01:50,389 --> 00:01:47,520
as stephanie was saying really

49
00:01:52,870 --> 00:01:50,399
exemplifies how space station

50
00:01:55,990 --> 00:01:52,880
role in the all the

51
00:01:57,670 --> 00:01:56,000
goals and objectives of of nasa

52
00:02:00,550 --> 00:01:57,680
first we can talk a little bit about the

53
00:02:02,709 --> 00:02:00,560
expanding the human presence in space

54
00:02:05,510 --> 00:02:02,719
beyond low earth orbit and on

55
00:02:07,109 --> 00:02:05,520
to deep space and on to mars

56
00:02:09,830 --> 00:02:07,119
that's through our human research

57
00:02:12,630 --> 00:02:09,840
program through our research in

58
00:02:14,229 --> 00:02:12,640
in with the astronauts and with our

59
00:02:16,070 --> 00:02:14,239
examples of the rodent research that

60
00:02:17,430 --> 00:02:16,080
that we're also doing on this flight

61
00:02:19,110 --> 00:02:17,440
we're also

62
00:02:21,589 --> 00:02:19,120
talking about the

63
00:02:23,830 --> 00:02:21,599

commercial development of of low earth

64
00:02:25,510 --> 00:02:23,840
orbit through also the rodent research

65
00:02:27,750 --> 00:02:25,520
through our partner with cases of

66
00:02:30,470 --> 00:02:27,760
bringing in commercial users of of the

67
00:02:32,949 --> 00:02:30,480
space station uh in in commercial

68
00:02:35,030 --> 00:02:32,959
research uh we'll also talk

69
00:02:37,509 --> 00:02:35,040
about this flight uh benefits to

70
00:02:40,470 --> 00:02:37,519
humanity how through our our partners

71
00:02:42,309 --> 00:02:40,480
with uh science mission directorate uh

72
00:02:44,710 --> 00:02:42,319
on the rapidscat

73
00:02:46,390 --> 00:02:44,720
instrument uh to measure sea winds so

74
00:02:47,589 --> 00:02:46,400
this has been a really exciting uh

75
00:02:50,630 --> 00:02:47,599
launch for us

76
00:02:53,670 --> 00:02:50,640
it even goes on beyond uh to

77
00:02:55,830 --> 00:02:53,680
our science and technology

78
00:02:58,470 --> 00:02:55,840
mission directorate

79
00:02:59,830 --> 00:02:58,480
for technology development uh for the 3d

80
00:03:00,790 --> 00:02:59,840
printer

81
00:03:02,390 --> 00:03:00,800
again

82
00:03:04,390 --> 00:03:02,400
all these

83
00:03:05,990 --> 00:03:04,400
examples of of

84
00:03:09,990 --> 00:03:06,000
of things that were flying on this

85
00:03:13,350 --> 00:03:10,000
flight uh cuts across nasa's missions uh

86
00:03:15,910 --> 00:03:13,360
from from humans to technology to

87
00:03:19,270 --> 00:03:15,920
science and as many of you may have

88
00:03:21,030 --> 00:03:19,280

heard yesterday even into astrophysics

89
00:03:23,030 --> 00:03:21,040
with the announcement by sam ting about

90
00:03:25,509 --> 00:03:23,040
discovery of new high particle energy

91
00:03:27,190 --> 00:03:25,519
physics discoveries so we have a lot

92
00:03:28,869 --> 00:03:27,200
going on in this flight and with the

93
00:03:31,190 --> 00:03:28,879
international space station these days

94
00:03:33,030 --> 00:03:31,200
we certainly do it's very exciting and

95
00:03:35,270 --> 00:03:33,040
and coming up as well i mean one of the

96
00:03:37,190 --> 00:03:35,280
things we talk about is how we're doing

97
00:03:38,789 --> 00:03:37,200
these studies for a long duration

98
00:03:41,350 --> 00:03:38,799
mission and i think that there's also a

99
00:03:42,710 --> 00:03:41,360
one-year mission coming up how does

100
00:03:44,630 --> 00:03:42,720
studying

101
00:03:46,789 --> 00:03:44,640
the long-term effects on human

102
00:03:48,789 --> 00:03:46,799
spaceflight help us prepare for getting

103
00:03:50,630 --> 00:03:48,799
farther out into the solar system well

104
00:03:51,589 --> 00:03:50,640
today we have a lot of information and

105
00:03:53,270 --> 00:03:51,599
data

106
00:03:55,589 --> 00:03:53,280
and research on

107
00:03:57,190 --> 00:03:55,599
humans in space for up to six months uh

108
00:03:58,949 --> 00:03:57,200
we don't have much

109
00:04:01,030 --> 00:03:58,959
we don't have a lot of data beyond that

110
00:04:03,589 --> 00:04:01,040
so this one year crew missions coming up

111
00:04:05,830 --> 00:04:03,599
next year will be able to tell us if our

112
00:04:08,309 --> 00:04:05,840
bone loss and muscle and muscle loss

113
00:04:11,110 --> 00:04:08,319

protocols can be actually applied to

114
00:04:12,630 --> 00:04:11,120
longer duration missions uh things like

115
00:04:14,470 --> 00:04:12,640
also the

116
00:04:16,710 --> 00:04:14,480
medical issues that we've recently

117
00:04:19,110 --> 00:04:16,720
discovered about eye health we'll see if

118
00:04:21,509 --> 00:04:19,120
those issues continue

119
00:04:23,270 --> 00:04:21,519
or they end up tapering off in longer

120
00:04:25,670 --> 00:04:23,280
duration spaceflight

121
00:04:27,430 --> 00:04:25,680
okay great thank you so much sam

122
00:04:30,070 --> 00:04:27,440
you had mentioned the 3d printer and

123
00:04:31,990 --> 00:04:30,080
that gives us a great segue to jeff

124
00:04:33,430 --> 00:04:32,000
sheehai who's our senior technologist

125
00:04:36,070 --> 00:04:33,440
for the space technology mission

126
00:04:37,830 --> 00:04:36,080
directorate which found that the 3d

127
00:04:40,469 --> 00:04:37,840
printer can you tell us a little bit

128
00:04:42,790 --> 00:04:40,479
more about that sure well the 3d printer

129
00:04:45,270 --> 00:04:42,800
is a very exciting technology yesterday

130
00:04:47,590 --> 00:04:45,280
there was a briefing that gave a lot of

131
00:04:50,150 --> 00:04:47,600
detail on the printer and what it's

132
00:04:53,110 --> 00:04:50,160
intended to do what the parameters of

133
00:04:54,230 --> 00:04:53,120
the demonstration on iss are you really

134
00:04:55,990 --> 00:04:54,240
um

135
00:04:58,629 --> 00:04:56,000
the themes you know that that you'll

136
00:05:00,710 --> 00:04:58,639
hear over and over are partnerships and

137
00:05:03,430 --> 00:05:00,720
using the iss as a demonstration

138
00:05:05,909 --> 00:05:03,440

platform and so this is a partnership

139
00:05:08,469 --> 00:05:05,919
between nasa and a company called made

140
00:05:11,270 --> 00:05:08,479
in space within nasa it's a partnership

141
00:05:13,270 --> 00:05:11,280
between the space technology mission

142
00:05:15,110 --> 00:05:13,280
directorate which i represent and the

143
00:05:17,749 --> 00:05:15,120
human exploration and operations mission

144
00:05:19,189 --> 00:05:17,759
directorate which sam represents here

145
00:05:21,749 --> 00:05:19,199
so we're proud to be part of that

146
00:05:23,430 --> 00:05:21,759
partnership this printer is really an

147
00:05:26,469 --> 00:05:23,440
american success story if you think

148
00:05:27,990 --> 00:05:26,479
about it in terms of it was a proposal

149
00:05:29,990 --> 00:05:28,000
to the small business innovative

150
00:05:32,150 --> 00:05:30,000
research fund

151
00:05:35,110 --> 00:05:32,160
got maybe a hundred thousand dollars as

152
00:05:37,110 --> 00:05:35,120
a start-off to explore the concept does

153
00:05:38,550 --> 00:05:37,120
the concept really hang together do you

154
00:05:41,350 --> 00:05:38,560
rethink

155
00:05:42,950 --> 00:05:41,360
printing things in space printing tools

156
00:05:44,150 --> 00:05:42,960
in space would work

157
00:05:46,710 --> 00:05:44,160
then

158
00:05:49,029 --> 00:05:46,720
after that success it looked like the

159
00:05:52,870 --> 00:05:49,039
concept was was sound

160
00:05:55,590 --> 00:05:52,880
phase two sbir award to

161
00:05:57,590 --> 00:05:55,600
to develop the concept further to

162
00:05:59,909 --> 00:05:57,600
try out an initial implementation of the

163
00:06:02,469 --> 00:05:59,919

concept we were able in space technology

164
00:06:05,909 --> 00:06:02,479
to use our flight opportunities program

165
00:06:08,710 --> 00:06:05,919
which pairs promising technologies with

166
00:06:11,189 --> 00:06:08,720
vendors who offer suborbital flights

167
00:06:13,430 --> 00:06:11,199
to put the printer in a space

168
00:06:16,070 --> 00:06:13,440
environment for very short durations 30

169
00:06:18,309 --> 00:06:16,080
seconds at a time but let them tweak it

170
00:06:20,150 --> 00:06:18,319
and test it and determine what

171
00:06:22,550 --> 00:06:20,160
parameters they'd have to change to make

172
00:06:23,909 --> 00:06:22,560
it work well in the space environment

173
00:06:25,430 --> 00:06:23,919
and now we've got to the point where

174
00:06:27,510 --> 00:06:25,440
we're delivering it to the dragon

175
00:06:30,070 --> 00:06:27,520
capsule we're going to take it up to the

176
00:06:32,309 --> 00:06:30,080
space station we're going to have it

177
00:06:34,790 --> 00:06:32,319
installed there and do a full

178
00:06:37,430 --> 00:06:34,800
demonstration of its capability

179
00:06:39,350 --> 00:06:37,440
to actually operate successfully in the

180
00:06:41,749 --> 00:06:39,360
microgravity environment of space so

181
00:06:44,230 --> 00:06:41,759
it's it's really from initial concept

182
00:06:46,550 --> 00:06:44,240
all the way to demonstration and it's a

183
00:06:48,230 --> 00:06:46,560
partnership like this that helps carry

184
00:06:50,790 --> 00:06:48,240
technologies across what some people

185
00:06:52,790 --> 00:06:50,800
call the valley of death that that

186
00:06:55,189 --> 00:06:52,800
sometimes stands between a promising

187
00:06:57,749 --> 00:06:55,199
technology and its infusion into

188
00:06:59,430 --> 00:06:57,759

missions like like we want to do in nasa

189
00:07:01,990 --> 00:06:59,440
or it's or it's transferred to the

190
00:07:05,029 --> 00:07:02,000
marketplace and so partnering like this

191
00:07:07,350 --> 00:07:05,039
with within nasa and with companies

192
00:07:09,909 --> 00:07:07,360
external to nasa really helps carry

193
00:07:12,710 --> 00:07:09,919
technologies along

194
00:07:14,629 --> 00:07:12,720
in the broader context space technology

195
00:07:17,189 --> 00:07:14,639
is doing a lot of things

196
00:07:19,909 --> 00:07:17,199
on international space station we have

197
00:07:21,830 --> 00:07:19,919
demonstrations inside iss

198
00:07:24,950 --> 00:07:21,840
we're planning some demonstrations

199
00:07:27,430 --> 00:07:24,960
outside iss inside iss many people are

200
00:07:28,550 --> 00:07:27,440
probably familiar with the the robonaut

201
00:07:29,510 --> 00:07:28,560
r2

202
00:07:31,189 --> 00:07:29,520
the

203
00:07:32,710 --> 00:07:31,199
humanoid robotic

204
00:07:35,430 --> 00:07:32,720
platform and

205
00:07:37,990 --> 00:07:35,440
we recently delivered legs to robonaut

206
00:07:40,550 --> 00:07:38,000
and so uh instead of just the torso with

207
00:07:43,270 --> 00:07:40,560
the arms and and the head the vision

208
00:07:45,110 --> 00:07:43,280
capability it'll also have legs and be

209
00:07:46,869 --> 00:07:45,120
able to move around the space station so

210
00:07:48,309 --> 00:07:46,879
we'll be able to start some of that

211
00:07:50,469 --> 00:07:48,319
testing to see

212
00:07:52,390 --> 00:07:50,479
how how does it move around what do we

213
00:07:54,390 --> 00:07:52,400

need to tweak how does it

214
00:07:56,790 --> 00:07:54,400
interact in the environment that's

