
NASA
SPACEX

1
00:00:07,749 --> 00:00:04,950
good afternoon and welcome everybody to

2
00:00:09,509 --> 00:00:07,759
today's spacex commercial resupply

3
00:00:11,990 --> 00:00:09,519
services one

4
00:00:13,910 --> 00:00:12,000
mission science briefing as often as we

5
00:00:15,589 --> 00:00:13,920
possibly can we like to gather and talk

6
00:00:17,910 --> 00:00:15,599
about the science that's underway aboard

7
00:00:19,510 --> 00:00:17,920
this international space station uh for

8
00:00:21,189 --> 00:00:19,520
over a year now we have been in the

9
00:00:23,349 --> 00:00:21,199
utilization phase and there's a lot of

10
00:00:25,189 --> 00:00:23,359
science going on and we figured what

11
00:00:29,029 --> 00:00:25,199
better time than on the eve of the

12
00:00:30,790 --> 00:00:29,039
launch of the spacex falcon 9 and dragon

13
00:00:33,030 --> 00:00:30,800

on its way to the international space

14
00:00:35,350 --> 00:00:33,040
station to restore america's capability

15
00:00:37,830 --> 00:00:35,360
to take cargo up and bring it back down

16
00:00:39,430 --> 00:00:37,840
from american soil this is a be a great

17
00:00:41,270 --> 00:00:39,440
time to get together and talk to you

18
00:00:42,630 --> 00:00:41,280
about science so we've

19
00:00:45,029 --> 00:00:42,640
gathered a panel and i'd like to

20
00:00:46,470 --> 00:00:45,039
introduce them right now to my left is

21
00:00:48,470 --> 00:00:46,480
julie robinson

22
00:00:50,790 --> 00:00:48,480
the international space station program

23
00:00:52,709 --> 00:00:50,800
scientist for nasa

24
00:00:55,189 --> 00:00:52,719
next to julie

25
00:00:56,549 --> 00:00:55,199
tim yeatman interim chief scientist for

26
00:00:59,910 --> 00:00:56,559
the center for the advancement of

27
00:01:01,990 --> 00:00:59,920
science in space or cases

28
00:01:03,750 --> 00:01:02,000
next to tim

29
00:01:05,670 --> 00:01:03,760
sheila nielsen price

30
00:01:07,590 --> 00:01:05,680
cell biologist from montana state

31
00:01:10,230 --> 00:01:07,600
university

32
00:01:12,310 --> 00:01:10,240
and next to sheila is scott smith

33
00:01:14,710 --> 00:01:12,320
a nasa nutritionist from the johnson

34
00:01:16,149 --> 00:01:14,720
space center in houston

35
00:01:17,910 --> 00:01:16,159
thank you all very much for being here

36
00:01:19,429 --> 00:01:17,920
we'll open up with comments and then

37
00:01:22,070 --> 00:01:19,439
we'll be happy to take questions from

38
00:01:23,270 --> 00:01:22,080

the from the gathered press

39
00:01:25,590 --> 00:01:23,280
go ahead julie

40
00:01:27,910 --> 00:01:25,600
well thanks a lot it's great to be here

41
00:01:29,190 --> 00:01:27,920
today on what is really a momentous

42
00:01:31,030 --> 00:01:29,200
milestone for research on the

43
00:01:33,270 --> 00:01:31,040
international space station as we head

44
00:01:35,749 --> 00:01:33,280
towards our first commercial cargo

45
00:01:38,149 --> 00:01:35,759
launch the spacex dragon is a really

46
00:01:40,710 --> 00:01:38,159
important vehicle for us because it

47
00:01:42,550 --> 00:01:40,720
supports the laboratory use of iss both

48
00:01:44,789 --> 00:01:42,560
in bringing cargo up to the space

49
00:01:45,590 --> 00:01:44,799
station and in bringing research samples

50
00:01:48,230 --> 00:01:45,600
home

51
00:01:50,310 --> 00:01:48,240
and it has a great return capability it

52
00:01:52,389 --> 00:01:50,320
essentially replaces that capacity that

53
00:01:54,230 --> 00:01:52,399
we lost when the shuttle retired so that

54
00:01:56,630 --> 00:01:54,240
now we'll be able to bring home a wide

55
00:01:58,230 --> 00:01:56,640
variety of biological samples physical

56
00:01:59,990 --> 00:01:58,240
sciences samples and we'll be able to

57
00:02:01,510 --> 00:02:00,000
bring home research equipment that we

58
00:02:03,910 --> 00:02:01,520
need to refurbish and then relaunch

59
00:02:06,469 --> 00:02:03,920
again for the next set of experiments

60
00:02:07,670 --> 00:02:06,479
so we're really excited to to be here

61
00:02:09,669 --> 00:02:07,680
and to share with you some of the

62
00:02:11,589 --> 00:02:09,679
science both that's going up and down on

63
00:02:13,430 --> 00:02:11,599

the flight as well as give you some

64
00:02:15,430 --> 00:02:13,440
background about the research going on

65
00:02:17,510 --> 00:02:15,440
on the space station today

66
00:02:20,150 --> 00:02:17,520
at any one time and now is no exception

67
00:02:21,430 --> 00:02:20,160
we have over 200 experiments active on

68
00:02:23,350 --> 00:02:21,440
the iss

69
00:02:25,589 --> 00:02:23,360
and about a hundred of those right now

70
00:02:27,270 --> 00:02:25,599
are our u.s based experiments and the

71
00:02:29,030 --> 00:02:27,280
others are from our international

72
00:02:31,830 --> 00:02:29,040
partners russia the canadian space

73
00:02:35,350 --> 00:02:31,840
agency the european space agency and the

74
00:02:37,430 --> 00:02:35,360
japanese aerospace exploration agency

75
00:02:39,830 --> 00:02:37,440
this spacex launch for the entire

76
00:02:42,949 --> 00:02:39,840
partnership will be taking up about a

77
00:02:45,030 --> 00:02:42,959
thousand pounds of research cargo uh

78
00:02:47,270 --> 00:02:45,040
equipment samples in addition to the

79
00:02:49,190 --> 00:02:47,280
things that it launches for the crew

80
00:02:51,750 --> 00:02:49,200
as well as for the vehicle maintenance

81
00:02:54,309 --> 00:02:51,760
and operations and it will be returning

82
00:02:57,030 --> 00:02:54,319
about the same and so this is a a pretty

83
00:02:59,430 --> 00:02:57,040
exciting thing for us the other

84
00:03:01,190 --> 00:02:59,440
excitement that we have is in seeing the

85
00:03:03,110 --> 00:03:01,200
development and the growth of our

86
00:03:04,790 --> 00:03:03,120
national laboratory users and so it's

87
00:03:06,949 --> 00:03:04,800
exciting to have

88
00:03:09,350 --> 00:03:06,959

scientists from cases representing

89
00:03:11,350 --> 00:03:09,360
representing cases today to talk about

90
00:03:13,830 --> 00:03:11,360
some of the activities going on with

91
00:03:16,470 --> 00:03:13,840
cases on the national laboratory side we

92
00:03:18,309 --> 00:03:16,480
have a combination of both nasa and

93
00:03:19,910 --> 00:03:18,319
national laboratory users and to give

94
00:03:22,790 --> 00:03:19,920
you a sense of what that looks like if i

95
00:03:24,869 --> 00:03:22,800
could have my first slide

96
00:03:26,470 --> 00:03:24,879
here in this graph you see the different

97
00:03:27,750 --> 00:03:26,480
disciplines that are on the

98
00:03:29,190 --> 00:03:27,760
international space station in this

99
00:03:31,830 --> 00:03:29,200
research portfolio i've been talking

100
00:03:33,350 --> 00:03:31,840
about biology and biotechnology earth

101
00:03:35,670 --> 00:03:33,360
and space science

102
00:03:37,670 --> 00:03:35,680
education and cultural activities human

103
00:03:39,910 --> 00:03:37,680
research physical sciences and

104
00:03:41,589 --> 00:03:39,920
technology development and demonstration

105
00:03:43,670 --> 00:03:41,599
and in this little pie chart i show you

106
00:03:45,990 --> 00:03:43,680
those hundred u.s investigations but

107
00:03:47,509 --> 00:03:46,000
they're broken out in two ways the the

108
00:03:48,869 --> 00:03:47,519
part of the pie on the right that's all

109
00:03:50,710 --> 00:03:48,879
crunched together shows you the

110
00:03:53,750 --> 00:03:50,720
nasa-sponsored investigations where

111
00:03:55,350 --> 00:03:53,760
nasa's the primary funder the uh

112
00:03:57,589 --> 00:03:55,360
blown-up part of the chart that's on the

113
00:03:59,670 --> 00:03:57,599

right side of the pie are those that are

114
00:04:01,670 --> 00:03:59,680
managed under iss is a national

115
00:04:04,470 --> 00:04:01,680
laboratory as you probably recall back

116
00:04:06,789 --> 00:04:04,480
in 2005 congress designated iss as a

117
00:04:08,710 --> 00:04:06,799
national laboratory and that's for users

118
00:04:10,390 --> 00:04:08,720
from other government agencies the

119
00:04:11,830 --> 00:04:10,400
private sector or nonprofit

120
00:04:14,149 --> 00:04:11,840
organizations

121
00:04:16,710 --> 00:04:14,159
this increment we have about 40 percent

122
00:04:19,189 --> 00:04:16,720
of the u.s research that is on that

123
00:04:20,870 --> 00:04:19,199
national laboratory side primarily

124
00:04:22,629 --> 00:04:20,880
because there are a large number of

125
00:04:24,310 --> 00:04:22,639
student experiments going up on this

126
00:04:27,350 --> 00:04:24,320
particular launch

127
00:04:29,510 --> 00:04:27,360
there's a the student education program

128
00:04:31,510 --> 00:04:29,520
has a wide variety of experiments going

129
00:04:34,550 --> 00:04:31,520
up and you may have seen a press release

130
00:04:36,150 --> 00:04:34,560
about that just uh yesterday

131
00:04:37,830 --> 00:04:36,160
the um

132
00:04:39,670 --> 00:04:37,840
the research as i showed you then on

133
00:04:41,270 --> 00:04:39,680
that graph there's a real diversity of

134
00:04:43,270 --> 00:04:41,280
research and i wanted to give you just a

135
00:04:45,110 --> 00:04:43,280
sense of the kinds of things going on on

136
00:04:46,870 --> 00:04:45,120
the space station today

137
00:04:48,629 --> 00:04:46,880
so if i could have my next chart i'll

138
00:04:51,030 --> 00:04:48,639

give you one example from each of these

139
00:04:53,749 --> 00:04:51,040
disciplines in the physical sciences we

140
00:04:55,670 --> 00:04:53,759