215
00:07:59,029 --> 00:07:56,800
occupied by humans how do humans

216
00:08:01,670 --> 00:07:59,039
interact with it and what humans need to

217
00:08:03,990 --> 00:08:01,680
do to control it and so that's a really

218
00:08:06,950 --> 00:08:04,000
interesting technology uh demonstration

219
00:08:09,270 --> 00:08:06,960
we have the spheres um

220
00:08:11,589 --> 00:08:09,280
the the world will little note and long

221
00:08:13,270 --> 00:08:11,599
forget what the acronym stands for and

222
00:08:14,629 --> 00:08:13,280
uh i could think i could i could

223
00:08:16,950 --> 00:08:14,639
remember it if i thought about it for 30

224
00:08:19,350 --> 00:08:16,960
seconds but let's not uh but there's

225
00:08:21,350 --> 00:08:19,360
sphericals the roughly spherical shaped

226
00:08:23,830 --> 00:08:21,360
robotic platforms that

227
00:08:25,430 --> 00:08:23,840
that move around the station and

228
00:08:27,189 --> 00:08:25,440
they can take instrument readings they

229
00:08:29,589 --> 00:08:27,199
can take inventory they can do a variety

230
00:08:32,790 --> 00:08:29,599
of things to relieve the crew from some

231
00:08:35,350 --> 00:08:32,800
of the day-to-day burden of upkeep and

232
00:08:38,469 --> 00:08:35,360
and shopkeeping on on the space station

233
00:08:40,550 --> 00:08:38,479
so that's a demonstration we have on iss

234
00:08:43,350 --> 00:08:40,560
we've done some microgravity fluid

235
00:08:45,350 --> 00:08:43,360
experiments to understand how fluids

236
00:08:47,670 --> 00:08:45,360
behave in the microgravity environment

237
00:08:49,910 --> 00:08:47,680
that can be used for

238
00:08:52,630 --> 00:08:49,920

developing large propulsion systems that

239
00:08:54,790 --> 00:08:52,640
might sit in microgravity for weeks or

240
00:08:57,269 --> 00:08:54,800
months before we fire the engines for

241
00:09:00,070 --> 00:08:57,279
example and and of course the 3d printer

242
00:09:03,190 --> 00:09:00,080
demo is is our latest and greatest

243
00:09:07,269 --> 00:09:03,200
demo inside the iss

244
00:09:08,389 --> 00:09:07,279
outside the iss in 2016 and 2017 we plan

245
00:09:10,310 --> 00:09:08,399
to deliver

246
00:09:12,870 --> 00:09:10,320
a few demos one is something called

247
00:09:16,070 --> 00:09:12,880
sextant which i wrote it down stands for

248
00:09:18,310 --> 00:09:16,080
station explorer for x-ray timing and

249
00:09:21,030 --> 00:09:18,320
navigation what it basically does is use

250
00:09:22,949 --> 00:09:21,040
pulsars astrophysical objects are

251
00:09:26,230 --> 00:09:22,959
actually collapsed stars

252
00:09:28,630 --> 00:09:26,240
neutron stars rotating neutron stars as

253
00:09:31,430 --> 00:09:28,640
a navigation beacon we may be able to

254
00:09:33,509 --> 00:09:31,440
navigate our way through the universe

255
00:09:36,790 --> 00:09:33,519
using things the universe has provided

256
00:09:38,790 --> 00:09:36,800
to us as navigation and timing beacon so

257
00:09:41,910 --> 00:09:38,800
that'll be a really interesting demo in

258
00:09:43,670 --> 00:09:41,920
it it kind of ties on to a

259
00:09:46,790 --> 00:09:43,680
experiment that the science mission

260
00:09:48,230 --> 00:09:46,800
directorate has on space station

261
00:09:51,110 --> 00:09:48,240
so we'll be using some of that

262
00:09:53,829 --> 00:09:51,120
capability to do this other demo

263
00:09:56,310 --> 00:09:53,839

we've been planning to demonstrate

264
00:09:58,710 --> 00:09:56,320
phased array heat exchangers

265
00:10:01,030 --> 00:09:58,720
we have a wax-based implementation and a

266
00:10:03,350 --> 00:10:01,040
water-based implementation these are

267
00:10:05,269 --> 00:10:03,360
devices that use the latent heat of

268
00:10:07,190 --> 00:10:05,279
fusion the fact that

269
00:10:09,030 --> 00:10:07,200
substances absorb energy without

270
00:10:10,790 --> 00:10:09,040
changing their temperature

271
00:10:14,150 --> 00:10:10,800
when they're at a phase change like

272
00:10:17,829 --> 00:10:14,160
solid to liquid and so in 2016 we'll

273
00:10:20,069 --> 00:10:17,839
deliver the wax-based model 2017 the

274
00:10:22,949 --> 00:10:20,079
water-based model and test out the

275
00:10:25,110 --> 00:10:22,959
capability of those to store and release

276
00:10:27,110 --> 00:10:25,120
thermal energy when when you want when

277
00:10:28,870 --> 00:10:27,120
you want it and then advanced solar

278
00:10:31,910 --> 00:10:28,880
arrays one of the things we're very

279
00:10:34,069 --> 00:10:31,920
proud of this summer in space technology

280
00:10:37,030 --> 00:10:34,079
it's been a busy summer for us so we've

281
00:10:39,110 --> 00:10:37,040
done a number of demonstration events

282
00:10:41,590 --> 00:10:39,120
is the advanced solar rays that we've

283
00:10:43,750 --> 00:10:41,600
developed in partnership with

284
00:10:46,230 --> 00:10:43,760
atk in one case

285
00:10:49,030 --> 00:10:46,240
and a company called deployable space

286
00:10:51,110 --> 00:10:49,040
systems or dss in another case so we had

287
00:10:54,389 --> 00:10:51,120
two

288
00:10:56,790 --> 00:10:54,399

working on

289
00:10:58,069 --> 00:10:56,800
different implementations of advanced

290
00:11:00,470 --> 00:10:58,079
high power

291
00:11:02,550 --> 00:11:00,480
solar arrays one of the things as we

292
00:11:04,870 --> 00:11:02,560
move out into deep space we're going to

293
00:11:07,430 --> 00:11:04,880
need higher power implementations of

294
00:11:09,829 --> 00:11:07,440
solar electric propulsion to move cargo

295
00:11:12,790 --> 00:11:09,839
around for us it's a very efficient way

296
00:11:14,470 --> 00:11:12,800
of moving cargo because

297
00:11:16,790 --> 00:11:14,480
making an analogy with automobile

298
00:11:18,310 --> 00:11:16,800
transportation you get really high

299
00:11:20,150 --> 00:11:18,320
miles per gallon

300
00:11:23,110 --> 00:11:20,160
you don't get much thrust but you get

301
00:11:25,509 --> 00:11:23,120
great fuel economy and so we can move

302
00:11:27,829 --> 00:11:25,519
cargo when we're not in a hurry

303
00:11:30,389 --> 00:11:27,839
by contrast with moving crew when we

304
00:11:32,389 --> 00:11:30,399
want to get them out there is

305
00:11:33,910 --> 00:11:32,399
in a reasonable amount of time we can

306
00:11:36,230 --> 00:11:33,920
move cargo with solar electric

307
00:11:38,630 --> 00:11:36,240
propulsion but we'll need high power to

308
00:11:41,269 --> 00:11:38,640
move a lot lot of cargo right now the

309
00:11:43,509 --> 00:11:41,279
spacecraft that we have in earth orbit

310
00:11:46,310 --> 00:11:43,519
with solar arrays they have a few

311
00:11:47,509 --> 00:11:46,320
kilowatts or tens of kilowatts maybe

312
00:11:50,310 --> 00:11:47,519
of uh

313
00:11:52,310 --> 00:11:50,320

of power electric power being delivered

314
00:11:54,150 --> 00:11:52,320
from the solar array we'll need many

315
00:11:57,590 --> 00:11:54,160
tens of kilowatts maybe a few hundreds

316
00:11:59,190 --> 00:11:57,600
of kilowatts to do something like a mars

317
00:12:01,750 --> 00:11:59,200
mission for example

318
00:12:03,590 --> 00:12:01,760
probably a few hundred kilowatts and so

319
00:12:05,269 --> 00:12:03,600
we're developing the array technologies

320
00:12:07,509 --> 00:12:05,279
we had two great deployment

321
00:12:10,949 --> 00:12:07,519
demonstrations we're looking forward

322
00:12:13,590 --> 00:12:10,959
maybe uh in the next few years to trying

323
00:12:15,430 --> 00:12:13,600
to do a demonstration on iss

324
00:12:17,750 --> 00:12:15,440
the possibility even exists that these

325
00:12:21,990 --> 00:12:17,760
advanced arrays could supplement the

326
00:12:24,389 --> 00:12:22,000
power on the iss and and provide a

327
00:12:27,430 --> 00:12:24,399
replacement or a supplement for the

328
00:12:29,350 --> 00:12:27,440
aging iss solar arrays so very excited

329
00:12:31,269 --> 00:12:29,360
about that and we're proud to be

330
00:12:34,949 --> 00:12:31,279
partnering with heo

331
00:12:36,710 --> 00:12:34,959
on fulfilling the promise of iss as as a

332
00:12:39,350 --> 00:12:36,720
premier laboratory

333
00:12:41,670 --> 00:12:39,360
for space science and technology

334
00:12:44,470 --> 00:12:41,680
development and demonstration iss is

335
00:12:45,590 --> 00:12:44,480
fulfilling that promise every day

336
00:12:47,670 --> 00:12:45,600
and uh

337
00:12:49,990 --> 00:12:47,680
in space technology we're really pleased

338
00:12:53,350 --> 00:12:50,000

to be part of that we're trying to

339
00:12:55,990 --> 00:12:53,360
develop technologies to facilitate the

340
00:12:57,670 --> 00:12:56,000
human exploration of deep space

341
00:12:59,829 --> 00:12:57,680
asteroid mission

342
00:13:02,150 --> 00:12:59,839
onto the moons of mars onto the surface

343
00:13:03,829 --> 00:13:02,160
of mars and really at the top level when

344
00:13:04,949 --> 00:13:03,839
you think about it you've you've got to

345
00:13:07,190 --> 00:13:04,959
get there

346
00:13:09,590 --> 00:13:07,200
you've got a land there

347
00:13:11,750 --> 00:13:09,600
which is trickier than it sounds like

348
00:13:14,389 --> 00:13:11,760
you want to live there we really intend

349
00:13:16,790 --> 00:13:14,399
to set up shop on mars we don't want to

350
00:13:18,790 --> 00:13:16,800
go and just leave a few boot prints it's

351
00:13:20,870 --> 00:13:18,800
a long way away

352
00:13:23,750 --> 00:13:20,880
a mission to mars a human mission to

353
00:13:25,430 --> 00:13:23,760
mars will last a few years

354
00:13:27,590 --> 00:13:25,440
you literally have to wait for the

355
00:13:30,230 --> 00:13:27,600
planets to align before you can go and

356
00:13:32,829 --> 00:13:30,240
come back can't go and come anytime you

357
00:13:35,670 --> 00:13:32,839
want unless you have unlimited energy so

358
00:13:36,870 --> 00:13:35,680
um so we're we're going to set up shop

359
00:13:38,870 --> 00:13:36,880
on mars so we have to develop

360
00:13:40,790 --> 00:13:38,880
technologies to live there so

361
00:13:42,790 --> 00:13:40,800
in in space technology mission director

362
00:13:44,550 --> 00:13:42,800
we're working on propulsion like solar

363
00:13:46,310 --> 00:13:44,560

electric as i talked about to get you to

364
00:13:48,389 --> 00:13:46,320
mars we're working on landing

365
00:13:50,470 --> 00:13:48,399
technologies we had a fabulous

366
00:13:52,069 --> 00:13:50,480
demonstration earlier this summer of

367
00:13:55,030 --> 00:13:52,079
something called the low density

368
00:13:56,710 --> 00:13:55,040
supersonic decelerator some people call

369
00:13:58,790 --> 00:13:56,720
it nasa's flying saucer because it's

370
00:14:01,269 --> 00:13:58,800
sort of the test vehicle looked like a

371
00:14:03,350 --> 00:14:01,279
flying saucer but it deployed a

372
00:14:05,590 --> 00:14:03,360
supersonic decelerator an inflatable

373
00:14:08,069 --> 00:14:05,600
device to help slow the vehicle down

374
00:14:10,870 --> 00:14:08,079
then deployed a parachute at supersonic

375
00:14:12,629 --> 00:14:10,880
speeds the parachute

376
00:14:14,629 --> 00:14:12,639
came apart pretty quickly many people

377
00:14:16,230 --> 00:14:14,639
probably saw that video but but we

378
00:14:18,550 --> 00:14:16,240
learned a lot from that we know what to

379
00:14:20,389 --> 00:14:18,560
tweak we know what to try the next time

380
00:14:22,710 --> 00:14:20,399
so it's really all about

381
00:14:25,509 --> 00:14:22,720
creating new knowledge

382
00:14:27,509 --> 00:14:25,519
demonstrating new capabilities and and

383
00:14:30,310 --> 00:14:27,519
new technologies and and that's what

384
00:14:32,790 --> 00:14:30,320
we're trying to do in in space tech one

385
00:14:35,350 --> 00:14:32,800
more exciting thing i'll mention is is

386
00:14:37,829 --> 00:14:35,360
we recently selected in uh cooperation

387
00:14:39,990 --> 00:14:37,839
with human exploration

388
00:14:42,150 --> 00:14:40,000

operations mission directorate and to be

389
00:14:44,230 --> 00:14:42,160
put on a platform

390
00:14:45,910 --> 00:14:44,240
being uh that will be delivered by

391
00:14:49,829 --> 00:14:45,920
science mission directorate that is the

392
00:14:52,870 --> 00:14:49,839
mars 2020 rover we selected an in-situ

393
00:14:54,470 --> 00:14:52,880
resource utilization experiment that's a

394
00:14:56,310 --> 00:14:54,480
mouthful of words but what it means is

395
00:14:58,470 --> 00:14:56,320
living off the land and so what we're

396
00:15:00,310 --> 00:14:58,480
going to demonstrate is the ability to

397
00:15:03,350 --> 00:15:00,320
suck in the mars atmosphere which is

398
00:15:06,470 --> 00:15:03,360
mostly carbon dioxide about 95 carbon

399
00:15:08,710 --> 00:15:06,480
dioxide and turn it into oxygen

400
00:15:11,269 --> 00:15:08,720
we can use oxygen for breathing of

401
00:15:12,870 --> 00:15:11,279
course if you you're a human and want to

402
00:15:15,509 --> 00:15:12,880
set up shop on mars as i mentioned but

403
00:15:17,910 --> 00:15:15,519
we can also use oxygen as a very

404
00:15:19,910 --> 00:15:17,920
effective liquid oxidizer in the

405
00:15:21,590 --> 00:15:19,920
propulsion system that might get you

406
00:15:22,949 --> 00:15:21,600
back from mars so

407
00:15:25,030 --> 00:15:22,959
get there

408
00:15:26,470 --> 00:15:25,040
land there live there and then

409
00:15:27,430 --> 00:15:26,480
you'll probably want to leave there and

410
00:15:29,189 --> 00:15:27,440
so

411
00:15:31,509 --> 00:15:29,199
this technology can be used both for

412
00:15:33,590 --> 00:15:31,519
living there and and leaving there so

413
00:15:35,670 --> 00:15:33,600

really excited to be

414
00:15:37,189 --> 00:15:35,680
part of performing the first

415
00:15:40,230 --> 00:15:37,199
demonstration

416
00:15:41,910 --> 00:15:40,240
on another planetary body of using the

417
00:15:44,310 --> 00:15:41,920
resources that are there to produce

418
00:15:46,310 --> 00:15:44,320
something useful living off the land so

419
00:15:47,829 --> 00:15:46,320
so in space technology we're we're

420
00:15:49,269 --> 00:15:47,839
trying to create new knowledge we're

421
00:15:54,069 --> 00:15:49,279
trying to

422
00:15:55,990 --> 00:15:54,079
demonstrate new technologies and really

423
00:15:57,910 --> 00:15:56,000
pleased to be partnering with industry

424
00:16:00,550 --> 00:15:57,920
and partnering with our other

425
00:16:01,829 --> 00:16:00,560
organizations and in nasa to to do those

426
00:16:03,269 --> 00:16:01,839
things

427
00:16:05,430 --> 00:16:03,279
great thank you so much that's a lot of

428
00:16:07,350 --> 00:16:05,440
good information we do spend a lot of

429
00:16:09,030 --> 00:16:07,360
time talking about science and research

430
00:16:11,030 --> 00:16:09,040
inside the space station and it's great

431
00:16:12,870 --> 00:16:11,040
to hear about science outside the space

432
00:16:14,790 --> 00:16:12,880
station enabled by the space station and

433
00:16:16,629 --> 00:16:14,800
one of those is rapid scat that we've

434
00:16:18,230 --> 00:16:16,639
been talking about this week ellen

435
00:16:20,310 --> 00:16:18,240
you're nasa's chief scientist could you

436
00:16:22,389 --> 00:16:20,320
tell us a little bit more please

437
00:16:25,030 --> 00:16:22,399
well this flight with crs4 is really

438
00:16:27,590 --> 00:16:25,040

showing the depth and breadth of the iss

439
00:16:29,030 --> 00:16:27,600
as a research platform um and and with

440
00:16:30,710 --> 00:16:29,040
this flight again you're we're just

441
00:16:34,710 --> 00:16:30,720
seeing the increasing maturity of the

442
00:16:36,629 --> 00:16:34,720
iss for research and rapid scat which is

443
00:16:37,990 --> 00:16:36,639
going to measure surface winds over the

444
00:16:40,310 --> 00:16:38,000
ocean

445
00:16:43,189 --> 00:16:40,320
is a great complement to our

446
00:16:45,189 --> 00:16:43,199
17 spacecraft that we have studying the

447
00:16:47,269 --> 00:16:45,199
earth we were really excited earlier

448
00:16:49,430 --> 00:16:47,279
this year to launch two spacecraft one

449
00:16:52,389 --> 00:16:49,440
to study global precipitation another to

450
00:16:55,030 --> 00:16:52,399
study carbon dioxide and you might say

451
00:16:56,790 --> 00:16:55,040
why do we need all those 17 spacecraft

452
00:16:59,030 --> 00:16:56,800
why do we need rapid scat to measure

453
00:17:01,110 --> 00:16:59,040
well as most of us know living on this

454
00:17:02,870 --> 00:17:01,120
planet it's a really complex planet

455
00:17:04,630 --> 00:17:02,880
we're trying to understand

456
00:17:06,549 --> 00:17:04,640
how the atmosphere is changing how the

457
00:17:08,870 --> 00:17:06,559
surface changes how that plays into it

458
00:17:11,350 --> 00:17:08,880
how the surface changes 70 percent of

459
00:17:12,870 --> 00:17:11,360
our planet is covered by oceans so

460
00:17:15,029 --> 00:17:12,880
we have a hard time actually making

461
00:17:17,590 --> 00:17:15,039
surface measurements all across those

462
00:17:20,150 --> 00:17:17,600
areas where there aren't people so being

463
00:17:22,390 --> 00:17:20,160

able to use space to get that global

464
00:17:25,110 --> 00:17:22,400
view is incredibly important

465
00:17:26,630 --> 00:17:25,120
but because the planet is so dynamic it

466
00:17:28,470 --> 00:17:26,640
really is changing all the time and

467
00:17:30,310 --> 00:17:28,480
you're trying to capture that change

468
00:17:32,230 --> 00:17:30,320
with all of these instruments for

469
00:17:33,430 --> 00:17:32,240
example our we have another instrument

470
00:17:35,750 --> 00:17:33,440
that is

471
00:17:37,590 --> 00:17:35,760
looking at sea surface winds but it's

472
00:17:39,830 --> 00:17:37,600
measuring at the same time of the day

473
00:17:41,990 --> 00:17:39,840
every day the great complement for a

474
00:17:43,990 --> 00:17:42,000
rapid scat is that the space station

475
00:17:45,350 --> 00:17:44,000
covers the tropical regions at different

476
00:17:46,710 --> 00:17:45,360
times of the day

477
00:17:49,110 --> 00:17:46,720
so we're not only going to be able to

478
00:17:51,270 --> 00:17:49,120
get data on how the winds change from

479
00:17:52,230 --> 00:17:51,280
day to day but how they change across

480
00:17:53,669 --> 00:17:52,240
the day

481
00:17:55,909 --> 00:17:53,679
and that's really important because if

482
00:17:57,909 --> 00:17:55,919
you think of how the weather changes how

483
00:17:59,830 --> 00:17:57,919
the climate changes a lot of it's due to

484
00:18:02,630 --> 00:17:59,840
the energy that we have in our

485
00:18:04,230 --> 00:18:02,640
atmosphere how's that energy

486
00:18:05,909 --> 00:18:04,240
taking place what's the exchange of

487
00:18:07,990 --> 00:18:05,919
energy between the sea surface and the

488
00:18:10,710 --> 00:18:08,000

atmosphere and winds are a really

489
00:18:13,430 --> 00:18:10,720
critical part of that equation that we

490
00:18:15,110 --> 00:18:13,440
really need to measure so rapid scat

491
00:18:17,430 --> 00:18:15,120
on the international space station is

492
00:18:19,270 --> 00:18:17,440
going to give us good insight

493
00:18:21,190 --> 00:18:19,280
to increasing our understanding of

494
00:18:22,710 --> 00:18:21,200
weather how that plays into climate over

495
00:18:24,470 --> 00:18:22,720
the long term really critical

496
00:18:25,669 --> 00:18:24,480
measurements that we're making

497
00:18:28,870 --> 00:18:25,679
right now

498
00:18:30,789 --> 00:18:28,880
to help us here on earth

499
00:18:31,990 --> 00:18:30,799
and and this is just one aspect as we've

500
00:18:34,070 --> 00:18:32,000
been hearing today of what the

501
00:18:35,909 --> 00:18:34,080
international space station is doing and

502
00:18:37,590 --> 00:18:35,919
it's amazing to me when you look at just

503
00:18:39,830 --> 00:18:37,600
the again the incredible breadth of

504
00:18:41,110 --> 00:18:39,840
research that we have going on yesterday

505
00:18:42,630 --> 00:18:41,120
we announced the alpha magnetic

506
00:18:44,549 --> 00:18:42,640
spectrometer

507
00:18:46,710 --> 00:18:44,559
they're released two different papers

508
00:18:48,710 --> 00:18:46,720
looking at the things like the amount of

509
00:18:50,390 --> 00:18:48,720
positrons and electrons that are are

510
00:18:52,470 --> 00:18:50,400
coming towards us really important to

511
00:18:54,150 --> 00:18:52,480
measure them in space because when you

512
00:18:55,270 --> 00:18:54,160
have this atmosphere it kind of messes

513
00:18:57,190 --> 00:18:55,280

up the measurement because these

514
00:18:59,669 --> 00:18:57,200
particles have mass

515
00:19:02,789 --> 00:18:59,679
and it's starting to give us hints

516
00:19:04,390 --> 00:19:02,799
about dark matter this stuff that takes

517
00:19:06,549 --> 00:19:04,400
up the majority of the universe that we

518
00:19:08,470 --> 00:19:06,559
have very little insight into its nature

519
00:19:10,310 --> 00:19:08,480
so really exciting results coming from

520
00:19:12,470 --> 00:19:10,320
ams and again who would think that the

521
00:19:15,029 --> 00:19:12,480
international space station would become

522
00:19:17,190 --> 00:19:15,039
such a fundamental platform for doing uh

523
00:19:20,150 --> 00:19:17,200
cosmology studies the origin of the

524
00:19:23,029 --> 00:19:20,160
universe the nature of the universe

525
00:19:25,430 --> 00:19:23,039
and as sam was going into earlier

526
00:19:27,430 --> 00:19:25,440
with our commercial partner cases

527
00:19:29,990 --> 00:19:27,440
sending arc 2 up to the international

528
00:19:31,430 --> 00:19:30,000
space station really a broad range of

529
00:19:33,510 --> 00:19:31,440
research going on from things like

530
00:19:35,750 --> 00:19:33,520
protein crystal growth

531
00:19:36,789 --> 00:19:35,760
to our very important model systems

532
00:19:38,150 --> 00:19:36,799
studies

533
00:19:39,830 --> 00:19:38,160
and i know you guys heard about that

534
00:19:41,990 --> 00:19:39,840
yesterday with the work that we're doing

535
00:19:45,270 --> 00:19:42,000
sending rodents up looking at muscle

536
00:19:47,110 --> 00:19:45,280
wasting bone density loss uh the fact

537
00:19:49,590 --> 00:19:47,120
that when you put

538
00:19:51,270 --> 00:19:49,600

things that evolved in a 1g atmosphere

539