have a wide variety of experiments just

141
00:04:57,909 --> 00:04:55,680
one of these is a combustion experiment

142
00:04:59,510 --> 00:04:57,919
where we're burning solid materials now

143
00:05:01,670 --> 00:04:59,520
in space you don't have convection

144
00:05:04,150 --> 00:05:01,680
meaning warm air does not rise and that

145
00:05:05,909 --> 00:05:04,160
really changes the way that things burn

146
00:05:07,830 --> 00:05:05,919
scientists are leveraging that both to

147
00:05:09,990 --> 00:05:07,840
understand combustion better to make

148
00:05:11,590 --> 00:05:10,000
more efficient engines but also to

149
00:05:14,070 --> 00:05:11,600
understand combustion better in case

150
00:05:15,909 --> 00:05:14,080
there is a fire on the spacecraft and

151
00:05:18,150 --> 00:05:15,919
this study is particularly focused on

152
00:05:19,990 --> 00:05:18,160
solids that are in spacecraft that might

153
00:05:21,749 --> 00:05:20,000
catch fire if you had a big accident and

154
00:05:22,950 --> 00:05:21,759
how you would suppress that burning by

155
00:05:24,390 --> 00:05:22,960
understanding that burning better and

156
00:05:26,550 --> 00:05:24,400
you can see some pictures this

157
00:05:28,230 --> 00:05:26,560
experiment has been ongoing for a while

158
00:05:30,390 --> 00:05:28,240
you can see some pictures of of things

159
00:05:31,990 --> 00:05:30,400
burning inside that the microgravity

160
00:05:34,150 --> 00:05:32,000
sciences glove box i think it's pretty

161
00:05:36,390 --> 00:05:34,160
cool there are things burning like that

162
00:05:37,749 --> 00:05:36,400
on the iss at different points in time

163
00:05:39,189 --> 00:05:37,759

and what we're bringing up on this

164
00:05:41,029 --> 00:05:39,199
flight are igniters the little thing

165
00:05:42,150 --> 00:05:41,039
that we use to help set these samples on

166
00:05:44,150 --> 00:05:42,160
fire

167
00:05:46,469 --> 00:05:44,160
if i could have the next chart switching

168
00:05:47,830 --> 00:05:46,479
gears to the earth and space sciences uh

169
00:05:50,629 --> 00:05:47,840
this instrument

170
00:05:53,029 --> 00:05:50,639
is uh on iss and and will be

171
00:05:54,150 --> 00:05:53,039
becoming more and more active as we

172
00:05:55,749 --> 00:05:54,160
continue

173
00:05:57,510 --> 00:05:55,759
our

174
00:06:01,830 --> 00:05:57,520
as we continue to implement it it's an

175
00:06:02,550 --> 00:06:01,840
instrument called iserv which stands for

176
00:06:04,390 --> 00:06:02,560
the

177
00:06:05,270 --> 00:06:04,400
environment research and visualization

178
00:06:07,990 --> 00:06:05,280
system

179
00:06:09,990 --> 00:06:08,000
this it's basically a telescope with a

180
00:06:11,510 --> 00:06:10,000
high resolution camera it can take

181
00:06:13,510 --> 00:06:11,520
images of the earth with three meter

182
00:06:15,670 --> 00:06:13,520
spatial resolution so very high quality

183
00:06:17,590 --> 00:06:15,680
high spatial resolution images

184
00:06:19,909 --> 00:06:17,600
it uh is linked to a project that's

185
00:06:21,590 --> 00:06:19,919
supported by usaid the agency for

186
00:06:22,870 --> 00:06:21,600
international development

187
00:06:25,270 --> 00:06:22,880
and it's

188
00:06:27,510 --> 00:06:25,280

and to a project called severe which

189
00:06:29,430 --> 00:06:27,520
helps to distribute data of major

190
00:06:32,230 --> 00:06:29,440
environmental events all around the

191
00:06:33,270 --> 00:06:32,240
world so things like droughts and floods

192
00:06:35,029 --> 00:06:33,280
and

193
00:06:37,510 --> 00:06:35,039
other kinds of dynamic events that can

194
00:06:39,029 --> 00:06:37,520
really have humanitarian impacts so this

195
00:06:41,189 --> 00:06:39,039
telescope will basically be able to

196
00:06:42,710 --> 00:06:41,199
point out our optical quality window and

197
00:06:44,790 --> 00:06:42,720
collect data and provide it to this

198
00:06:47,350 --> 00:06:44,800
severe network it's a pathfinder

199
00:06:48,950 --> 00:06:47,360
instrument to uh for us to help us see

200
00:06:50,309 --> 00:06:48,960
how we can get this kind of high

201
00:06:52,230 --> 00:06:50,319
resolution data it'll be the highest

202
00:06:53,749 --> 00:06:52,240
resolution data we've collected from iss

203
00:06:55,589 --> 00:06:53,759
so far

204
00:06:57,029 --> 00:06:55,599
and then but its real importance is for

205
00:06:58,390 --> 00:06:57,039
supporting the environmental decision

206
00:07:00,710 --> 00:06:58,400
making around the world and as a

207
00:07:02,469 --> 00:07:00,720
pathfinder for the major external

208
00:07:05,430 --> 00:07:02,479
instruments that we're in the process of

209
00:07:08,629 --> 00:07:07,029
another area of research that we do on

210
00:07:11,029 --> 00:07:08,639
the international space station is

211
00:07:12,629 --> 00:07:11,039
technology development and demonstration

212
00:07:14,629 --> 00:07:12,639
and by doing these kinds of

213
00:07:16,390 --> 00:07:14,639

demonstration activities we can make

214
00:07:18,150 --> 00:07:16,400
sure that the next space exploration

215
00:07:21,189 --> 00:07:18,160
that we do is safer and more cost

216
00:07:23,029 --> 00:07:21,199
effective one example of uh

217
00:07:24,790 --> 00:07:23,039
of a piece of hardware on iss today

218
00:07:26,629 --> 00:07:24,800
that's important is the missy 8

219
00:07:28,710 --> 00:07:26,639
experiment and if i could have the next

220
00:07:29,990 --> 00:07:28,720
slide to show a picture of that

221
00:07:31,990 --> 00:07:30,000
missy eight here you can see an

222
00:07:34,390 --> 00:07:32,000
astronaut on eva right next to the miss

223
00:07:37,430 --> 00:07:34,400
eight hardware this is a system for

224
00:07:40,309 --> 00:07:37,440
testing materials on iss and some of the

225
00:07:41,830 --> 00:07:40,319
commercial providers of satellites have

226
00:07:43,909 --> 00:07:41,840
have found that if they test a new

227
00:07:45,589 --> 00:07:43,919
material in this way they really learn

228
00:07:47,189 --> 00:07:45,599
things about those materials space

229
00:07:49,510 --> 00:07:47,199
environment is quite harsh it gets hot

230
00:07:51,430 --> 00:07:49,520
and cold there's ultraviolet light

231
00:07:53,510 --> 00:07:51,440
there's atomic oxygen in low earth orbit

232
00:07:55,270 --> 00:07:53,520
that can really chew things up and so by

233
00:07:56,950 --> 00:07:55,280
testing these materials satellite

234
00:07:58,710 --> 00:07:56,960
providers can have better performance

235
00:07:59,909 --> 00:07:58,720
and can take new advanced materials that

236
00:08:01,589 --> 00:07:59,919
are developed and be sure they're going

237
00:08:03,110 --> 00:08:01,599
to work before they put them in a

238
00:08:05,909 --> 00:08:03,120

spacecraft and that really saves

239
00:08:08,309 --> 00:08:05,919
development time

240
00:08:10,309 --> 00:08:08,319
then shifting gears yet again to another

241
00:08:12,150 --> 00:08:10,319
discipline we have human research that's

242
00:08:14,390 --> 00:08:12,160
really focused on understanding the

243
00:08:16,469 --> 00:08:14,400
effects of space on the human body so

244
00:08:20,070 --> 00:08:16,479
that astronauts can explore beyond earth

245
00:08:22,469 --> 00:08:20,080
orbit and in the next picture you'll see

246
00:08:24,710 --> 00:08:22,479
an example this a photograph of mike

247
00:08:27,909 --> 00:08:24,720
fossum and ron garan a few months ago

248
00:08:29,670 --> 00:08:27,919
putting samples into our melfi freezer

249
00:08:31,029 --> 00:08:29,680
that's a minus 80 degree laboratory

250
00:08:33,190 --> 00:08:31,039
freezer that we have on the space

251
00:08:35,110 --> 00:08:33,200
station they're putting in samples of

252
00:08:37,190 --> 00:08:35,120
blood and urine that they had collected

253
00:08:38,550 --> 00:08:37,200
to monitor their physiological status

254
00:08:40,790 --> 00:08:38,560
and

255
00:08:42,149 --> 00:08:40,800
one experiment uh that they've been

256
00:08:44,149 --> 00:08:42,159
sampling for is an experiment called

257
00:08:46,310 --> 00:08:44,159
vascular which is short for

258
00:08:48,550 --> 00:08:46,320
cardiovascular health consequences of

259
00:08:50,630 --> 00:08:48,560
long-duration space flight it's canadian

260
00:08:52,790 --> 00:08:50,640
space agency investigation and it's

261
00:08:55,269 --> 00:08:52,800
focused on during space flight uh

262
00:08:56,630 --> 00:08:55,279
whether the blood vessels change and if

263
00:08:57,910 --> 00:08:56,640

they look more like blood vessels of

264
00:08:59,110 --> 00:08:57,920
older people

265
00:09:01,590 --> 00:08:59,120
and if there are inflammation of the

266
00:09:03,269 --> 00:09:01,600
artery walls as well as other changes in

267
00:09:05,110 --> 00:09:03,279
the vessel properties and that links to

268
00:09:06,790 --> 00:09:05,120
the loss of cardiovascular fitness that

269
00:09:08,790 --> 00:09:06,800
can happen to astronauts because it's so

270
00:09:10,230 --> 00:09:08,800
easy to float around in space rather

271
00:09:12,949 --> 00:09:10,240
than really having to fight gravity

272
00:09:14,949 --> 00:09:12,959
every day like we do here on earth so

273
00:09:16,630 --> 00:09:14,959
this is just one example of a number of

274
00:09:19,509 --> 00:09:16,640
human research investigations that are

275
00:09:21,269 --> 00:09:19,519
active on iss today

276
00:09:23,269 --> 00:09:21,279
of course if the human body is so

277
00:09:25,030 --> 00:09:23,279
affected by being in space it's not

278
00:09:26,070 --> 00:09:25,040