00:19:54,070 --> 00:19:51,280
up into microgravity there's all kinds

540
00:19:56,310 --> 00:19:54,080
of changes how can we use those changes

541
00:19:57,990 --> 00:19:56,320
to help us better understand how the

542
00:19:59,909 --> 00:19:58,000
human system operates and that's

543
00:20:01,909 --> 00:19:59,919
critical not just for sending humans

544
00:20:03,430 --> 00:20:01,919
beyond low earth orbit to mars where for

545
00:20:05,590 --> 00:20:03,440
three years they're going to go out into

546
00:20:07,190 --> 00:20:05,600
this low gravity environment but it's

547
00:20:10,149 --> 00:20:07,200
critical because things like bone

548
00:20:11,669 --> 00:20:10,159
density loss muscle wasting

549
00:20:13,430 --> 00:20:11,679
and my age i already feel those things

550
00:20:15,029 --> 00:20:13,440
coming on so

551
00:20:16,870 --> 00:20:15,039
you know if we can learn from the fact

552
00:20:18,789 --> 00:20:16,880
that those things happen very rapidly in

553
00:20:20,549 --> 00:20:18,799
space learn more about them learn how to

554
00:20:22,630 --> 00:20:20,559
treat them effectively it will help us

555
00:20:24,630 --> 00:20:22,640
here on earth

556
00:20:26,230 --> 00:20:24,640
and that's our our phrase for the space

557
00:20:28,549 --> 00:20:26,240
station which i think is really critical

558
00:20:30,630 --> 00:20:28,559
is it's off the earth but it's for the

559
00:20:33,590 --> 00:20:30,640
earth this research doesn't just benefit

560
00:20:36,390 --> 00:20:33,600
us on our journey to mars it benefits us

561
00:20:38,470 --> 00:20:36,400
right here on this planet um and and for

562
00:20:40,230 --> 00:20:38,480
our journey to mars you know this this

563
00:20:44,630 --> 00:20:40,240

research we're doing is critical our

564
00:20:46,310 --> 00:20:44,640
partnership with spacex uh getting cargo

565
00:20:47,909 --> 00:20:46,320
along with orbital getting cargo up to

566
00:20:50,230 --> 00:20:47,919
the space station is critical because we

567
00:20:52,070 --> 00:20:50,240
want to get experiments up there we want

568
00:20:55,590 --> 00:20:52,080
to get data from those experiments back

569
00:20:57,270 --> 00:20:55,600
down here on earth and earlier this week

570
00:20:59,830 --> 00:20:57,280
our big announcement as sam was talking

571
00:21:02,230 --> 00:20:59,840
about partnering with spacex and boeing

572
00:21:03,990 --> 00:21:02,240
to send commercial crew to the

573
00:21:05,110 --> 00:21:04,000
international space station starting in

574
00:21:07,990 --> 00:21:05,120
a few years

575
00:21:10,390 --> 00:21:08,000
another critical step on ensuring that

576
00:21:12,070 --> 00:21:10,400
in the 2030s we get humans

577
00:21:13,510 --> 00:21:12,080
to the red planet

578
00:21:15,669 --> 00:21:13,520
and that's critical for me as a

579
00:21:17,830 --> 00:21:15,679
scientist because i want to see uh

580
00:21:19,750 --> 00:21:17,840
geologists and astrobiologists on the

581
00:21:22,230 --> 00:21:19,760
surface of mars trying to really address

582
00:21:25,270 --> 00:21:22,240
that question of did life ever evolve

583
00:21:27,750 --> 00:21:25,280
uh on the planet um and

584
00:21:30,230 --> 00:21:27,760
you know this is kind of a crazy

585
00:21:33,270 --> 00:21:30,240
busy week for us here at nasa from the

586
00:21:34,549 --> 00:21:33,280
commercial crew announcement to our

587
00:21:36,710 --> 00:21:34,559
launch here

588
00:21:39,830 --> 00:21:36,720

in the early hours of tomorrow morning

589
00:21:42,789 --> 00:21:39,840
to on sunday evening incredibly exciting

590
00:21:45,830 --> 00:21:42,799
we have the maven spacecraft arriving at

591
00:21:47,990 --> 00:21:45,840
mars having mars orbit insertion maven

592
00:21:49,190 --> 00:21:48,000
will be studying uh the processing take

593
00:21:50,710 --> 00:21:49,200
place at the top of the martian

594
00:21:52,789 --> 00:21:50,720
atmosphere which is really critical for

595
00:21:54,470 --> 00:21:52,799
understanding the history of water on

596
00:21:56,710 --> 00:21:54,480
that planet we know mars had a lot of

597
00:21:57,909 --> 00:21:56,720
water in the past it's lost that water

598
00:21:59,029 --> 00:21:57,919
maven maven's going to give us this

599
00:22:01,029 --> 00:21:59,039
critical

600
00:22:03,510 --> 00:22:01,039
measurements to try to understand how

601
00:22:05,029 --> 00:22:03,520
that how mars atmosphere has evolved

602
00:22:06,630 --> 00:22:05,039
over time

603
00:22:08,630 --> 00:22:06,640
getting back to that question of are we

604
00:22:10,230 --> 00:22:08,640
alone and did life ever evolve on the

605
00:22:13,110 --> 00:22:10,240
red planet so

606
00:22:15,029 --> 00:22:13,120
crazy busy week for nasa and really

607
00:22:17,590 --> 00:22:15,039
focused on this

608
00:22:19,830 --> 00:22:17,600
let's go beyond low earth orbit let's go

609
00:22:22,230 --> 00:22:19,840
on a journey to mars

610
00:22:24,710 --> 00:22:22,240
excellent thank you we will now open it

611
00:22:26,549 --> 00:22:24,720
up for questions and please identify

612
00:22:28,470 --> 00:22:26,559
yourself and your affiliation and to

613
00:22:32,950 --> 00:22:28,480

whom you're addressing your question

614
00:22:35,830 --> 00:22:34,470
thanks very much good morning my

615
00:22:38,549 --> 00:22:35,840
question is for

616
00:22:41,430 --> 00:22:38,559
for sam with the house and senate

617
00:22:44,230 --> 00:22:41,440
passing a continuing resolution for the

618
00:22:45,750 --> 00:22:44,240
um for the nasa budget does that impact

619
00:22:47,590 --> 00:22:45,760
the uh

620
00:22:49,590 --> 00:22:47,600
first year funding for the commercial

621
00:22:52,230 --> 00:22:49,600
crew awards

622
00:22:55,029 --> 00:22:52,240
i think that was addressed uh in the in

623
00:22:56,630 --> 00:22:55,039
the discussion a couple of days ago is

624
00:22:59,029 --> 00:22:56,640
that right that's correct uh it

625
00:23:03,110 --> 00:22:59,039
shouldn't have any effect

626
00:23:07,669 --> 00:23:04,950
i have also another financial question

627
00:23:10,070 --> 00:23:07,679
also for you um yesterday the um

628
00:23:11,990 --> 00:23:10,080
inspector general's office uh came out

629
00:23:14,149 --> 00:23:12,000
with their report about the future

630
00:23:16,149 --> 00:23:14,159
operations of the space station and

631
00:23:18,870 --> 00:23:16,159
expressed some concerns about it being

632
00:23:23,350 --> 00:23:18,880
um that nasa was uh under

633
00:23:25,029 --> 00:23:23,360
was um wasn't really properly um

634
00:23:27,350 --> 00:23:25,039
planning on the amount of money that

635
00:23:29,029 --> 00:23:27,360
it's going to cost to keep it going i'm

636
00:23:30,310 --> 00:23:29,039
just wondering if you had any response

637
00:23:31,430 --> 00:23:30,320
to that

638
00:23:33,750 --> 00:23:31,440

well we've been

639
00:23:36,950 --> 00:23:33,760
working uh last couple of years to

640
00:23:39,590 --> 00:23:36,960
understand uh what it takes to keep the

641
00:23:41,110 --> 00:23:39,600
station from an operational standpoint

642
00:23:43,110 --> 00:23:41,120
and maintenance standpoint what it takes

643
00:23:45,269 --> 00:23:43,120
to do that and

644
00:23:46,950 --> 00:23:45,279
what we what we expect for the

645
00:23:49,350 --> 00:23:46,960
transportation cost to be in the future

646
00:23:51,190 --> 00:23:49,360
so we're continuing to work those cost

647
00:23:53,269 --> 00:23:51,200
estimates through our regular budget

648
00:23:55,510 --> 00:23:53,279
process

649
00:23:57,510 --> 00:23:55,520
marcia dunn

650
00:23:59,430 --> 00:23:57,520
marsha done associated press for mr

651
00:24:01,110 --> 00:23:59,440
sheehy probably although

652
00:24:02,070 --> 00:24:01,120
you can anyone can

653
00:24:04,070 --> 00:24:02,080
chip in

654
00:24:06,870 --> 00:24:04,080
3d printer

655
00:24:09,110 --> 00:24:06,880
when would you envision when would you

656
00:24:11,590 --> 00:24:09,120
think that astronauts on the space

657
00:24:14,310 --> 00:24:11,600
station if at all might actually use the

658
00:24:16,710 --> 00:24:14,320
3d printer for replacement parts repair

659
00:24:18,390 --> 00:24:16,720
parts i know there's a commercial unit

660
00:24:19,669 --> 00:24:18,400
going up i think next year

661
00:24:21,110 --> 00:24:19,679
what's the earliest you could see that

662
00:24:22,630 --> 00:24:21,120
happening and how hard would it be for

663
00:24:25,190 --> 00:24:22,640

nasa to get its

664
00:24:27,909 --> 00:24:25,200
its head into um

665
00:24:29,510 --> 00:24:27,919
using a 3d printer part

666
00:24:30,870 --> 00:24:29,520
if it's a life and death situation on

667
00:24:32,310 --> 00:24:30,880
the space station versus something

668
00:24:33,830 --> 00:24:32,320
that's been tested a hundred thousand

669
00:24:36,310 --> 00:24:33,840
times on the ground

670
00:24:38,950 --> 00:24:36,320
sure that's a great question um

671
00:24:40,870 --> 00:24:38,960
part of the uh rationale behind doing

672
00:24:42,310 --> 00:24:40,880
the demo that we have planned for this

673
00:24:45,510 --> 00:24:42,320
mission is

674
00:24:47,669 --> 00:24:45,520
to to get some initial data and to do

675
00:24:49,590 --> 00:24:47,679
some initial testing on

676
00:24:51,669 --> 00:24:49,600
you know what kind how what what is the

677
00:24:54,630 --> 00:24:51,679
quality of the parts that come out when

678
00:24:56,630 --> 00:24:54,640
you make them in space and so um i think

679
00:24:59,110 --> 00:24:56,640
the briefing yesterday showed that in

680
00:25:00,789 --> 00:24:59,120
addition to some sample parts they're

681
00:25:03,510 --> 00:25:00,799
making a bunch they will be making a

682
00:25:05,110 --> 00:25:03,520
bunch of test articles

683
00:25:07,430 --> 00:25:05,120
some of them look like dog bones and

684
00:25:09,750 --> 00:25:07,440
different sorts of test coupons and so

685
00:25:11,510 --> 00:25:09,760
those will be pulled and twisted and

686
00:25:13,510 --> 00:25:11,520
and peeled and and

687
00:25:15,830 --> 00:25:13,520
subjected to a lot of tests to determine

688
00:25:17,590 --> 00:25:15,840

the quality of the parts here on earth

689
00:25:18,870 --> 00:25:17,600
we're investing in

690
00:25:19,990 --> 00:25:18,880
um

691
00:25:23,669 --> 00:25:20,000
developing

692
00:25:26,470 --> 00:25:23,679
technologies to do 3d manufacturing of

693
00:25:28,710 --> 00:25:26,480
components of rocket engines even entire

694
00:25:30,630 --> 00:25:28,720
rocket engines so one of the projects

695
00:25:32,710 --> 00:25:30,640
space technology mission directorate's

696
00:25:36,710 --> 00:25:32,720
doing in conjunction with human

697
00:25:38,710 --> 00:25:36,720
exploration is is looking at

698
00:25:40,710 --> 00:25:38,720
building components out of various

699
00:25:43,430 --> 00:25:40,720
metals and then putting them in rocket

700
00:25:45,909 --> 00:25:43,440
engines and subjecting them to hot fire

701
00:25:47,830 --> 00:25:45,919
gives you the opportunity not only to

702
00:25:49,350 --> 00:25:47,840
build the thing and tweak it and twist

703
00:25:51,269 --> 00:25:49,360
it and pull it and

704
00:25:53,430 --> 00:25:51,279
determine its mechanical properties but

705
00:25:56,070 --> 00:25:53,440
then how does it last when you put it in

706
00:25:57,590 --> 00:25:56,080
the hot fire environment of a of a

707
00:25:59,110 --> 00:25:57,600
rocket engine high pressures high

708
00:25:59,990 --> 00:25:59,120
temperatures and so

709
00:26:01,750 --> 00:26:00,000
um

710
00:26:03,909 --> 00:26:01,760
i think the experiments being done on

711
00:26:05,750 --> 00:26:03,919
earth and the development demonstration

712
00:26:08,230 --> 00:26:05,760
activities combined with

713
00:26:10,390 --> 00:26:08,240

the demos we can do in space

714
00:26:11,750 --> 00:26:10,400
will give us confidence that the stuff

715
00:26:14,789 --> 00:26:11,760
we make

716
00:26:16,870 --> 00:26:14,799
by this method even though it's it's new

717
00:26:18,789 --> 00:26:16,880
and innovative and it's different than

718
00:26:21,269 --> 00:26:18,799
machining a part out of a huge chunk of

719
00:26:22,630 --> 00:26:21,279
metal for example um do have the

720
00:26:25,430 --> 00:26:22,640
durability

721
00:26:27,830 --> 00:26:25,440
do have the mechanical and thermal

722
00:26:30,710 --> 00:26:27,840
capabilities that

723
00:26:33,110 --> 00:26:30,720
traditional parts have and so that's

724
00:26:35,430 --> 00:26:33,120
part of the reason for the demo and and

725
00:26:37,350 --> 00:26:35,440
all the other

726
00:26:39,110 --> 00:26:37,360
technology development demonstration

727
00:26:40,710 --> 00:26:39,120
activities that are going on

728
00:26:43,110 --> 00:26:40,720
in that whole area of additive

729
00:26:44,230 --> 00:26:43,120
manufacturing so

730
00:26:45,430 --> 00:26:44,240
what year

731
00:26:47,669 --> 00:26:45,440
i don't know if it's going to be two

732
00:26:49,590 --> 00:26:47,679
years three years five years since

733
00:26:51,909 --> 00:26:49,600
but

734
00:26:53,430 --> 00:26:51,919
i think it's a certainty that nasa will

735
00:26:54,390 --> 00:26:53,440
reach the point

736
00:26:56,630 --> 00:26:54,400
of

737
00:26:59,430 --> 00:26:56,640
manufacturing replacement parts

738
00:27:01,190 --> 00:26:59,440

manufacturing tools as needed and

739
00:27:05,029 --> 00:27:01,200
relying on those

740
00:27:06,549 --> 00:27:05,039
instead of not in addition to

741
00:27:08,149 --> 00:27:06,559
things that are brought from earth if

742
00:27:09,430 --> 00:27:08,159
we're really going to set up shop on

743
00:27:11,830 --> 00:27:09,440
mars

744
00:27:13,430 --> 00:27:11,840
we have to get there we really can't

745
00:27:15,990 --> 00:27:13,440
afford to bring

746
00:27:17,350 --> 00:27:16,000
everything we need for an indefinite

747
00:27:19,590 --> 00:27:17,360
amount of time we may do that for the

748
00:27:21,590 --> 00:27:19,600
first mission but we'll need to get to

749
00:27:23,430 --> 00:27:21,600
the point where we can make things that

750
00:27:25,029 --> 00:27:23,440
we need as we go

751
00:27:26,870 --> 00:27:25,039
so we will get there

752
00:27:29,590 --> 00:27:26,880
i don't know if it'll be next year but

753
00:27:32,070 --> 00:27:29,600
it'll be in the near future

754
00:27:34,389 --> 00:27:32,080
uh ken cramer

755
00:27:36,470 --> 00:27:34,399
hi ken kramer for um universe today in

756
00:27:39,029 --> 00:27:36,480
america space got a question kind of for

757
00:27:40,389 --> 00:27:39,039
for all of you um

758
00:27:44,310 --> 00:27:40,399
the is

759
00:27:46,630 --> 00:27:44,320
extension so what i would like to know

760
00:27:48,950 --> 00:27:46,640
is have you gotten some new proposals

761
00:27:51,350 --> 00:27:48,960
now for science and technology now that

762
00:27:52,630 --> 00:27:51,360
you've got this extension of at least

763
00:27:55,269 --> 00:27:52,640

four years

764
00:27:56,630 --> 00:27:55,279
um i also would like to know

765
00:27:57,990 --> 00:27:56,640
you've talked a lot about the earth

766
00:28:00,230 --> 00:27:58,000
science

767
00:28:02,070 --> 00:28:00,240
okay i'd like to know

768
00:28:05,510 --> 00:28:02,080
what will we be doing if anything for

769
00:28:07,350 --> 00:28:05,520
the iss for astronomy and astrophysics

770
00:28:09,029 --> 00:28:07,360
jeff i really enjoyed um your

771
00:28:10,549 --> 00:28:09,039
presentation too

772
00:28:12,870 --> 00:28:10,559
had a lot of questions you answered but

773
00:28:15,669 --> 00:28:12,880
i like to know about these solar arrays

774
00:28:18,070 --> 00:28:15,679
you mentioned augmenting the iss could

775
00:28:20,310 --> 00:28:18,080
these possibly be used for unmanned

776
00:28:23,350 --> 00:28:20,320
missions in deep space to for the outer

777
00:28:26,710 --> 00:28:23,360
planets given the limitations of the um

778
00:28:28,870 --> 00:28:26,720
plutonium supply thank you

779
00:28:29,750 --> 00:28:28,880
maybe i'll talk first about solar rays

780
00:28:32,710 --> 00:28:29,760
and

781
00:28:36,470 --> 00:28:32,720
also i'll touch on long-term

782
00:28:41,029 --> 00:28:38,230
you know as you go deeper into space

783
00:28:44,310 --> 00:28:41,039
solar becomes a less and less attractive

784
00:28:46,870 --> 00:28:44,320
option because the solar flux or fluence

785
00:28:49,350 --> 00:28:46,880
falls off pretty rapidly as you get get

786
00:28:51,830 --> 00:28:49,360
out so

787
00:28:55,029 --> 00:28:51,840
but yes the bigger you're able to make

788
00:28:57,590 --> 00:28:55,039

an array the more of that decreasing

789
00:28:59,430 --> 00:28:57,600
light you can capture and so

790
00:29:02,070 --> 00:28:59,440
one of the things we're looking at to

791
00:29:04,470 --> 00:29:02,080
kind of augment the let's go big in

792
00:29:07,110 --> 00:29:04,480
solar arrays is how can you

793
00:29:09,350 --> 00:29:07,120
assemble these things on orbit maybe

794
00:29:11,269 --> 00:29:09,360
even reconfigure them so

795
00:29:14,149 --> 00:29:11,279
we're gearing up to do development and

796
00:29:16,870 --> 00:29:14,159
demonstration projects in lightweight

797
00:29:19,269 --> 00:29:16,880
structures autonomous assembly and

798
00:29:22,070 --> 00:29:19,279
looking at maybe getting to megawatt

799
00:29:23,669 --> 00:29:22,080
class solar rays so

800
00:29:25,750 --> 00:29:23,679
i think you know there's a trade always

801
00:29:27,190 --> 00:29:25,760
to be made in terms of

802
00:29:28,710 --> 00:29:27,200
whether you want to go solar whether you

803
00:29:30,870 --> 00:29:28,720
want to go nuclear

804
00:29:33,590 --> 00:29:30,880
as you go deeper and deeper into space

805
00:29:35,269 --> 00:29:33,600
and nuclear tends to win out because you

806
00:29:37,510 --> 00:29:35,279
don't need to capture that decreasing

807
00:29:39,110 --> 00:29:37,520
amount of light but

808
00:29:40,950 --> 00:29:39,120
but those are the kind of trades we're

809
00:29:42,710 --> 00:29:40,960
looking at and and developing the

810
00:29:45,190 --> 00:29:42,720
ability to make big arrays is something

811
00:29:47,430 --> 00:29:45,200
that we're looking at in terms of

812
00:29:49,430 --> 00:29:47,440
long-term use of the station

813
00:29:51,430 --> 00:29:49,440

one of the things that we're really

814
00:29:52,230 --> 00:29:51,440
looking at is

815
00:29:53,909 --> 00:29:52,240
the

816
00:29:56,789 --> 00:29:53,919
environmental control and life support

817
00:29:59,110 --> 00:29:56,799
systems what what we do on the station

818
00:30:01,190 --> 00:29:59,120
uh you know is effective but it requires

819
00:30:03,350 --> 00:30:01,200
a lot of upkeep a lot of maintenance

820
00:30:06,470 --> 00:30:03,360
we'd like to increase the efficiencies

821
00:30:09,830 --> 00:30:06,480
of some of the processes for say

822
00:30:10,870 --> 00:30:09,840
recovering water we recover a lot um

823
00:30:12,149 --> 00:30:10,880
you've

824
00:30:14,149 --> 00:30:12,159
most people know about the urine

825
00:30:16,789 --> 00:30:14,159
processor assembly which tries to

826
00:30:18,310 --> 00:30:16,799
recover water in in that method and

827
00:30:20,070 --> 00:30:18,320
people tend to giggle about it but it's

828
00:30:22,230 --> 00:30:20,080
a lot of water and we can recover it and

829
00:30:25,029 --> 00:30:22,240
and put it to good use and and but

830
00:30:26,630 --> 00:30:25,039
there's other uh water that's that's uh

831
00:30:29,190 --> 00:30:26,640
consumed on the station if we could

832
00:30:31,269 --> 00:30:29,200
recover a bigger fraction of that um

833
00:30:33,990 --> 00:30:31,279
oxygen recovery those sorts of

834
00:30:36,389 --> 00:30:34,000
technologies and so the iss will be

835
00:30:37,190 --> 00:30:36,399
the demonstration platform

836
00:30:39,510 --> 00:30:37,200
to

837
00:30:41,909 --> 00:30:39,520
implement the next generation of life

838
00:30:44,870 --> 00:30:41,919

support technologies that gets ready to

839
00:30:47,750 --> 00:30:44,880
live on mars in the 2030s as ellen

840
00:30:49,590 --> 00:30:47,760
mentioned and so we see those

841
00:30:52,070 --> 00:30:49,600
development and demonstration activities

842
00:30:53,990 --> 00:30:52,080
going well into the extended life of the

843
00:30:56,470 --> 00:30:54,000
station so that's just one example yeah

844
00:30:58,630 --> 00:30:56,480
i'd like to expand them upon that uh not

845
00:31:00,950 --> 00:30:58,640
only the technology of keeping humans

846
00:31:02,870 --> 00:31:00,960
alive and and healthy is you know the

847
00:31:05,110 --> 00:31:02,880
crew exercise equipment is another area

848
00:31:07,430 --> 00:31:05,120
that will be developing the next

849
00:31:10,070 --> 00:31:07,440
generation technology the air and and

850
00:31:12,310 --> 00:31:10,080
blood uh characterization on orbit and

851
00:31:13,750 --> 00:31:12,320
situ measurements on orbit that we need

852
00:31:15,669 --> 00:31:13,760
to keep the crew healthy and things of

853
00:31:17,590 --> 00:31:15,679
that nature our

854
00:31:19,190 --> 00:31:17,600
our partner director the science mission

855
00:31:21,190 --> 00:31:19,200
directorate has

856
00:31:23,830 --> 00:31:21,200
put space station as part of their

857
00:31:25,590 --> 00:31:23,840
platforms and their uh and their regular

858
00:31:28,470 --> 00:31:25,600
research data calls

859
00:31:29,990 --> 00:31:28,480
we have more earth science

860
00:31:33,190 --> 00:31:30,000
instruments being flown to station the

861
00:31:35,509 --> 00:31:33,200
next couple of years we have

862
00:31:37,269 --> 00:31:35,519
proposals for heliophysics and we have

863
00:31:38,630 --> 00:31:37,279

high energy physics like ice cream

864
00:31:39,909 --> 00:31:38,640
coming up

865
00:31:46,070 --> 00:31:39,919
next

866
00:31:48,149 --> 00:31:46,080
bit going on across the directorates

867
00:31:50,389 --> 00:31:48,159
not to mention on the exploration

868
00:31:52,950 --> 00:31:50,399
technology side for instance we're doing

869
00:31:54,950 --> 00:31:52,960
the robotic

870
00:31:57,110 --> 00:31:54,960
refueling demonstrations on space

871
00:31:59,350 --> 00:31:57,120
station we're also going to be flying up

872
00:32:00,470 --> 00:31:59,360
a a sensor suite for prox ops and

873
00:32:02,070 --> 00:32:00,480
rendezvous

874
00:32:03,430 --> 00:32:02,080
that we'll be demonstrating on space