surprising that

279
00:09:27,750 --> 00:09:26,080
cells

280
00:09:29,670 --> 00:09:27,760
animals small animals small plants and

281
00:09:31,030 --> 00:09:29,680
so forth are also affected and so i

282
00:09:33,430 --> 00:09:31,040
wanted to give you one example of an

283
00:09:35,990 --> 00:09:33,440
experiment in biology and biotechnology

284
00:09:37,750 --> 00:09:36,000
the plant signaling investigation it

285
00:09:39,509 --> 00:09:37,760
will have samples coming home on this

286
00:09:41,829 --> 00:09:39,519
flight and if i could have the next

287
00:09:43,269 --> 00:09:41,839
picture you can see a picture of sunny

288
00:09:46,150 --> 00:09:43,279

williams actually carrying out

289
00:09:49,750 --> 00:09:46,160
operations on this investigation on the

290
00:09:52,550 --> 00:09:50,870
so this

291
00:09:54,949 --> 00:09:52,560
is a study that's looking at the effect

292
00:09:56,870 --> 00:09:54,959
of microgravity on the growth of plants

293
00:09:59,269 --> 00:09:56,880
and especially the way the plant uses

294
00:10:00,550 --> 00:09:59,279
plant hormones to signal and coordinate

295
00:10:02,870 --> 00:10:00,560
the growth of the different kinds of

296
00:10:05,030 --> 00:10:02,880
cells that it has this is important both

297
00:10:06,870 --> 00:10:05,040
for food and crop production on earth as

298
00:10:08,150 --> 00:10:06,880
well as possibly understanding better

299
00:10:09,829 --> 00:10:08,160
how to produce

300
00:10:11,750 --> 00:10:09,839
food plants

301
00:10:13,509 --> 00:10:11,760
in space

302
00:10:16,949 --> 00:10:13,519
and if i could have the next picture

303
00:10:20,389 --> 00:10:18,790
next picture

304
00:10:22,150 --> 00:10:20,399
this final picture

305
00:10:24,310 --> 00:10:22,160
shows you an example of an educational

306
00:10:26,630 --> 00:10:24,320
activity this is the

307
00:10:28,550 --> 00:10:26,640
the tech ed sat it was just deployed

308
00:10:30,470 --> 00:10:28,560
from iss on thursday

309
00:10:32,150 --> 00:10:30,480
it's a an example of an engineering

310
00:10:34,790 --> 00:10:32,160
education activity it was built by

311
00:10:37,509 --> 00:10:34,800
students at san jose state university it

312
00:10:38,870 --> 00:10:37,519
has a ham radio transmitter in it to

313
00:10:40,870 --> 00:10:38,880

communicate with it

314
00:10:42,389 --> 00:10:40,880
and it's about a four inch cube the

315
00:10:44,230 --> 00:10:42,399
entire experiment was built for about

316
00:10:46,150 --> 00:10:44,240
thirty thousand dollars by using good

317
00:10:47,430 --> 00:10:46,160
commercial components and one of the

318
00:10:49,590 --> 00:10:47,440
things that we're seeing in many of our

319
00:10:52,150 --> 00:10:49,600
education projects is we've brought the

320
00:10:54,630 --> 00:10:52,160
cost of doing research down enough on

321
00:10:56,389 --> 00:10:54,640
iss that it's really accessible for

322
00:10:57,829 --> 00:10:56,399
students to do small tests and different

323
00:11:00,150 --> 00:10:57,839
things

324
00:11:01,670 --> 00:11:00,160
if you noticed on that national on the

325
00:11:03,670 --> 00:11:01,680
pie chart i showed there was a really

326
00:11:07,190 --> 00:11:03,680
large wedge of education projects on the

327
00:11:10,550 --> 00:11:07,200
national lab side and that's driven by

328
00:11:12,389 --> 00:11:10,560
about 23 to 26 investigations that are

329
00:11:14,389 --> 00:11:12,399
student designed there have been some

330
00:11:16,310 --> 00:11:14,399
contests under the student space flight

331
00:11:17,350 --> 00:11:16,320
experiments program

332
00:11:19,190 --> 00:11:17,360
and

333
00:11:21,030 --> 00:11:19,200
the winners of those contests those

334
00:11:22,870 --> 00:11:21,040
lucky schools are getting to fly their

335
00:11:24,470 --> 00:11:22,880
experiments each experiment is in what

336
00:11:26,630 --> 00:11:24,480
we call a mixed stick it's basically a

337
00:11:29,110 --> 00:11:26,640
little little stick it's sort of like

338
00:11:31,030 --> 00:11:29,120

the stick that you use the glow sticks

339
00:11:32,470 --> 00:11:31,040
that kids use at night or at concerts or

340
00:11:34,310 --> 00:11:32,480
things like that and you break them to

341
00:11:35,829 --> 00:11:34,320
mix the fluids together the astronauts

342
00:11:37,110 --> 00:11:35,839
will take them out break them to

343
00:11:38,550 --> 00:11:37,120
activate the experiment and then they'll

344
00:11:42,150 --> 00:11:38,560
be returned home

345
00:11:44,389 --> 00:11:42,160
about 7 000 students have applied

346
00:11:46,870 --> 00:11:44,399
developed experiment proposals for the

347
00:11:49,110 --> 00:11:46,880
ssep program and so that has a really

348
00:11:50,949 --> 00:11:49,120
amazing impact scientists are educators

349
00:11:52,230 --> 00:11:50,959
have studied

350
00:11:53,829 --> 00:11:52,240
middle school and high school students

351
00:11:54,870 --> 00:11:53,839
and find if they get to do real science

352
00:11:57,110 --> 00:11:54,880
where they're generating their own

353
00:11:58,949 --> 00:11:57,120
hypotheses that's what really engages

354
00:12:00,949 --> 00:11:58,959
them in stem education in science

355
00:12:02,629 --> 00:12:00,959
technology engineering and math so we're

356
00:12:04,389 --> 00:12:02,639
really excited

357
00:12:06,069 --> 00:12:04,399
for those students and

358
00:12:08,470 --> 00:12:06,079
in particular we had some experiments

359
00:12:09,509 --> 00:12:08,480
that were not successfully activated on

360
00:12:11,430 --> 00:12:09,519
a previous flight and they're all

361
00:12:13,430 --> 00:12:11,440
getting to refly this time and one of

362
00:12:14,870 --> 00:12:13,440
the great things about spacex cargo and

363
00:12:16,230 --> 00:12:14,880

having these frequent launches is that

364
00:12:17,990 --> 00:12:16,240
when something does go wrong which it

365
00:12:19,910 --> 00:12:18,000
does in the laboratory we're able to

366
00:12:21,670 --> 00:12:19,920
recover it very quickly

367
00:12:23,750 --> 00:12:21,680
so that kind of gives you a sense

368
00:12:25,269 --> 00:12:23,760
overall of the diversity of activities

369
00:12:27,590 --> 00:12:25,279
the number of activities on the space

370
00:12:28,949 --> 00:12:27,600
station the last year of full

371
00:12:30,949 --> 00:12:28,959
utilization from the time that the

372
00:12:34,069 --> 00:12:30,959
shuttle retired until today has been

373
00:12:35,910 --> 00:12:34,079
just extraordinary we've had record

374
00:12:37,110 --> 00:12:35,920
numbers of crew hours going to research

375
00:12:39,590 --> 00:12:37,120
we've had record numbers of

376
00:12:42,069 --> 00:12:39,600
investigators active on iss and so with

377
00:12:43,670 --> 00:12:42,079
that as context let me hand off to dr

378
00:12:45,509 --> 00:12:43,680
tim yateman and he can give you some

379
00:12:47,269 --> 00:12:45,519
updates on cases

380
00:12:49,509 --> 00:12:47,279
sure thank you julie um

381
00:12:51,590 --> 00:12:49,519
well as you may know cases stands for

382
00:12:52,949 --> 00:12:51,600
the center for administration of science

383
00:12:54,949 --> 00:12:52,959
and space and

384
00:12:57,750 --> 00:12:54,959
basically um our organization is

385
00:13:00,790 --> 00:12:57,760
responsible for uh partnering with nasa

386
00:13:03,190 --> 00:13:00,800
to really identify the best science to

387
00:13:06,069 --> 00:13:03,200
go up to the station to the national lab

388
00:13:07,910 --> 00:13:06,079

um and and we've been um

389
00:13:09,590 --> 00:13:07,920
spending our first year

390
00:13:11,990 --> 00:13:09,600
not only developing the organization but

391
00:13:13,670 --> 00:13:12,000
starting to actively look

392
00:13:16,870 --> 00:13:13,680
for both solicit and unsolicited

393
00:13:18,150 --> 00:13:16,880
projects to go up in space

394
00:13:19,829 --> 00:13:18,160
during in fact

395
00:13:22,230 --> 00:13:19,839
projects that will unfold during

396
00:13:24,550 --> 00:13:22,240
increment 33 and 34

397
00:13:26,949 --> 00:13:24,560
um will be three um one is called

398
00:13:29,030 --> 00:13:26,959
spheres which is a a robotics

399
00:13:31,110 --> 00:13:29,040
programming competition

400
00:13:33,030 --> 00:13:31,120
where satellites inside the internal

401
00:13:34,870 --> 00:13:33,040
international space station

402
00:13:37,110 --> 00:13:34,880
will be programmed to software

403
00:13:39,829 --> 00:13:37,120
competition for students

404
00:13:41,910 --> 00:13:39,839
to to test out their capabilities

405
00:13:44,550 --> 00:13:41,920
there's another program called windows

406
00:13:48,310 --> 00:13:44,560
on earth which is

407
00:13:50,470 --> 00:13:48,320
basically again a software program to

408
00:13:52,389 --> 00:13:50,480
basically take advantage of google earth

409
00:13:54,310 --> 00:13:52,399
engine and and

410
00:13:56,949 --> 00:13:54,320
provide

411
00:14:00,069 --> 00:13:56,959
better visualization capabilities

412
00:14:02,310 --> 00:14:00,079
and the third is called isaac the

413
00:14:05,350 --> 00:14:02,320

international space station agrocultural

414
00:14:08,790 --> 00:14:05,360
camera which captures some of these

415
00:14:12,710 --> 00:14:08,800
fantastic geographical areas of interest

416
00:14:15,670 --> 00:14:12,720
with red and near-infrared band passes

417
00:14:16,629 --> 00:14:15,680
and medium and high spatial resolution

418
00:14:18,230 --> 00:14:16,639
so

419
00:14:19,509 --> 00:14:18,240
that's what's going on now but in the

420
00:14:21,590 --> 00:14:19,519
future

421