875
00:32:05,430 --> 00:32:03,440
station that could be used across the

876
00:32:07,750 --> 00:32:05,440
spectrum of spacecraft

877
00:32:09,509 --> 00:32:07,760
as we go beyond low earth orbit so

878
00:32:10,789 --> 00:32:09,519
we have a lot going on

879
00:32:12,389 --> 00:32:10,799
not only in the near term for space

880
00:32:14,789 --> 00:32:12,399
station but we are planning you know to

881
00:32:17,269 --> 00:32:14,799
fully utilize the platform in all all

882
00:32:19,909 --> 00:32:17,279
its aspects from human research to

883
00:32:21,509 --> 00:32:19,919
science mission direct to technology to

884
00:32:24,870 --> 00:32:21,519
returning benefits to people here on

885
00:32:26,710 --> 00:32:24,880
earth so um our plates felt filling up

886
00:32:28,549 --> 00:32:26,720
yeah if i could expand i mean one of the

887
00:32:30,070 --> 00:32:28,559
critical things when you think about um

888
00:32:31,750 --> 00:32:30,080

a scientist trying to conduct this

889
00:32:32,950 --> 00:32:31,760
experiment if you conduct it once you

890
00:32:35,350 --> 00:32:32,960
find something interesting and it

891
00:32:37,830 --> 00:32:35,360
usually doesn't end right there and so

892
00:32:41,830 --> 00:32:37,840
um for for the research community having

893
00:32:43,669 --> 00:32:41,840
this 10-year extension going out to

894
00:32:45,190 --> 00:32:43,679
um you know there are new areas of

895
00:32:46,870 --> 00:32:45,200
research that are going to come in that

896
00:32:49,110 --> 00:32:46,880
we don't know yet but a lot of it is

897
00:32:51,909 --> 00:32:49,120
that continuity so for example this is

898
00:32:54,389 --> 00:32:51,919
our first rodent flight and so there's

899
00:32:56,389 --> 00:32:54,399
already a whole series of plans for how

900
00:32:58,230 --> 00:32:56,399
can we expand

901
00:33:00,549 --> 00:32:58,240
the use of model systems not just

902
00:33:01,750 --> 00:33:00,559
rodents but also fruit flies and the

903
00:33:03,909 --> 00:33:01,760
other

904
00:33:06,710 --> 00:33:03,919
organisms that we sent up plants

905
00:33:09,029 --> 00:33:06,720
to really try to get at okay you ask a

906
00:33:11,190 --> 00:33:09,039
question you get an answer that leads to

907
00:33:13,350 --> 00:33:11,200
more questions you want to follow up and

908
00:33:15,350 --> 00:33:13,360
it's that ability to tell the research

909
00:33:16,470 --> 00:33:15,360
community look you have this platform

910
00:33:17,990 --> 00:33:16,480
for a long time you're going to be able

911
00:33:20,149 --> 00:33:18,000
to follow up on your scientific

912
00:33:22,950 --> 00:33:20,159
questions and get an answer

913
00:33:25,909 --> 00:33:22,960

is extremely important um

914
00:33:28,389 --> 00:33:25,919
and and for example one of the specific

915
00:33:31,029 --> 00:33:28,399
examples um which sam touched on earlier

916
00:33:32,470 --> 00:33:31,039
was the one-year mission um when we try

917
00:33:34,149 --> 00:33:32,480
to say all right we want to send humans

918
00:33:37,190 --> 00:33:34,159
to mars eight months there eight months

919
00:33:39,830 --> 00:33:37,200
back sometime on the surface um the

920
00:33:42,070 --> 00:33:39,840
amount of risks that we have to mitigate

921
00:33:44,710 --> 00:33:42,080
between now and the 2030s

922
00:33:46,470 --> 00:33:44,720
having the number of subjects up on the

923
00:33:48,950 --> 00:33:46,480
international space station to gather

924
00:33:51,590 --> 00:33:48,960
data on eye health on cardiovascular

925
00:33:53,669 --> 00:33:51,600
issues immune system issues

926
00:33:55,269 --> 00:33:53,679
that 10-year period is giving our human

927
00:33:57,029 --> 00:33:55,279
research program

928
00:33:59,190 --> 00:33:57,039
the assurance that they're going to have

929
00:34:01,590 --> 00:33:59,200
enough individuals that they can study

930
00:34:03,029 --> 00:34:01,600
over the right time intervals that we

931
00:34:04,710 --> 00:34:03,039
really know what we're doing when we

932
00:34:06,070 --> 00:34:04,720
send humans you know the when the humans

933
00:34:07,590 --> 00:34:06,080
get to mars after eight months they've

934
00:34:09,109 --> 00:34:07,600
got to be able to

935
00:34:11,270 --> 00:34:09,119
get out of the spacecraft and start

936
00:34:12,950 --> 00:34:11,280
working and then they got to be able to

937
00:34:14,470 --> 00:34:12,960
come back and so we need to make sure

938
00:34:16,149 --> 00:34:14,480

they're ready to do that and so this

939
00:34:17,909 --> 00:34:16,159
10-year period has given our human

940
00:34:19,750 --> 00:34:17,919
research program

941
00:34:21,750 --> 00:34:19,760
a really good map

942
00:34:23,109 --> 00:34:21,760
um to get there safely and that's that's

943
00:34:24,950 --> 00:34:23,119
been critical and then the one-year

944
00:34:26,950 --> 00:34:24,960
missions coming up are really the the

945
00:34:29,589 --> 00:34:26,960
first first part of that

946
00:34:32,389 --> 00:34:29,599
um and as far as earth science goes just

947
00:34:34,470 --> 00:34:32,399
later this year we have a cloud aerosol

948
00:34:35,909 --> 00:34:34,480
mission launching cats that studies

949
00:34:38,230 --> 00:34:35,919
little particles in the atmosphere that

950
00:34:41,349 --> 00:34:38,240
have an effect on on weather and climate

951
00:34:42,869 --> 00:34:41,359
going up um and we just selected two new

952
00:34:45,510 --> 00:34:42,879
payloads in our science that will be

953
00:34:48,230 --> 00:34:45,520
going up over the next couple years to

954
00:34:49,270 --> 00:34:48,240
study again various aspects of of this

955
00:34:51,349 --> 00:34:49,280
planet

956
00:34:52,869 --> 00:34:51,359
in astrophysics not just the ice cream

957
00:34:54,950 --> 00:34:52,879
payload that sam mentioned that'll be

958
00:34:56,869 --> 00:34:54,960
going up

959
00:34:59,589 --> 00:34:56,879
but the continuation of measurements on

960
00:35:01,190 --> 00:34:59,599
ams the alpha magnetic spectrometer one

961
00:35:03,829 --> 00:35:01,200
of the issues with ams is we're trying

962
00:35:06,310 --> 00:35:03,839
to collect these high-energy particles

963
00:35:08,150 --> 00:35:06,320

and we really need time to go forward

964
00:35:10,870 --> 00:35:08,160
for them to really get at this question

965
00:35:12,870 --> 00:35:10,880
are we detecting evidence of dark matter

966
00:35:15,109 --> 00:35:12,880
we're not there yet we're seeing hints

967
00:35:18,790 --> 00:35:15,119
that that's what we're seeing

968
00:35:20,390 --> 00:35:18,800
but the time to collect the data for ams

969
00:35:22,310 --> 00:35:20,400
is really critical and i think it's

970
00:35:24,630 --> 00:35:22,320
really exciting we're not able to say

971
00:35:26,230 --> 00:35:24,640
definitively yes we've seen evidence of

972
00:35:28,150 --> 00:35:26,240
dark matter right

973
00:35:30,230 --> 00:35:28,160
right at this point in time all we can

974
00:35:32,630 --> 00:35:30,240
say is that we're seeing hints of it but

975
00:35:34,069 --> 00:35:32,640
ams is going to nail that down it's just

976
00:35:36,230 --> 00:35:34,079
going to take a couple more years of

977
00:35:39,109 --> 00:35:36,240
data collection so stay tuned on that

978
00:35:41,030 --> 00:35:39,119
one it's an amazing platform and we're

979
00:35:43,510 --> 00:35:41,040
really trying to utilize it the best we

980
00:35:45,829 --> 00:35:43,520
can over the time interval that we have

981
00:35:47,670 --> 00:35:45,839
and again our commercial cargo partners

982
00:35:49,349 --> 00:35:47,680
are really critical uh in that

983
00:35:51,990 --> 00:35:49,359
partnership going forward as well as

984
00:35:53,670 --> 00:35:52,000
cases our in our national lab partner

985
00:35:55,990 --> 00:35:53,680
and our international partners it's all

986
00:35:59,270 --> 00:35:56,000
about partnerships

987
00:36:00,870 --> 00:35:59,280
i think the gentleman in the yellow

988
00:36:02,870 --> 00:36:00,880

thanks stephen clark with space flight

989
00:36:04,069 --> 00:36:02,880
now for uh sam

990
00:36:06,230 --> 00:36:04,079
um

991
00:36:09,670 --> 00:36:06,240
when do you expect to release an rfp for

992
00:36:10,710 --> 00:36:09,680
the crs-2 contract and make awards

993
00:36:12,150 --> 00:36:10,720
and also

994
00:36:13,670 --> 00:36:12,160
what's your strategy for bridging the

995
00:36:16,630 --> 00:36:13,680
gap between the existing contract and

996
00:36:18,710 --> 00:36:16,640
crs-2 with extensions to the current

997
00:36:19,750 --> 00:36:18,720
providers and when do you expect to do

998
00:36:22,310 --> 00:36:19,760
that thanks

999
00:36:23,589 --> 00:36:22,320
i don't have particular dates

1000
00:36:24,870 --> 00:36:23,599
handy with me

1001
00:36:26,870 --> 00:36:24,880
but there are i can tell you what the

1002
00:36:28,950 --> 00:36:26,880
strategy is uh the strategy is to make

1003
00:36:32,710 --> 00:36:28,960
sure that we don't have a gap

1004
00:36:34,790 --> 00:36:32,720
in in between crs-1 and crs-2 so we have

1005
00:36:37,990 --> 00:36:34,800
um in the process of extending the

1006
00:36:42,390 --> 00:36:39,670
contracts that we have

1007
00:36:44,630 --> 00:36:42,400
to make sure that we do not have a gap

1008
00:36:46,710 --> 00:36:44,640
we're expecting uh

1009
00:36:50,390 --> 00:36:46,720
to be able to

1010
00:36:52,190 --> 00:36:50,400
bring online the our crs2 providers

1011
00:36:53,910 --> 00:36:52,200
sometime in the

1012
00:36:58,069 --> 00:36:53,920
2017-2018

1013
00:36:58,079 --> 00:37:03,910

uh james dean

1014
00:37:08,470 --> 00:37:06,310
uh thanks james d in florida today a few

1015
00:37:10,550 --> 00:37:08,480
questions if there's time but uh sam

1016
00:37:12,870 --> 00:37:10,560
first uh just wonder if you could expand

1017
00:37:14,630 --> 00:37:12,880
on the significance immediately if any

1018
00:37:17,190 --> 00:37:14,640
of the commercial crew

1019
00:37:19,190 --> 00:37:17,200
announcement uh in just giving you that

1020
00:37:21,990 --> 00:37:19,200
certainty now about who your providers

1021
00:37:23,750 --> 00:37:22,000
are going to be and how quickly does do

1022
00:37:25,589 --> 00:37:23,760
you kind of like integrate

1023
00:37:28,310 --> 00:37:25,599
iss into their

1024
00:37:30,230 --> 00:37:28,320
continued development process um is it

1025
00:37:31,030 --> 00:37:30,240
not until you get to like a test flight

1026
00:37:33,510 --> 00:37:31,040
uh

1027
00:37:35,030 --> 00:37:33,520
crude test flight point or or much

1028
00:37:36,630 --> 00:37:35,040
sooner than that uh what's been

1029
00:37:38,710 --> 00:37:36,640
happening actually the uh station

1030
00:37:40,870 --> 00:37:38,720
program has been integral actually to

1031
00:37:42,790 --> 00:37:40,880
all the development to date and and the

1032
00:37:44,550 --> 00:37:42,800
station program will be continued

1033
00:37:48,390 --> 00:37:44,560
through the uh through this contract

1034
00:37:50,790 --> 00:37:48,400
period uh through the certification uh

1035
00:37:52,550 --> 00:37:50,800
the purpose of of us going down the

1036
00:37:53,750 --> 00:37:52,560
commercial crew route is to get crew to

1037
00:37:56,950 --> 00:37:53,760