00:14:24,310 --> 00:14:21,600
what we're trying to do

422
00:14:26,710 --> 00:14:24,320
is identify uh the best science to go to

423
00:14:29,590 --> 00:14:26,720
the station and so what we've done

424
00:14:30,949 --> 00:14:29,600
initially is we we assembled what i

425
00:14:32,150 --> 00:14:30,959
would call a blue ribbon panel of

426
00:14:35,189 --> 00:14:32,160
scientists

427
00:14:36,790 --> 00:14:35,199
um and uh and reviewed um basically

428
00:14:40,389 --> 00:14:36,800
what's been done today to try to

429
00:14:43,430 --> 00:14:40,399
identify um key areas of interest we've

430
00:14:45,430 --> 00:14:43,440
we've identified really three main

431
00:14:47,670 --> 00:14:45,440
pathways one of the life sciences

432
00:14:49,110 --> 00:14:47,680
material sciences and then earth

433
00:14:51,189 --> 00:14:49,120
observation

434
00:14:52,710 --> 00:14:51,199
and i can tell you a lot more about the

435
00:14:55,189 --> 00:14:52,720
the life sciences where we made some

436
00:14:56,550 --> 00:14:55,199
significant progress

437
00:14:59,110 --> 00:14:56,560
we've actually

438
00:14:59,990 --> 00:14:59,120

identified within life sciences about

439
00:15:01,509 --> 00:15:00,000
four

440
00:15:03,910 --> 00:15:01,519
areas of interest

441
00:15:05,990 --> 00:15:03,920
the first is protein crystallography and

442
00:15:07,910 --> 00:15:06,000
you might put up a video behind me if

443
00:15:11,750 --> 00:15:07,920
you're not familiar with this protein

444
00:15:13,030 --> 00:15:11,760
crystallography is the beginning of drug

445
00:15:15,509 --> 00:15:13,040
discovery

446
00:15:17,750 --> 00:15:15,519
for big pharma so

447
00:15:20,470 --> 00:15:17,760
most of the drugs that we that are made

448
00:15:22,389 --> 00:15:20,480
today the targeted drugs particularly

449
00:15:24,470 --> 00:15:22,399
the targeted drugs which are coming out

450
00:15:27,189 --> 00:15:24,480
of the human genome project

451
00:15:29,350 --> 00:15:27,199
start with understanding the protein

452
00:15:31,110 --> 00:15:29,360
structure and the better you under

453
00:15:33,269 --> 00:15:31,120
understand the protein structure the

454
00:15:35,430 --> 00:15:33,279
better you can make a drug and it turns

455
00:15:38,470 --> 00:15:35,440
out that there is a promise a

456
00:15:40,629 --> 00:15:38,480
significant promise that proteins can be

457
00:15:42,629 --> 00:15:40,639
better crystallized in the microgravity

458
00:15:45,670 --> 00:15:42,639
environment than on earth and so we're

459
00:15:48,550 --> 00:15:45,680
now going to really test that out and um

460
00:15:51,749 --> 00:15:48,560
and uh and one of one of case's goals is

461
00:15:53,910 --> 00:15:51,759
to engage uh commercial interest and so

462
00:15:55,670 --> 00:15:53,920
uh that would be big pharma and so

463
00:15:57,749 --> 00:15:55,680

you'll see on the cases website some

464
00:16:00,470 --> 00:15:57,759
announcements um with big pharma

465
00:16:01,350 --> 00:16:00,480
interest in in in projects in space

466
00:16:03,430 --> 00:16:01,360
um

467
00:16:06,069 --> 00:16:03,440
the second area of interest uh

468
00:16:08,470 --> 00:16:06,079
we found was uh um in looking at

469
00:16:10,629 --> 00:16:08,480
osteoporosis osteoporosis is a

470
00:16:13,110 --> 00:16:10,639
significant disease affecting

471
00:16:16,949 --> 00:16:13,120
post-menopausal women in particular in

472
00:16:20,150 --> 00:16:16,959
in aging women and so um uh there it

473
00:16:23,189 --> 00:16:20,160
turns out in space um astronauts are

474
00:16:24,310 --> 00:16:23,199
significantly affected by

475
00:16:25,269 --> 00:16:24,320
bone loss

476
00:16:27,749 --> 00:16:25,279
when they come back from the

477
00:16:30,350 --> 00:16:27,759
microgravity environment and

478
00:16:33,189 --> 00:16:30,360
so it appears to be a very good

479
00:16:33,990 --> 00:16:33,199
recapitulation of the human problem and

480
00:16:36,230 --> 00:16:34,000
so

481
00:16:37,910 --> 00:16:36,240
we're now looking into potentially

482
00:16:39,590 --> 00:16:37,920
putting mouse models up in space they

483
00:16:41,269 --> 00:16:39,600
could be tested

484
00:16:44,470 --> 00:16:41,279
with drugs or

485
00:16:46,870 --> 00:16:44,480
wild-type and transgenic mice comparing

486
00:16:48,870 --> 00:16:46,880
control proper controls for these mice

487
00:16:51,990 --> 00:16:48,880
to really study and develop potentially

488
00:16:54,389 --> 00:16:52,000

develop drugs for osteoporosis a third

489
00:16:57,110 --> 00:16:54,399
is muscle wasting again another problem

490
00:16:59,430 --> 00:16:57,120
that came from the astronauts uh in

491
00:17:02,790 --> 00:16:59,440
their in their post-trip evaluations we

492
00:17:04,390 --> 00:17:02,800
found they lost muscle uh mass and uh

493
00:17:07,429 --> 00:17:04,400
and that that exercise

494
00:17:09,590 --> 00:17:07,439
um you know alone wasn't sufficient to

495
00:17:11,829 --> 00:17:09,600
uh prevent that problem it turns out

496
00:17:15,029 --> 00:17:11,839
that the muscle loss again appears to

497
00:17:17,029 --> 00:17:15,039
recapitulate some of the the human uh

498
00:17:18,630 --> 00:17:17,039
capacities we see where there's muscle

499
00:17:20,630 --> 00:17:18,640
loss the human diseases where we see

500
00:17:22,390 --> 00:17:20,640
muscle loss and so again there's a

501
00:17:24,390 --> 00:17:22,400
pharma interest in in

502
00:17:25,909 --> 00:17:24,400
potentially developing drugs to target

503
00:17:28,390 --> 00:17:25,919
muscle wasting

504
00:17:31,110 --> 00:17:28,400
and we're also looking at other problems

505
00:17:32,470 --> 00:17:31,120
such as immune loss which is a problem

506
00:17:35,110 --> 00:17:32,480
and and

507
00:17:37,830 --> 00:17:35,120
the potential for stem cells to be grown

508
00:17:40,150 --> 00:17:37,840
better in space than on earth

509
00:17:42,150 --> 00:17:40,160
we've had um

510
00:17:46,549 --> 00:17:42,160
a number of unsolicited proposals

511
00:17:48,630 --> 00:17:46,559
submitted i think about 35 to date and

512
00:17:51,669 --> 00:17:48,640
we're progressing to

513
00:17:54,310 --> 00:17:51,679

fund some of those and we've also had

514
00:17:55,270 --> 00:17:54,320
our first solicited rfp

515
00:17:58,310 --> 00:17:55,280
i mean that was in protein

516
00:18:00,150 --> 00:17:58,320
crystallography and

517
00:18:02,070 --> 00:18:00,160
and so i think we're progressing on a

518
00:18:04,789 --> 00:18:02,080
number of fronts as well as material

519
00:18:07,029 --> 00:18:04,799
science um there's been a unsolicited

520
00:18:09,669 --> 00:18:07,039
proposal there that uh will likely be

521
00:18:12,870 --> 00:18:09,679
funded so um all in all very exciting

522
00:18:14,470 --> 00:18:12,880
and a very uh diverse uh uh group of

523
00:18:17,029 --> 00:18:14,480
experiments

524
00:18:19,270 --> 00:18:17,039
so thank you

525
00:18:21,669 --> 00:18:19,280
okay well let me start by saying this is

526
00:18:24,070 --> 00:18:21,679
our first flight opportunity and

527
00:18:25,430 --> 00:18:24,080
myself and my whole team is is thrilled

528
00:18:27,590 --> 00:18:25,440
to be part of it

529
00:18:29,830 --> 00:18:27,600
we're actually looking at our

530
00:18:31,510 --> 00:18:29,840
experiments are called micro sticks and

531
00:18:33,669 --> 00:18:31,520
we're interested in

532
00:18:36,150 --> 00:18:33,679
analyzing canada albicans which is a

533
00:18:39,590 --> 00:18:36,160
yeast and how it responds to the micro

534
00:18:41,830 --> 00:18:39,600
environment of microgravity

535
00:18:44,390 --> 00:18:41,840
there are a few you know a few things

536
00:18:46,470 --> 00:18:44,400
that we're looking at one is canada

537
00:18:48,549 --> 00:18:46,480
albicans is a commensal organism it's

538
00:18:49,669 --> 00:18:48,559

common but it usually doesn't cause many

539
00:18:51,590 --> 00:18:49,679
problems

540
00:18:53,909 --> 00:18:51,600
but it is also a human pathogen an

541
00:18:55,990 --> 00:18:53,919
opportunistic human pathogen so when our

542
00:18:58,070 --> 00:18:56,000
immune systems

543
00:18:59,110 --> 00:18:58,080
take a hit and aren't functioning as

544
00:19:01,029 --> 00:18:59,120
well

545
00:19:02,870 --> 00:19:01,039
canada albicans finds an opportunity to

546
00:19:05,909 --> 00:19:02,880
cause infection and those infections can

547
00:19:07,590 --> 00:19:05,919
be things like thrush or fungal nails so

548
00:19:09,669 --> 00:19:07,600
we think it's important in its own right

549
00:19:11,750 --> 00:19:09,679
because of that potential

550
00:19:12,870 --> 00:19:11,760
because canada does have this infectious

551
00:19:14,789 --> 00:19:12,880
potential

552
00:19:17,110 --> 00:19:14,799
the role of these experiments really the

553
00:19:19,590 --> 00:19:17,120
data that we're trying to acquire is is

554
00:19:21,270 --> 00:19:19,600
dual in function one is

555
00:19:23,350 --> 00:19:21,280
we really want to assess whether there

556
00:19:25,590 --> 00:19:23,360
can't whether canada albicans poses any

557
00:19:27,669 --> 00:19:25,600
health risk to the flight crew

558
00:19:29,510 --> 00:19:27,679
and then we're also very interested in

559
00:19:31,990 --> 00:19:29,520
learning what we can about how canada

560
00:19:34,150 --> 00:19:32,000
albicans responds to this environment

561
00:19:36,630 --> 00:19:34,160
and use that to extrapolate how we think

562
00:19:39,669 --> 00:19:36,640
it might be responding in different

563
00:19:41,190 --> 00:19:39,679

aspects of the human body

564
00:19:45,190 --> 00:19:41,200
one of the

565
00:19:48,710 --> 00:19:45,200
we think is influencing

566
00:19:49,510 --> 00:19:48,720
canada albicans is low fluid shear

567
00:19:51,669 --> 00:19:49,520
and

568
00:19:53,669 --> 00:19:51,679
if you go to the first slide

569
00:19:55,669 --> 00:19:53,679
to try and demonstrate what does fluid

570
00:19:58,390 --> 00:19:55,679
shear really mean if you think of a

571
00:19:59,990 --> 00:19:58,400
stone in a body of water if that body of

572
00:20:01,750 --> 00:20:00,000
water happens to be a waterfall or a

573
00:20:04,070 --> 00:20:01,760
rushing river there's going to be a lot

574
00:20:06,630 --> 00:20:04,080
of influence of the water flowing over

575
00:20:08,390 --> 00:20:06,640
rushing over the stone to that stone in

576
00:20:10,230 --> 00:20:08,400
contrast if and that's a high shear

577
00:20:12,950 --> 00:20:10,240
environment in contrast if you think

578
00:20:14,789 --> 00:20:12,960
about that stone in the bottom of a lake

579
00:20:16,310 --> 00:20:14,799
where there's very minimal shear the

580
00:20:18,950 --> 00:20:16,320
influence of the water is going to be

581
00:20:20,950 --> 00:20:18,960
very different on the stone

582
00:20:23,430 --> 00:20:20,960
we have we basically think about cells

583
00:20:25,510 --> 00:20:23,440
growing in liquid very similarly if a

584
00:20:27,990 --> 00:20:25,520
cell is growing in an active liquid

585
00:20:29,270 --> 00:20:28,000
environment it's going to experience

586
00:20:30,789 --> 00:20:29,280
a high shear

587
00:20:33,190 --> 00:20:30,799
impact on its cell membrane and it's

588
00:20:35,510 --> 00:20:33,200

going to respond according to that that

589
00:20:37,590 --> 00:20:35,520
pressure if it's growing in a low shear

590
00:20:39,270 --> 00:20:37,600
environment the the response of that

591
00:20:41,430 --> 00:20:39,280
organism is going to be very different

592
00:20:43,029 --> 00:20:41,440
if you go to the the next

593
00:20:44,789 --> 00:20:43,039
chart

594
00:20:46,549 --> 00:20:44,799
we can actually

595
00:20:47,830 --> 00:20:46,559
reproduce these different levels of

596
00:20:49,990 --> 00:20:47,840
shear

597
00:20:52,549 --> 00:20:50,000
in the laboratory so in the top left

598
00:20:54,710 --> 00:20:52,559
panel you see flasks of media that's how

599
00:20:57,029 --> 00:20:54,720
we typically grow lots of organisms

600
00:20:59,430 --> 00:20:57,039
including these yeast and those are very

601
00:21:01,990 --> 00:20:59,440
rigorously shaking

602
00:21:04,070 --> 00:21:02,000
experiments so that's an opportunity for

603
00:21:06,390 --> 00:21:04,080
high shear growth if you will and then

604
00:21:08,549 --> 00:21:06,400
on the right really the only way that we

605
00:21:10,470 --> 00:21:08,559
can repro the only way we can really get

606
00:21:12,870 --> 00:21:10,480
a microgravity and the low shear

607
00:21:14,549 --> 00:21:12,880
associated with microgravity is to send

608
00:21:16,390 --> 00:21:14,559
the bugs in space which hopefully

609
00:21:18,870 --> 00:21:16,400
they're going to do tomorrow

610
00:21:22,789 --> 00:21:18,880
so the hardware that we use it's in that

611
00:21:24,470 --> 00:21:22,799
image but i also have an example here

612
00:21:26,310 --> 00:21:24,480
this is hardware that was developed by

613
00:21:28,710 --> 00:21:26,320

bioserve and what it does our

614
00:21:30,950 --> 00:21:28,720
experiments are contained within these

615
00:21:34,310 --> 00:21:30,960
tricked out test tubes if you will

616
00:21:36,789 --> 00:21:34,320
so that there are three chambers and the

617
00:21:38,789 --> 00:21:36,799
plunger is depressed on that to allow a

618
00:21:42,549 --> 00:21:38,799
sequential mixing of the reagents in

619
00:21:45,750 --> 00:21:42,559
those three chambers so on on flight or

620
00:21:47,990 --> 00:21:45,760
on station the plunger will be depressed

621
00:21:49,830 --> 00:21:48,000
to activate cell growth and then the

622
00:21:52,310 --> 00:21:49,840
next plunger will be depressed to

623
00:21:54,310 --> 00:21:52,320
terminate growth so all that will happen

624
00:21:59,350 --> 00:21:54,320
on station before they come back at the

625
00:22:03,510 --> 00:22:01,029
low shears and i have alluded to it

626
00:22:05,110 --> 00:22:03,520
already low shear is also

627
00:22:07,750 --> 00:22:05,120
probably an environment that the but

628
00:22:10,470 --> 00:22:07,760
that the yeast might

629
00:22:13,590 --> 00:22:10,480
access in the human body so for example

630
00:22:15,990 --> 00:22:13,600
the nail bed is probably a location of

631
00:22:18,470 --> 00:22:16,000
low fluid shear as are the brush borders

632
00:22:20,390 --> 00:22:18,480
and the kidney so we again that's why

633
00:22:22,549 --> 00:22:20,400
we're looking at the response of the

634
00:22:24,470 --> 00:22:22,559
organism to this environment because we

635
00:22:26,470 --> 00:22:24,480
think we can extrapolate

636
00:22:27,990 --> 00:22:26,480
what we find out there and and bring it

637
00:22:29,430 --> 00:22:28,000
back and predict what might be happening

638
00:22:31,350 --> 00:22:29,440

in the human body

639
00:22:32,789 --> 00:22:31,360
we're anticipating a lot of data from

640
00:22:35,750 --> 00:22:32,799
these experiments and if you'll go to

641
00:22:40,230 --> 00:22:37,510
one thing that we're clearly going to be

642
00:22:41,750 --> 00:22:40,240
doing a large molecular analysis we want

643
00:22:43,909 --> 00:22:41,760
to know what genes are expressed what

644
00:22:46,390 --> 00:22:43,919
molecular pathways are activated and

645
00:22:48,310 --> 00:22:46,400
what molecular pathways are inactivated

646
00:22:49,990 --> 00:22:48,320
while in this microgravity environment

647
00:22:52,070 --> 00:22:50,000
we're also going to be looking at a lot

648
00:22:53,830 --> 00:22:52,080
of physiological parameters so what's

649
00:22:55,270 --> 00:22:53,840
illustrated here

650
00:22:56,390 --> 00:22:55,280
just two different ways to look at the

651
00:22:58,549 --> 00:22:56,400
cells

652
00:23:01,110 --> 00:22:58,559
under high shear conditions

653
00:23:03,830 --> 00:23:01,120
these yeasts grow in this circular form

654
00:23:06,149 --> 00:23:03,840
kind of they look like balls up there

655
00:23:08,390 --> 00:23:06,159
but when they're exposed to low shear as

656
00:23:11,350 --> 00:23:08,400
we've done in the laboratory we see an

657
00:23:13,590 --> 00:23:11,360
increase in that long the elongated

658
00:23:15,510 --> 00:23:13,600
filamentous form

659
00:23:17,350 --> 00:23:15,520
which is associated that basically the

660
00:23:20,549 --> 00:23:17,360
two the combination of those two forms

661
00:23:22,549 --> 00:23:20,559
is associated with infectious organisms

662
00:23:23,830 --> 00:23:22,559
the next slide please

663
00:23:25,669 --> 00:23:23,840

the next chart

664
00:23:27,669 --> 00:23:25,679
thank you we'll also be looking at the

665
00:23:30,470 --> 00:23:27,679
ability of these organisms to form

666
00:23:33,350 --> 00:23:30,480
multicellular communities or biofilms

667
00:23:35,270 --> 00:23:33,360
and again this kind of structure is

668
00:23:36,950 --> 00:23:35,280
protective for the organisms when they

669
00:23:38,870 --> 00:23:36,960
encounter environmental stresses so

670
00:23:40,710 --> 00:23:38,880
we'll be interested to see if there is

671
00:23:41,990 --> 00:23:40,720
an increase in

672
00:23:49,350 --> 00:23:42,000
the

673
00:23:52,470 --> 00:23:50,630
something else that we found in our

674
00:23:54,149 --> 00:23:52,480
ground-based studies that was very

675
00:23:56,630 --> 00:23:54,159
interesting is on the right-hand side

676
00:23:58,630 --> 00:23:56,640
you'll see cells that are plated and

677
00:24:01,110 --> 00:23:58,640
they grow as a community these are

678
00:24:02,710 --> 00:24:01,120
actually visual to the naked eye

679
00:24:05,029 --> 00:24:02,720
they're pretty

680
00:24:07,190 --> 00:24:05,039
normal looking smooth colonies but cells

681
00:24:09,350 --> 00:24:07,200
that were subjected to low shear make

682
00:24:12,230 --> 00:24:09,360
the on the left-hand panel these very

683
00:24:14,149 --> 00:24:12,240
convoluted three-dimensional structures

684
00:24:16,310 --> 00:24:14,159
and so we'll be really anxious to see if

685
00:24:17,909 --> 00:24:16,320
if we find cells that make those types

686
00:24:22,070 --> 00:24:17,919
of colonies when they're grown in the

687
00:24:25,110 --> 00:24:23,350
the

688
00:24:26,950 --> 00:24:25,120

let's see where um

689
00:24:29,350 --> 00:24:26,960
so basically the

690
00:24:30,470 --> 00:24:29,360
the experiments um

691
00:24:31,350 --> 00:24:30,480
oh the other thing i was going to

692
00:24:33,029 --> 00:24:31,360
mention is we're also going to be

693
00:24:34,390 --> 00:24:33,039
looking at antimicrobial resistance we

694
00:24:37,110 --> 00:24:34,400
think that's important because we are

695
00:24:39,430 --> 00:24:37,120
looking at an infectious agent

696
00:24:41,190 --> 00:24:39,440
and so ultimately the experiments that

697
00:24:43,750 --> 00:24:41,200
that we're looking at

698
00:24:46,710 --> 00:24:43,760
are to assess the risk to the flight

699
00:24:48,149 --> 00:24:46,720
crew but also to learn what we can about

700
00:24:51,110 --> 00:24:48,159
the molecular and physiological

701
00:24:52,870 --> 00:24:51,120
signaling that low shear environment and

702
00:24:56,390 --> 00:24:52,880
an overall microgravity environment

703
00:24:57,510 --> 00:24:56,400
produces in these cells so that we can

704
00:24:59,269 --> 00:24:57,520