space station

1038
00:37:59,190 --> 00:37:56,960

and so station is a large part of of the

1039
00:38:01,349 --> 00:37:59,200
certification of getting there providing

1040
00:38:03,430 --> 00:38:01,359
a rescue service being on station you

1041
00:38:05,750 --> 00:38:03,440
know for six months or so and then

1042
00:38:08,950 --> 00:38:05,760
returning so a station is actually

1043
00:38:15,270 --> 00:38:08,960
integral to the certification of of

1044
00:38:20,310 --> 00:38:17,430
i was i wonder if you could explain how

1045
00:38:23,030 --> 00:38:20,320
adding a fourth crew member

1046
00:38:25,510 --> 00:38:23,040
apparently doubles the science output

1047
00:38:27,109 --> 00:38:25,520
you anticipate on station and if that is

1048
00:38:30,150 --> 00:38:27,119
in fact the case

1049
00:38:32,870 --> 00:38:30,160
why isn't there a lot more urgency to

1050
00:38:35,270 --> 00:38:32,880
enable that capability um

1051
00:38:36,310 --> 00:38:35,280
you know we've certainly heard it but

1052
00:38:38,470 --> 00:38:36,320
you know we hear more about sort of

1053
00:38:40,550 --> 00:38:38,480
restoring this capability to launch

1054
00:38:41,349 --> 00:38:40,560
astronauts and so forth but not much

1055
00:38:43,829 --> 00:38:41,359
about

1056
00:38:45,589 --> 00:38:43,839
how this goes let's get much more output

1057
00:38:48,150 --> 00:38:45,599
from productivity from the station it

1058
00:38:50,710 --> 00:38:48,160
was always intended to expand the the

1059
00:38:53,190 --> 00:38:50,720
crew size on space station to

1060
00:38:55,349 --> 00:38:53,200
the uh to a seventh crew member that was

1061
00:38:59,670 --> 00:38:55,359
always always the plan we have not had

1062
00:39:01,670 --> 00:38:59,680
the capability when we lost the ability

1063
00:39:03,910 --> 00:39:01,680

when the shuttle program ended to expand

1064
00:39:06,310 --> 00:39:03,920
the crew size for for for periods of

1065
00:39:11,030 --> 00:39:06,320
time uh we we had to rely on the on the

1066
00:39:12,390 --> 00:39:11,040
soyuz as you all are aware of so we are

1067
00:39:15,030 --> 00:39:12,400
we would have liked to have it much

1068
00:39:17,670 --> 00:39:15,040
earlier but we're happy to get it when

1069
00:39:19,190 --> 00:39:17,680
we do get it and that crew member an

1070
00:39:21,990 --> 00:39:19,200
additional crew member will be fully

1071
00:39:22,950 --> 00:39:22,000
subscribed how it doubles is basically

1072
00:39:24,470 --> 00:39:22,960
is that

1073
00:39:27,750 --> 00:39:24,480
we have

1074
00:39:30,950 --> 00:39:27,760
the equivalent of one work week of of

1075
00:39:32,230 --> 00:39:30,960
accrue time today 35 hours at least 35

1076
00:39:34,470 --> 00:39:32,240
hours of

1077
00:39:36,710 --> 00:39:34,480
utilization time this additional crew

1078
00:39:40,150 --> 00:39:36,720
member will dedicate event effectively

1079
00:39:43,190 --> 00:39:40,160
be able to double uh that amount of work

1080
00:39:45,109 --> 00:39:43,200
week time so that's basically how

1081
00:39:46,870 --> 00:39:45,119
we're doubling the other crew members

1082
00:39:48,069 --> 00:39:46,880
are are

1083
00:39:50,470 --> 00:39:48,079
you know there's a lot of time the crew

1084
00:39:52,150 --> 00:39:50,480
has to sleep uh they have to exercise

1085
00:39:54,550 --> 00:39:52,160
they have to eat

1086
00:39:56,390 --> 00:39:54,560
they have to be able to maintain the

1087
00:39:58,550 --> 00:39:56,400
space station in a healthy environment

1088
00:40:00,310 --> 00:39:58,560

so uh this dish this additional crew

1089
00:40:02,630 --> 00:40:00,320
member will um

1090
00:40:05,109 --> 00:40:02,640
be more free and not that this

1091
00:40:06,390 --> 00:40:05,119
particular person will do all he'll be

1092
00:40:08,470 --> 00:40:06,400
dedicated but

1093
00:40:10,390 --> 00:40:08,480
we've got to spread out the time uh more

1094
00:40:11,750 --> 00:40:10,400
evenly across the crew members and

1095
00:40:13,510 --> 00:40:11,760
obviously that's critical i mean some of

1096
00:40:15,829 --> 00:40:13,520
our experiments like rapid scat aren't

1097
00:40:17,750 --> 00:40:15,839
don't require human tending but other

1098
00:40:19,510 --> 00:40:17,760
experiments for example like the rodents

1099
00:40:22,069 --> 00:40:19,520
some of our plant experiments some of

1100
00:40:23,990 --> 00:40:22,079
our materials uh properties experiments

1101
00:40:26,069 --> 00:40:24,000
that we do they take a lot of crew time

1102
00:40:29,510 --> 00:40:26,079
and so being able to have

1103
00:40:30,950 --> 00:40:29,520
that extra 40 hours a week uh is is a

1104
00:40:34,069 --> 00:40:30,960
critical thing that we've sort of been

1105
00:40:36,390 --> 00:40:34,079
building in and so to get the commercial

1106
00:40:38,710 --> 00:40:36,400
crew announcement out this week and to

1107
00:40:40,470 --> 00:40:38,720
see us on that path is something the

1108
00:40:43,910 --> 00:40:40,480
research community is really excited

1109
00:40:47,910 --> 00:40:45,349
thanks evan last one jeff i don't know

1110
00:40:50,550 --> 00:40:47,920
if this might fall in your area

1111
00:40:52,870 --> 00:40:50,560
if spacex as i believe they are is doing

1112
00:40:55,589 --> 00:40:52,880
their booster flyback this this flight

1113
00:40:57,990 --> 00:40:55,599

um is nasa deploying any

1114
00:40:59,589 --> 00:40:58,000
uh assets to track the uh the booster i

1115
00:41:02,390 --> 00:40:59,599
think i believe that was part of a um

1116
00:41:04,390 --> 00:41:02,400
sort of mars related um

1117
00:41:05,589 --> 00:41:04,400
research on atmospheric re-entry and so

1118
00:41:09,109 --> 00:41:05,599
forth

1119
00:41:11,430 --> 00:41:09,119
right we have a effort in a topic called

1120
00:41:13,109 --> 00:41:11,440
supersonic retro propulsion

1121
00:41:14,790 --> 00:41:13,119
which is uh

1122
00:41:16,790 --> 00:41:14,800
would be a means of

1123
00:41:19,349 --> 00:41:16,800
slowing down vehicles descending to the

1124
00:41:21,910 --> 00:41:19,359
surface of mars

1125
00:41:24,790 --> 00:41:21,920
and it turns out that spacex in the

1126
00:41:27,430 --> 00:41:24,800
course of their own investigations

1127
00:41:30,150 --> 00:41:27,440
into flying back their boosters

1128
00:41:31,430 --> 00:41:30,160
and and bringing them to soft landing

1129
00:41:32,150 --> 00:41:31,440
for reuse

1130
00:41:33,109 --> 00:41:32,160
is

1131
00:41:35,750 --> 00:41:33,119
um

1132
00:41:37,589 --> 00:41:35,760
actually operating their engines in the

1133
00:41:40,230 --> 00:41:37,599
precise environment

1134
00:41:41,190 --> 00:41:40,240
uh in the flight regime in terms of mach

1135
00:41:43,990 --> 00:41:41,200
number

1136
00:41:46,710 --> 00:41:44,000
that we're interested in for supersonic

1137
00:41:50,870 --> 00:41:46,720
retropropulsion for mars and so nasa has

1138
00:41:52,309 --> 00:41:50,880

been engaged in the last few flights in

1139
00:41:55,109 --> 00:41:52,319
getting data

1140
00:41:58,309 --> 00:41:55,119
in supplementing what spacex is doing to

1141
00:42:01,030 --> 00:41:58,319
obtain data and then in um

1142
00:42:02,790 --> 00:42:01,040
with a agree under agreement with spacex

1143
00:42:04,950 --> 00:42:02,800
utilizing that data

1144
00:42:06,950 --> 00:42:04,960
um getting all the data that spacex

1145
00:42:09,589 --> 00:42:06,960
collects and and trying to

1146
00:42:11,349 --> 00:42:09,599
see if we need to do our own experiments

1147
00:42:13,270 --> 00:42:11,359
or if what they're doing is

1148
00:42:14,470 --> 00:42:13,280
is enough to give us the information we

1149
00:42:17,750 --> 00:42:14,480
need so

1150
00:42:19,670 --> 00:42:17,760
to to date it saved us a significant

1151
00:42:21,430 --> 00:42:19,680
development effort that we were getting

1152
00:42:23,670 --> 00:42:21,440
ready to undertake

1153
00:42:25,990 --> 00:42:23,680
once we realized that we could partner

1154
00:42:27,270 --> 00:42:26,000
with spacex and and utilize the data

1155
00:42:30,230 --> 00:42:27,280
sets that they're

1156
00:42:33,190 --> 00:42:30,240
uh obtaining and that we could

1157
00:42:35,349 --> 00:42:33,200
deploy some additional assets to help

1158
00:42:37,270 --> 00:42:35,359
collect additional data we jumped on

1159
00:42:39,829 --> 00:42:37,280
that and so again that's a great

1160
00:42:43,349 --> 00:42:39,839
partnership that allows us to

1161
00:42:43,359 --> 00:42:47,589
and without having to pay for it twice

1162
00:42:54,470 --> 00:42:51,430
irene thanks um irene klotz with reuters

1163
00:42:57,430 --> 00:42:54,480

um sam could you just explain what needs

1164
00:43:00,230 --> 00:42:57,440
to be uh flown if anything to the

1165
00:43:02,390 --> 00:43:00,240
station to accommodate a permanent

1166
00:43:04,870 --> 00:43:02,400
seventh crew member like a sleeping

1167
00:43:06,950 --> 00:43:04,880
birth or whatever and also um in the

1168
00:43:09,670 --> 00:43:06,960
boeing proposal at least includes a

1169
00:43:11,030 --> 00:43:09,680
fifth seat for a tourist or space flight

1170
00:43:12,710 --> 00:43:11,040
participant

1171
00:43:14,790 --> 00:43:12,720
how many people actually could be

1172
00:43:16,790 --> 00:43:14,800
accommodated on the station

1173
00:43:18,150 --> 00:43:16,800
that are not crew members

1174
00:43:21,109 --> 00:43:18,160
thanks

1175
00:43:24,230 --> 00:43:21,119
so we so the um

1176
00:43:25,670 --> 00:43:24,240
i'll answer the last question first

1177
00:43:27,670 --> 00:43:25,680
we have the capability for short periods

1178
00:43:30,950 --> 00:43:27,680
of time to accommodate additional crew

1179
00:43:32,710 --> 00:43:30,960
members on board the space station

1180
00:43:34,150 --> 00:43:32,720
if you remember during

1181
00:43:36,550 --> 00:43:34,160
shuttle times

1182
00:43:38,870 --> 00:43:36,560
we had quite a few extra crew members

1183
00:43:41,670 --> 00:43:38,880
aboard space station but the shuttle

1184
00:43:43,190 --> 00:43:41,680
brought uh with them uh their own food

1185
00:43:45,670 --> 00:43:43,200
their own water their own sleeping

1186
00:43:47,190 --> 00:43:45,680
station things of that nature uh with

1187
00:43:48,950 --> 00:43:47,200
the our commercial crew providers

1188
00:43:50,790 --> 00:43:48,960

they're basically bringing up the crew

1189
00:43:51,910 --> 00:43:50,800
themselves and maybe a small amount of

1190
00:43:53,109 --> 00:43:51,920
supplies

1191
00:43:56,630 --> 00:43:53,119
uh so

1192
00:43:59,990 --> 00:43:56,640
um uh to be able to accommodate you know

1193
00:44:02,790 --> 00:44:00,000
around a couple of weeks or so um

1194
00:44:04,470 --> 00:44:02,800
we'd have to do you know exact analysis

1195
00:44:06,470 --> 00:44:04,480
on you know how long they could actually

1196
00:44:09,750 --> 00:44:06,480
stay given the particular increment that

1197
00:44:11,349 --> 00:44:09,760
they're on we do something today called

1198
00:44:13,670 --> 00:44:11,359
direct handover

1199
00:44:15,349 --> 00:44:13,680
that also allows similar activities with

1200
00:44:17,430 --> 00:44:15,359
the soyuz

1201
00:44:19,430 --> 00:44:17,440
as far as what accommodations do we need

1202