sort of take the next step in

705
00:25:01,350 --> 00:24:59,279
understanding what happens when these

706
00:25:06,070 --> 00:25:01,360
organisms are actually growing in

707
00:25:09,510 --> 00:25:07,350
thank you sheila

708
00:25:10,789 --> 00:25:09,520
scott

709
00:25:11,990 --> 00:25:10,799
excuse me

710
00:25:15,430 --> 00:25:12,000
well i'm here to talk about everybody's

711
00:25:18,230 --> 00:25:15,440
favorite topic blood and urine samples

712
00:25:20,310 --> 00:25:18,240
we're we're very excited

713
00:25:22,149 --> 00:25:20,320

sorry we're very excited about the

714
00:25:23,669 --> 00:25:22,159
spacex launch tomorrow

715
00:25:25,510 --> 00:25:23,679
we're more excited for spacex to come

716
00:25:27,750 --> 00:25:25,520
home because what we're expecting

717
00:25:31,430 --> 00:25:27,760
is 384

718
00:25:33,190 --> 00:25:31,440
syringes of urine and 112 tubes of blood

719
00:25:34,789 --> 00:25:33,200
to come home in this spacex dragon

720
00:25:37,190 --> 00:25:34,799
capsule

721
00:25:39,110 --> 00:25:37,200
these samples will support

722
00:25:41,110 --> 00:25:39,120
two of the experiments that my team has

723
00:25:42,789 --> 00:25:41,120
onboard the international space station

724
00:25:44,230 --> 00:25:42,799
the first one is what we call nutrition

725
00:25:46,310 --> 00:25:44,240
simply enough

726
00:25:48,710 --> 00:25:46,320
and that's a study looking at a broad

727
00:25:50,549 --> 00:25:48,720
based biochemical set of parameters in

728
00:25:52,710 --> 00:25:50,559
blood and urine to try to better

729
00:25:54,310 --> 00:25:52,720
understand nutritional status

730
00:25:56,710 --> 00:25:54,320
and related physiological symptoms

731
00:25:58,470 --> 00:25:56,720
things like bone metabolism oxidative

732
00:25:59,830 --> 00:25:58,480
stress you name it

733
00:26:02,390 --> 00:25:59,840
we also have an experiment that these

734
00:26:03,990 --> 00:26:02,400
samples support known as pro-k

735
00:26:06,390 --> 00:26:04,000
and this is a countermeasure study where

736
00:26:09,510 --> 00:26:06,400
we're actually looking at using

737
00:26:11,110 --> 00:26:09,520
modifying the diet to help minimize

738
00:26:15,909 --> 00:26:11,120

diet

739
00:26:16,630 --> 00:26:15,919
changes during flight

740
00:26:18,470 --> 00:26:16,640
now

741
00:26:19,830 --> 00:26:18,480
to talk briefly about

742
00:26:21,830 --> 00:26:19,840
the way these samples are collected i

743
00:26:23,830 --> 00:26:21,840
think the first picture

744
00:26:25,990 --> 00:26:23,840
shows aki hishide after one of his blood

745
00:26:26,950 --> 00:26:26,000
collections the blood collections are

746
00:26:28,870 --> 00:26:26,960
just like they are when you go to the

747
00:26:31,190 --> 00:26:28,880
clinic here on earth

748
00:26:33,269 --> 00:26:31,200
we use a standard needle standard tubes

749
00:26:35,830 --> 00:26:33,279
and you can see he's smiling there so

750
00:26:37,990 --> 00:26:35,840
it can't be all that bad

751
00:26:39,830 --> 00:26:38,000
on the other side one of the most common

752
00:26:41,190 --> 00:26:39,840
questions folks get

753
00:26:43,590 --> 00:26:41,200
when we're from nasa when you go out and

754
00:26:45,510 --> 00:26:43,600
talk is how do people go to the bathroom

755
00:26:46,950 --> 00:26:45,520
and while we do have a typical what we

756
00:26:49,190 --> 00:26:46,960
call a waste collection system or you

757
00:26:50,789 --> 00:26:49,200
might call it toilet

758
00:26:52,390 --> 00:26:50,799
just like your toilet at home it doesn't

759
00:26:54,549 --> 00:26:52,400
collect any samples so when we want to

760
00:26:55,830 --> 00:26:54,559
collect samples for scientific reasons

761
00:26:56,630 --> 00:26:55,840
we have to have a different way to do

762
00:26:58,470 --> 00:26:56,640
that

763
00:27:00,710 --> 00:26:58,480

and what we do is we have what's called

764
00:27:02,149 --> 00:27:00,720
a urine collection device

765
00:27:04,390 --> 00:27:02,159
and i brought one of these here that you

766
00:27:06,950 --> 00:27:04,400
can see

767
00:27:08,870 --> 00:27:06,960
this is essentially a bag with a this is

768
00:27:10,149 --> 00:27:08,880
the male version with a condom cuff on

769
00:27:12,870 --> 00:27:10,159
the one end

770
00:27:15,669 --> 00:27:12,880
there is a different adapter for females

771
00:27:18,149 --> 00:27:15,679
crew member voids into the bag

772
00:27:20,950 --> 00:27:18,159
before flight we put in a small

773
00:27:22,389 --> 00:27:20,960
amount of a a volume marker a chemical

774
00:27:24,710 --> 00:27:22,399
that goes in the bag

775
00:27:27,350 --> 00:27:24,720
they void in the bag mix it up and then

776
00:27:28,950 --> 00:27:27,360
out the blue port in this end they take

777
00:27:32,310 --> 00:27:28,960
one of these syringes

778
00:27:33,990 --> 00:27:32,320
and we'll fill this up with urine and

779
00:27:35,269 --> 00:27:34,000
this is what comes home and again we're

780
00:27:37,669 --> 00:27:35,279
expecting

781
00:27:39,909 --> 00:27:37,679
just under 400 of these tubes of urine

782
00:27:41,990 --> 00:27:39,919
to come home the other bag goes in the

783
00:27:44,070 --> 00:27:42,000
uh goes in into another bag and then

784
00:27:45,750 --> 00:27:44,080
essentially goes into the trash

785
00:27:48,310 --> 00:27:45,760
so while it may

786
00:27:49,909 --> 00:27:48,320
it may seem very strange to some folks

787
00:27:51,110 --> 00:27:49,919
my typical line is that it may be

788
00:27:53,029 --> 00:27:51,120

yearned to you

789
00:27:54,870 --> 00:27:53,039
but it's gold to us and that there's a

790
00:27:56,310 --> 00:27:54,880
lot of science that comes out of this

791
00:27:57,669 --> 00:27:56,320
we've been doing these experiments for

792
00:27:58,870 --> 00:27:57,679
for a number of years now actually

793
00:28:00,870 --> 00:27:58,880
yesterday

794
00:28:02,549 --> 00:28:00,880
marked the sixth anniversary of our

795
00:28:04,789 --> 00:28:02,559
first blood collection on board the

796
00:28:07,750 --> 00:28:04,799
international space station mike lopez

797
00:28:09,029 --> 00:28:07,760
alegria did that on expedition 14

798
00:28:10,870 --> 00:28:09,039
and we've published a number of our

799
00:28:13,350 --> 00:28:10,880
studies over the years

800
00:28:15,190 --> 00:28:13,360
one of the more recent studies

801
00:28:16,950 --> 00:28:15,200
published last month in the journal of

802
00:28:19,909 --> 00:28:16,960
fundamental research

803
00:28:20,710 --> 00:28:19,919
and what we what we showed there is

804
00:28:27,029 --> 00:28:20,720
that

805
00:28:29,510 --> 00:28:27,039
exercise hard

806
00:28:31,350 --> 00:28:29,520
can maintain their bone mineral density

807
00:28:32,549 --> 00:28:31,360
as i said we published that last month

808
00:28:34,870 --> 00:28:32,559
the image you're seeing there is the

809
00:28:37,750 --> 00:28:34,880
cover of the september journal of

810
00:28:40,230 --> 00:28:37,760
fundamental research jbmr is considered

811
00:28:41,190 --> 00:28:40,240
the leading bone scientific journal out

812
00:28:42,870 --> 00:28:41,200
there

813
00:28:45,190 --> 00:28:42,880

and we were honored to be selected not

814
00:28:47,510 --> 00:28:45,200
only to have our paper published there

815
00:28:49,750 --> 00:28:47,520
but to make the cover as well

816
00:28:52,389 --> 00:28:49,760
and while there are some nuances to the

817
00:28:54,470 --> 00:28:52,399
data that we found that is we have not

818
00:28:55,430 --> 00:28:54,480
we've not yet entirely solved the bone

819
00:28:57,750 --> 00:28:55,440
problem

820
00:29:00,070 --> 00:28:57,760
we have shown for the first time in 51

821
00:29:01,909 --> 00:29:00,080
years of human space flight significant

822
00:29:04,230 --> 00:29:01,919
progress in

823
00:29:05,750 --> 00:29:04,240
maintaining bone mineral density

824
00:29:08,070 --> 00:29:05,760
again there's some things that we still

825
00:29:09,990 --> 00:29:08,080
need to do in terms of understanding

826
00:29:11,190 --> 00:29:10,000
changes in bone strength there's some

827
00:29:13,350 --> 00:29:11,200
things we need to do in terms of

828
00:29:15,430 --> 00:29:13,360
optimizing exercise in terms of

829
00:29:16,950 --> 00:29:15,440
optimizing nutrition

830
00:29:18,230 --> 00:29:16,960
but again the fact that we're making

831
00:29:21,269 --> 00:29:18,240
progress

832
00:29:22,070 --> 00:29:21,279
in human subjects during space flight

833
00:29:24,950 --> 00:29:22,080
is

834
00:29:27,669 --> 00:29:24,960
why

835
00:29:30,310 --> 00:29:27,679
we're very excited for just about 500

836
00:29:31,990 --> 00:29:30,320
tubes of bloody urine to come home

837
00:29:34,470 --> 00:29:32,000
at the end of this month

838
00:29:36,310 --> 00:29:34,480

throwback to you mike okay thanks scott

839
00:29:38,389 --> 00:29:36,320
well not only do we have members of the

840
00:29:40,549 --> 00:29:38,399
traditional media with us but we are

841
00:29:43,110 --> 00:29:40,559
pleased to be joined by members of the

842
00:29:44,789 --> 00:29:43,120
nasa social who are using social media

843
00:29:46,870 --> 00:29:44,799
to report on the happenings around the

844
00:29:49,430 --> 00:29:46,880
spacex commercial resupply services

845
00:29:51,830 --> 00:29:49,440
mission 1 and we're going to take

846
00:29:54,230 --> 00:29:51,840
questions now we'll start

847
00:29:56,149 --> 00:29:54,240
here with marcia dunn please state your

848
00:29:58,310 --> 00:29:56,159
name and affiliation and to whom you're

849
00:30:01,110 --> 00:29:58,320
addressing your question marcia marcia

850
00:30:03,029 --> 00:30:01,120
then associated press for dr smith um

851
00:30:04,070 --> 00:30:03,039
how long how old are these samples i

852
00:30:05,990 --> 00:30:04,080
mean i don't know if you've been

853
00:30:07,350 --> 00:30:06,000
stockpiling them ever since the shuttle

854
00:30:10,310 --> 00:30:07,360
stopped flying i don't know if you

855
00:30:12,149 --> 00:30:10,320
brought any back in may and how

856
00:30:14,549 --> 00:30:12,159
important is it to have the spacex

857
00:30:16,789 --> 00:30:14,559
capability to actually return things

858
00:30:17,990 --> 00:30:16,799
unlike the other cargo ships

859
00:30:19,590 --> 00:30:18,000
well

860
00:30:21,669 --> 00:30:19,600
to answer your first question no we have

861
00:30:23,669 --> 00:30:21,679
not brought any samples back since the

862
00:30:25,510 --> 00:30:23,679
last shuttle flight

863
00:30:26,470 --> 00:30:25,520

and one of the ways that we when nasa

864
00:30:28,470 --> 00:30:26,480
knew this

865
00:30:30,389 --> 00:30:28,480
the shuttle was going to retire

866
00:30:31,909 --> 00:30:30,399
we actually flew extra freezers to the

867
00:30:34,630 --> 00:30:31,919
space station to hold those samples so

868
00:30:37,269 --> 00:30:34,640
that the crews could continue

869
00:30:38,549 --> 00:30:37,279
to continue to collect samples on orbit

870
00:30:40,470 --> 00:30:38,559
uh knowing that we would bring them back

871
00:30:42,950 --> 00:30:40,480
when we had a chance and and the novelty

872
00:30:47,190 --> 00:30:42,960
at this point of spacex is that this is

873
00:30:49,430 --> 00:30:47,200
the the first real um return vehicle for

874
00:30:52,630 --> 00:30:49,440
this type of samples uh obviously we get

875
00:30:54,470 --> 00:30:52,640
the crew home uh on the soyuz uh but the

876
00:30:56,789 --> 00:30:54,480
the cargo capability of the soyuz is

877
00:30:58,789 --> 00:30:56,799
extremely limited so this is our first

878
00:31:00,070 --> 00:30:58,799
set of samples that have come back

879
00:31:01,509 --> 00:31:00,080
so if you want to go back i guess the

880
00:31:02,630 --> 00:31:01,519
oldest samples in those freezers has

881
00:31:05,029 --> 00:31:02,640
been

882
00:31:07,350 --> 00:31:05,039
since last july

883
00:31:08,389 --> 00:31:07,360
they all coming back in freezers is that

884
00:31:09,750 --> 00:31:08,399
that's correct there's actually two

885
00:31:11,509 --> 00:31:09,760
different types of freezers we have one

886
00:31:13,190 --> 00:31:11,519
is a typical powered freezer that's

887
00:31:14,870 --> 00:31:13,200
known as the glacier and that's where

888
00:31:16,230 --> 00:31:14,880

all the blood will be we also have

889
00:31:18,549 --> 00:31:16,240
samples coming back in what's called the

890
00:31:20,230 --> 00:31:18,559
double cold bag which is essentially a

891
00:31:21,509 --> 00:31:20,240
fancy lunch bag

892
00:31:22,870 --> 00:31:21,519
that we don't let them put their lunches

893
00:31:24,710 --> 00:31:22,880
in but it has

894
00:31:26,950 --> 00:31:24,720
as ice packs in there

895
00:31:28,310 --> 00:31:26,960
that after very intensive testing

896
00:31:30,070 --> 00:31:28,320
we've shown that these that they can

897
00:31:31,430 --> 00:31:30,080
stay in there for three or four days

898
00:31:32,630 --> 00:31:31,440
plenty of time from the point at which

899
00:31:34,549 --> 00:31:32,640
they come out of the freezer go into the

900
00:31:36,310 --> 00:31:34,559
bag and we get them back in our hands in

901
00:31:37,509 --> 00:31:36,320
the lab and these are the same two

902
00:31:39,509 --> 00:31:37,519
technologies that we use to bring

903
00:31:41,190 --> 00:31:39,519
samples back on the shuttle uh it's just

904
00:31:43,830 --> 00:31:41,200
now we've adapted them to this other

905
00:31:45,909 --> 00:31:43,840
vehicle and if i could um one question

906
00:31:47,509 --> 00:31:45,919
for dr robinson

907
00:31:48,549 --> 00:31:47,519
yesterday there was an announcement

908
00:31:50,230 --> 00:31:48,559
about

909
00:31:51,990 --> 00:31:50,240
in 2015

910
00:31:55,190 --> 00:31:52,000
two crew members spending a whole entire

911
00:31:56,950 --> 00:31:55,200
year aboard the space station um how

912
00:31:58,950 --> 00:31:56,960
what does that mean to your team of

913
00:32:01,509 --> 00:31:58,960

scientists how exciting is that what

914
00:32:02,950 --> 00:32:01,519
what can you really get out of it and

915
00:32:05,190 --> 00:32:02,960
what have you learned from the three

916
00:32:06,310 --> 00:32:05,200
russian experiences that went that

917
00:32:07,430 --> 00:32:06,320
distance

918
00:32:09,350 --> 00:32:07,440
years ago

919
00:32:10,470 --> 00:32:09,360
sure yeah that's a great question um you

920
00:32:12,230 --> 00:32:10,480
know we've been working across the

921
00:32:13,990 --> 00:32:12,240
partnership looking at this for a number

922
00:32:16,149 --> 00:32:14,000
of months

923
00:32:18,149 --> 00:32:16,159
you know the in the past the the russian

924
00:32:20,149 --> 00:32:18,159
cosmonauts that have flown for one year

925
00:32:22,470 --> 00:32:20,159
they flew at a time when both medical

926
00:32:24,789 --> 00:32:22,480
technology was not as advanced as it is

927
00:32:26,070 --> 00:32:24,799
today and also when we didn't have the

928
00:32:28,470 --> 00:32:26,080
knowledge that we've gotten from the

929
00:32:29,990 --> 00:32:28,480
space station so far about exercise

930
00:32:31,750 --> 00:32:30,000
routines and nutrition some of the

931
00:32:33,350 --> 00:32:31,760
things that scott talked about

932
00:32:36,149 --> 00:32:33,360
so today we're in a position where we

933
00:32:37,830 --> 00:32:36,159
think we know a lot more about what it

934
00:32:40,149 --> 00:32:37,840
takes to keep a crew member healthy for

935
00:32:42,149 --> 00:32:40,159
six months in orbit but we know that for

936
00:32:44,310 --> 00:32:42,159
a variety of space missions that are

937
00:32:46,230 --> 00:32:44,320
under consideration we really might need

938
00:32:47,430 --> 00:32:46,240

crew members to go a little bit longer

939
00:32:49,590 --> 00:32:47,440
and so

940
00:32:51,750 --> 00:32:49,600
we have to we can get a quick look at

941
00:32:53,830 --> 00:32:51,760
what we don't know by having a small

942
00:32:55,269 --> 00:32:53,840
number of subjects like the like the

943
00:32:57,830 --> 00:32:55,279
astronaut and the cosmonaut that will do

944
00:32:59,750 --> 00:32:57,840
this one one year duration flight we can

945
00:33:01,190 --> 00:32:59,760
collect similar kinds of measurements on

946
00:33:02,789 --> 00:33:01,200
them as we do in our six-month crew

947
00:33:04,789 --> 00:33:02,799
members and it will give us just a

948
00:33:06,470 --> 00:33:04,799
couple of data points that will tell us

949
00:33:08,070 --> 00:33:06,480
you know is the trajectory of what we

950
00:33:10,389 --> 00:33:08,080
see happening in the first six months

951
00:33:11,830 --> 00:33:10,399
does that continue does it level out on

952
00:33:13,350 --> 00:33:11,840
a lot of these different parameters and

953
00:33:16,310 --> 00:33:13,360
that's going to really change the way

954
00:33:18,310 --> 00:33:16,320
that we look at our long duration

955
00:33:19,990 --> 00:33:18,320
research program so it will immediately

956
00:33:22,389 --> 00:33:20,000
feed back into our human research risk

957
00:33:23,909 --> 00:33:22,399
models and help us redefine what where

958
00:33:26,149 --> 00:33:23,919
we need more information where we're

959
00:33:27,509 --> 00:33:26,159
good to go

960
00:33:30,470 --> 00:33:27,519
james

961
00:33:32,870 --> 00:33:30,480
robinson i don't think hardly any

962
00:33:34,789 --> 00:33:32,880
science flew on the demonstration flight

963
00:33:36,310 --> 00:33:34,799

back in may

964
00:33:37,590 --> 00:33:36,320
why not and

965
00:33:39,669 --> 00:33:37,600
at this point with this mission does

966
00:33:40,789 --> 00:33:39,679
this represent

967
00:33:44,230 --> 00:33:40,799
a

968
00:33:47,430 --> 00:33:44,240
kind of science you would like to to fly

969
00:33:48,549 --> 00:33:47,440
are you still sort of working up to um

970
00:33:50,070 --> 00:33:48,559
what you would consider like your

971
00:33:52,470 --> 00:33:50,080
highest value

972
00:33:54,870 --> 00:33:52,480
uh cargo um as they continue to

973
00:33:56,710 --> 00:33:54,880
demonstrate the uh the ability to to get

974
00:33:58,230 --> 00:33:56,720
up and down yeah what we did in may

975
00:34:00,149 --> 00:33:58,240
because it was a demonstration flight

976
00:34:02,630 --> 00:34:00,159
and there were some uncertainties not so

977
00:34:04,710 --> 00:34:02,640
much about the success of the flight but

978
00:34:06,710 --> 00:34:04,720
about the ground operations and things

979
00:34:08,230 --> 00:34:06,720
with new teams handling samples some of

980
00:34:10,310 --> 00:34:08,240
which have limited lives things that are

981
00:34:12,230 --> 00:34:10,320
frozen and so forth we

982
00:34:14,230 --> 00:34:12,240
primarily flew samples that we knew were

983
00:34:15,750 --> 00:34:14,240
degrading in orbit and we brought those

984
00:34:17,829 --> 00:34:15,760
home on the demonstration flight and we

985
00:34:19,349 --> 00:34:17,839
did launch cargo both ways but it was as

986
00:34:22,149 --> 00:34:19,359
you say a slightly reduced complement

987
00:34:24,950 --> 00:34:22,159
from our normal full up this flight is

988
00:34:26,550 --> 00:34:24,960

all out maxed out really filling our

989
00:34:28,310 --> 00:34:26,560