00:44:20,790 --> 00:44:19,440
to uh to add additional crew members

1203
00:44:23,030 --> 00:44:20,800
obviously they

1204
00:44:25,510 --> 00:44:23,040
need food for them and their and their

1205
00:44:27,030 --> 00:44:25,520
toothpaste and their clothes uh

1206
00:44:28,790 --> 00:44:27,040
those kind those kind of things have

1207
00:44:30,069 --> 00:44:28,800
have to be accommodated uh we also have

1208
00:44:32,150 --> 00:44:30,079
to accommodate an additional sleep

1209
00:44:33,910 --> 00:44:32,160
station as well but it's just more of

1210
00:44:38,069 --> 00:44:33,920
the same there's nothing quite unique

1211
00:44:40,550 --> 00:44:39,670
other questions

1212
00:44:42,550 --> 00:44:40,560
ken

1213
00:44:44,390 --> 00:44:42,560

yeah i'd like to follow up i'd like to

1214
00:44:46,069 --> 00:44:44,400
actually follow up on this about the

1215
00:44:48,390 --> 00:44:46,079
extra crew member

1216
00:44:50,950 --> 00:44:48,400
so you would probably need would you

1217
00:44:52,550 --> 00:44:50,960
probably need then to bring up more

1218
00:44:55,270 --> 00:44:52,560
payload every year if you're going to

1219
00:44:57,430 --> 00:44:55,280
have a seventh crew member okay do you

1220
00:44:59,829 --> 00:44:57,440
need more crs you know flights from

1221
00:45:01,030 --> 00:44:59,839
orbital and spacex or whoever else um

1222
00:45:03,829 --> 00:45:01,040
you choose

1223
00:45:05,349 --> 00:45:03,839
yeah so our we expect our uh

1224
00:45:07,190 --> 00:45:05,359
requirements for

1225
00:45:09,670 --> 00:45:07,200
uh for for

1226
00:45:11,589 --> 00:45:09,680
the our commercial cargo providers to go

1227
00:45:13,109 --> 00:45:11,599
up in this in this timeframe yes and

1228
00:45:15,589 --> 00:45:13,119
part of it is

1229
00:45:17,109 --> 00:45:15,599
is the uh additional supplies needed for

1230
00:45:19,349 --> 00:45:17,119
for for the crew

1231
00:45:21,990 --> 00:45:19,359
it also is related to utilizing the

1232
00:45:23,990 --> 00:45:22,000
space station uh more in a more robust

1233
00:45:26,630 --> 00:45:24,000
way as well so we're expecting our

1234
00:45:28,950 --> 00:45:26,640
utilization requirements to also go up

1235
00:45:32,550 --> 00:45:28,960
in the same time period so it's a

1236
00:45:36,069 --> 00:45:32,560
combination of both

1237
00:45:38,150 --> 00:45:36,079
marcia marcia done associated press um

1238
00:45:39,910 --> 00:45:38,160

space station question

1239
00:45:41,430 --> 00:45:39,920
in that inspector general report it

1240
00:45:42,550 --> 00:45:41,440
mentioned how

1241
00:45:44,870 --> 00:45:42,560
cargo

1242
00:45:46,790 --> 00:45:44,880
with the absence of the japanese and

1243
00:45:48,309 --> 00:45:46,800
european cargo carriers is going to be

1244
00:45:50,630 --> 00:45:48,319
more of a crunch to get more things up

1245
00:45:51,910 --> 00:45:50,640
there obviously and i'm just wondering

1246
00:45:53,910 --> 00:45:51,920
um

1247
00:45:55,829 --> 00:45:53,920
why i know these decisions were made

1248
00:45:58,790 --> 00:45:55,839
long ago but why were the europeans and

1249
00:46:01,030 --> 00:45:58,800
the japanese limited to such

1250
00:46:02,950 --> 00:46:01,040
relatively a handful of resupply

1251
00:46:05,829 --> 00:46:02,960
missions why aren't they doing more in

1252
00:46:07,510 --> 00:46:05,839
that regard and um

1253
00:46:09,270 --> 00:46:07,520
how worried are you that you can get

1254
00:46:11,190 --> 00:46:09,280
enough up there to do all the science

1255
00:46:12,950 --> 00:46:11,200
and keep the seventh person and i mean

1256
00:46:15,190 --> 00:46:12,960
there's a lot going on as you mentioned

1257
00:46:16,470 --> 00:46:15,200
but that takes a lot of up mass yeah so

1258
00:46:19,589 --> 00:46:16,480
um our

1259
00:46:22,710 --> 00:46:19,599
go back to our original plans i'll

1260
00:46:25,030 --> 00:46:22,720
address the uh the european atv first uh

1261
00:46:29,030 --> 00:46:25,040
it was a decision uh that we made that

1262
00:46:30,950 --> 00:46:29,040
uh the atv was providing more propulsive

1263
00:46:33,030 --> 00:46:30,960

you know more

1264
00:46:36,150 --> 00:46:33,040
propulsion fuel

1265
00:46:38,870 --> 00:46:36,160
than cargo that we needed and it has

1266
00:46:41,190 --> 00:46:38,880
turned out that the russians are

1267
00:46:43,030 --> 00:46:41,200
supply via progress

1268
00:46:44,550 --> 00:46:43,040
supplies enough

1269
00:46:47,030 --> 00:46:44,560
fuel for the space station for a further

1270
00:46:48,950 --> 00:46:47,040
foreseeable future so it was a good

1271
00:46:52,069 --> 00:46:48,960
trade for nasa to go

1272
00:46:54,950 --> 00:46:52,079
and trade the value of the atv flights

1273
00:46:57,589 --> 00:46:54,960
to turn that into the service module

1274
00:46:58,870 --> 00:46:57,599
for the uh at least for the first orion

1275
00:47:01,589 --> 00:46:58,880
flight so that was a strategic

1276
00:47:03,829 --> 00:47:01,599
discussion uh we also knew that our our

1277
00:47:06,630 --> 00:47:03,839
commercial park partners would come on

1278
00:47:08,150 --> 00:47:06,640
online for uh the first crs contract so

1279
00:47:10,630 --> 00:47:08,160
we weren't concerned that we wouldn't be

1280
00:47:14,069 --> 00:47:10,640
able to make up the atv

1281
00:47:17,270 --> 00:47:14,079
capability as far as htv

1282
00:47:18,550 --> 00:47:17,280
we expect to continue htv flights

1283
00:47:20,150 --> 00:47:18,560
they're not

1284
00:47:22,309 --> 00:47:20,160
beyond our current set we're still in

1285
00:47:25,430 --> 00:47:22,319
negotiations with the japanese just to

1286
00:47:27,910 --> 00:47:25,440
supply uh cargo beyond the current set

1287
00:47:29,670 --> 00:47:27,920
so um we uh

1288
00:47:32,870 --> 00:47:29,680

so we're still in discussions with that

1289
00:47:34,790 --> 00:47:32,880
so the htv we don't do not expect us to

1290
00:47:37,349 --> 00:47:34,800
lose the htv

1291
00:47:39,030 --> 00:47:37,359
capability and again like i said earlier

1292
00:47:41,109 --> 00:47:39,040
our requirements are going to go up and

1293
00:47:43,109 --> 00:47:41,119
we expect our commercial uh cargo

1294
00:47:46,390 --> 00:47:43,119
providers to pick up that

1295
00:47:49,510 --> 00:47:48,150
uh yes this is james space flight

1296
00:47:51,910 --> 00:47:49,520
insider i just have a question about the

1297
00:47:53,109 --> 00:47:51,920
long duration mission um you know scott

1298
00:47:55,349 --> 00:47:53,119
kelly the american astronaut and the

1299
00:47:57,510 --> 00:47:55,359
russian cosmonaut um they're both uh

1300
00:47:59,910 --> 00:47:57,520
veteran astronauts 180 days around there

1301
00:48:01,750 --> 00:47:59,920
in space in their 50s uh why were they

1302
00:48:03,589 --> 00:48:01,760
selected uh to monitor the health

1303
00:48:05,990 --> 00:48:03,599
effects as opposed to like a reed

1304
00:48:07,510 --> 00:48:06,000
wiseman you know a younger astronaut

1305
00:48:09,670 --> 00:48:07,520
with like a clean slate when it comes to

1306
00:48:12,230 --> 00:48:09,680
his exposure and you know bone density

1307
00:48:13,190 --> 00:48:12,240
loss and all that

1308
00:48:15,829 --> 00:48:13,200
i don't know

1309
00:48:20,069 --> 00:48:15,839
okay i'll take a shot um i'm i'm not a

1310
00:48:25,109 --> 00:48:21,750
make that clear

1311
00:48:28,390 --> 00:48:25,119
uh for the uh for the one one year uh uh

1312
00:48:30,870 --> 00:48:28,400
crew duration uh there's a lot of um if

1313
00:48:32,309 --> 00:48:30,880

you will uh constraints a number of

1314
00:48:34,790 --> 00:48:32,319
hours in space

1315
00:48:36,549 --> 00:48:34,800
uh exposure to radiation

1316
00:48:38,470 --> 00:48:36,559
the right characteristics and you know

1317
00:48:41,589 --> 00:48:38,480
all those kinds of things that we had to

1318
00:48:44,390 --> 00:48:41,599
go through to select a uh a set of of

1319
00:48:46,069 --> 00:48:44,400
possible astronaut candidates

1320
00:48:47,589 --> 00:48:46,079
i personally do not know all the

1321
00:48:50,069 --> 00:48:47,599
specifics about

1322
00:48:50,950 --> 00:48:50,079
those those conditions

1323
00:48:52,870 --> 00:48:50,960
but

1324
00:48:54,950 --> 00:48:52,880
going through all those conditions we we

1325
00:48:57,349 --> 00:48:54,960
settled on the set that we have for our

1326
00:48:58,630 --> 00:48:57,359
first for our for our first uh one-year

1327
00:49:00,309 --> 00:48:58,640
work group

1328
00:49:01,670 --> 00:49:00,319
what we're doing is before we go off and

1329
00:49:02,549 --> 00:49:01,680
execute anymore we're going to learn

1330
00:49:04,069 --> 00:49:02,559
what

1331
00:49:06,150 --> 00:49:04,079
we don't know

1332
00:49:08,470 --> 00:49:06,160
and then we'll go far to see what's the

1333
00:49:09,670 --> 00:49:08,480
real effect of of a one year duration

1334
00:49:11,829 --> 00:49:09,680
and then we'll go

1335
00:49:16,710 --> 00:49:11,839
maybe modify our selection criteria

1336
00:49:19,750 --> 00:49:18,150
you know like someone that doesn't have

1337
00:49:20,950 --> 00:49:19,760
in the future for another mission like a

1338
00:49:23,510 --> 00:49:20,960

clean slate

1339
00:49:25,510 --> 00:49:23,520
again we'll we'll we'll we'll learn from

1340
00:49:27,430 --> 00:49:25,520
from from this mission and then we'll uh

1341
00:49:29,670 --> 00:49:27,440
you know just as as necessary to get a

1342
00:49:35,589 --> 00:49:29,680
more broader uh

1343
00:49:37,670 --> 00:49:35,599
space and and and

1344
00:49:39,670 --> 00:49:37,680
of astronauts and we can certainly get

1345
00:49:41,829 --> 00:49:39,680
you additional information about that

1346
00:49:44,069 --> 00:49:41,839
and i think one of the cool slash unique

1347
00:49:46,470 --> 00:49:44,079
things about this is that scott's also a

1348
00:49:47,670 --> 00:49:46,480
twin so we have a number of twin studies

1349
00:49:50,150 --> 00:49:47,680
that are

1350
00:49:52,309 --> 00:49:50,160
being conducted in addition to just the

1351
00:49:53,990 --> 00:49:52,319
one year mission um i think that's all

1352
00:49:55,829 --> 00:49:54,000
the time we have for today so we'll wrap

1353
00:49:57,829 --> 00:49:55,839
up thank you all for your questions and

1354
00:49:59,349 --> 00:49:57,839
for joining us and thank you on our

1355
00:50:01,510 --> 00:49:59,359
panel for enlightening us about the

1356
00:50:04,069 --> 00:50:01,520
collaborations among your directorates

1357
00:50:05,910 --> 00:50:04,079
as well as the exciting missions to come

1358
00:50:07,190 --> 00:50:05,920
of course you can follow all the regular

1359
00:50:09,910 --> 00:50:07,200
news about

1360
00:50:10,950 --> 00:50:09,920
nasa as it continues to explore our

1361
00:50:12,630 --> 00:50:10,960
planet and

1362
00:50:17,349 --> 00:50:12,640
go farther out into the solar system on

1363
00:50:23,990 --> 00:50:19,589

for all the news related to tonight's

1364
00:50:29,030 --> 00:50:26,950
spacex and stay tuned to nasa tv coming

1365
00:50:31,510 --> 00:50:29,040
up at 10 a.m eastern we have a

1366
00:50:33,589 --> 00:50:31,520
pre-launch briefing to update the status

1367
00:50:37,270 --> 00:50:33,599
on preparations for the launch which is