research needs and this is what we're

990
00:34:30,069 --> 00:34:28,320
going to expect spacex flights to look

991
00:34:31,589 --> 00:34:30,079
like every time they launch in the

992
00:34:32,869 --> 00:34:31,599
future

993
00:34:35,270 --> 00:34:32,879
thanks and and

994
00:34:37,750 --> 00:34:35,280
you um talking about down mass of course

995
00:34:38,950 --> 00:34:37,760
compared to the the shuttle and

996
00:34:41,030 --> 00:34:38,960
did i understand correctly does this

997
00:34:44,389 --> 00:34:41,040
actually does dragon actually

998
00:34:47,109 --> 00:34:44,399
at least from a research perspective um

999
00:34:49,589 --> 00:34:47,119
equal what what the shuttle could return

1000
00:34:52,230 --> 00:34:49,599
in in terms of capacity so it doesn't

1001
00:34:53,589 --> 00:34:52,240
equal at mass for mass but in we've

1002
00:34:55,430 --> 00:34:53,599
designed the space station so that we

1003
00:34:57,430 --> 00:34:55,440
don't really need to bring up and down

1004
00:34:59,750 --> 00:34:57,440
really large components

1005
00:35:01,270 --> 00:34:59,760
so for our research resupply for keeping

1006
00:35:05,030 --> 00:35:01,280
the lab running it gives us everything

1007
00:35:10,310 --> 00:35:07,430
mark ratterman with talking space for dr

1008
00:35:13,270 --> 00:35:10,320
robinson i saw a mention on the

1009
00:35:15,670 --> 00:35:13,280
payload list of ams cables is that for

1010
00:35:17,190 --> 00:35:15,680
replacement or spares or what can you

1011
00:35:19,589 --> 00:35:17,200
tell us about ams

1012
00:35:23,910 --> 00:35:19,599
yeah so it's just a spare a spare cable

1013
00:35:26,390 --> 00:35:23,920

for one that that we replaced on orbit

1014
00:35:27,670 --> 00:35:26,400
and another question about iserv and you

1015
00:35:30,150 --> 00:35:27,680
mentioned it being the highest

1016
00:35:31,910 --> 00:35:30,160
resolution device to fly on station for

1017
00:35:34,790 --> 00:35:31,920
earth imaging

1018
00:35:37,510 --> 00:35:34,800
how does that compare to other

1019
00:35:39,349 --> 00:35:37,520
satellites and apparatus in orbit that's

1020
00:35:42,150 --> 00:35:39,359
that's doing earth imaging is it similar

1021
00:35:44,230 --> 00:35:42,160
is it another step ahead so some of the

1022
00:35:46,310 --> 00:35:44,240
commercial imagers that that people buy

1023
00:35:50,150 --> 00:35:46,320
imagery from like orb view have about

1024
00:35:52,790 --> 00:35:50,160
one meter spatial resolution so it's uh

1025
00:35:53,510 --> 00:35:52,800
not quite as high resolution as that

1026
00:35:56,550 --> 00:35:53,520
but

1027
00:35:58,069 --> 00:35:56,560
imagery that can be provided to the

1028
00:36:00,150 --> 00:35:58,079
developing world for helping to solve

1029
00:36:02,150 --> 00:36:00,160
problems it's higher resolution as a

1030
00:36:04,310 --> 00:36:02,160
comparison landsat which is the other

1031
00:36:05,990 --> 00:36:04,320
sort of inexpensive data source that's

1032
00:36:08,390 --> 00:36:06,000
often used as a workhorse around the

1033
00:36:09,349 --> 00:36:08,400
world that's 30 meter spatial resolution

1034
00:36:11,349 --> 00:36:09,359
so when you're trying to look at

1035
00:36:14,550 --> 00:36:11,359
droughts or floods that extra spatial

1036
00:36:16,710 --> 00:36:14,560
resolution can be really valuable

1037
00:36:17,750 --> 00:36:16,720
hi i'm stacy severn i'm with the nasa

1038
00:36:19,910 --> 00:36:17,760

social

1039
00:36:21,990 --> 00:36:19,920
a question for dr yeatman you mentioned

1040
00:36:25,109 --> 00:36:22,000
that there was an unsolicited rfp that

1041
00:36:27,270 --> 00:36:25,119
came in for protein crystallography

1042
00:36:29,270 --> 00:36:27,280
i'm just curious do we see

1043
00:36:30,710 --> 00:36:29,280
more of that in the future you know

1044
00:36:33,030 --> 00:36:30,720
independent corporations wanting

1045
00:36:35,349 --> 00:36:33,040
research done on the space station

1046
00:36:37,589 --> 00:36:35,359
well we certainly hope so um i think by

1047
00:36:40,790 --> 00:36:37,599
by generating interest through solicit

1048
00:36:41,990 --> 00:36:40,800
solicitations we we obviously generate a

1049
00:36:43,829 --> 00:36:42,000
lot of um

1050
00:36:46,150 --> 00:36:43,839
advertising for what can be done on the

1051
00:36:47,589 --> 00:36:46,160
space station and uh we hope that

1052
00:36:49,349 --> 00:36:47,599
unsolicited will come through as well

1053
00:36:52,470 --> 00:36:49,359
and we have a mechanism to filter those

1054
00:36:53,790 --> 00:36:52,480
and examine them so

1055
00:36:56,390 --> 00:36:53,800
art

1056
00:36:58,630 --> 00:36:56,400
savemanspace.com uh two quick questions

1057
00:37:00,470 --> 00:36:58,640
why just one thousand pounds of cargo up

1058
00:37:02,550 --> 00:37:00,480
and down on this mission its capacity is

1059
00:37:04,069 --> 00:37:02,560
a lot more well that's not the total

1060
00:37:06,710 --> 00:37:04,079
cargo up and down that's the research

1061
00:37:09,030 --> 00:37:06,720
cargo up and down so we also have food

1062
00:37:11,430 --> 00:37:09,040
clothing spare parts all kinds of other

1063
00:37:13,109 --> 00:37:11,440

things the flight is full excellent and

1064
00:37:16,230 --> 00:37:13,119
the follow-up on the the one-year

1065
00:37:19,349 --> 00:37:16,240
mission i believe one of the highest

1066
00:37:20,870 --> 00:37:19,359
values of the space station is doing is

1067
00:37:24,069 --> 00:37:20,880
simulating

1068
00:37:26,150 --> 00:37:24,079
mars and other deep space missions uh

1069
00:37:29,589 --> 00:37:26,160
is will this there be additional or is

1070
00:37:31,670 --> 00:37:29,599
it just gonna be this one shot in uh um

1071
00:37:33,270 --> 00:37:31,680
in 2015

1072
00:37:34,950 --> 00:37:33,280
due to the uh

1073
00:37:37,270 --> 00:37:34,960
uh the the

1074
00:37:38,230 --> 00:37:37,280
russian scheduling of the uh the

1075
00:37:39,349 --> 00:37:38,240
tourists

1076
00:37:40,790 --> 00:37:39,359
well so

1077
00:37:42,390 --> 00:37:40,800
i want to emphasize that this this

1078
00:37:44,470 --> 00:37:42,400
one-year decision was made across the

1079
00:37:46,390 --> 00:37:44,480
partnership for scientific and and

1080
00:37:48,870 --> 00:37:46,400
technology testing value

1081
00:37:51,670 --> 00:37:48,880
um the plan is to do it once and then

1082
00:37:53,190 --> 00:37:51,680
see what what we identify so you know as

1083
00:37:54,710 --> 00:37:53,200
i talked about if we're seeing that most

1084
00:37:56,230 --> 00:37:54,720
of the trends are exactly what we would

1085
00:37:57,670 --> 00:37:56,240
predict then we would know

1086
00:37:59,270 --> 00:37:57,680
scientifically we don't really need

1087
00:38:01,510 --> 00:37:59,280
additional one-year missions but if we

1088
00:38:02,710 --> 00:38:01,520

see some big surprises come out of of

1089
00:38:03,750 --> 00:38:02,720
our observations of the one year crew

1090
00:38:05,670 --> 00:38:03,760
member that's going to send us in a

1091
00:38:08,710 --> 00:38:05,680
different trajectory so the great thing

1092
00:38:10,950 --> 00:38:08,720
is across the partnership we're we're we

1093
00:38:12,390 --> 00:38:10,960
have an active team that that is working

1094
00:38:14,390 --> 00:38:12,400
on all of these different mission

1095
00:38:16,069 --> 00:38:14,400
simulations and what should we be doing

1096
00:38:17,829 --> 00:38:16,079
to get all the knowledge we need from

1097
00:38:19,910 --> 00:38:17,839
the iss period so that we're ready to go

1098
00:38:21,589 --> 00:38:19,920
on to those future destinations

1099
00:38:23,270 --> 00:38:21,599
and and we'll be able to assess that as

1100
00:38:25,190 --> 00:38:23,280
we go as we learn from this first

1101
00:38:27,829 --> 00:38:25,200
mission excellent thank you we're going

1102
00:38:29,109 --> 00:38:27,839
to take one more question here and then

1103
00:38:30,710 --> 00:38:29,119
we're going to take a question on the

1104
00:38:32,390 --> 00:38:30,720
phone bridge and then we'll come back so

1105
00:38:33,910 --> 00:38:32,400
let's take a question here

1106
00:38:36,550 --> 00:38:33,920
steve carney with the florida news

1107
00:38:39,430 --> 00:38:36,560
network dr yeatman you mentioned uh the

1108
00:38:41,910 --> 00:38:39,440
possible collaboration between cases and

1109
00:38:43,829 --> 00:38:41,920
uh big pharma i was just curious as to

1110
00:38:45,030 --> 00:38:43,839
what sort of interest you've generated

1111
00:38:46,470 --> 00:38:45,040
so far

1112
00:38:48,069 --> 00:38:46,480
if any and

1113
00:38:51,030 --> 00:38:48,079

what sort of time frame you're looking

1114
00:38:54,710 --> 00:38:51,040
at uh for a collaboration to uh

1115
00:38:56,950 --> 00:38:54,720
get started and possibly see some uh

1116
00:38:59,589 --> 00:38:56,960
some effects from it

1117
00:39:01,270 --> 00:38:59,599
sure so um i think on the website it's

1118
00:39:04,069 --> 00:39:01,280
when an announcement was made that that

1119
00:39:05,670 --> 00:39:04,079
merck has an interest in a particular

1120
00:39:07,430 --> 00:39:05,680
protein crystallography experiment with

1121
00:39:10,710 --> 00:39:07,440
a monoclonal antibody which looks very

1122
00:39:13,030 --> 00:39:10,720
exciting um i think that

1123
00:39:14,790 --> 00:39:13,040
as we develop capabilities further

1124
00:39:16,470 --> 00:39:14,800
capabilities for instance mouse models

1125
00:39:18,790 --> 00:39:16,480
to go in space

1126
00:39:20,950 --> 00:39:18,800
we'll be able to engage

1127
00:39:22,710 --> 00:39:20,960
a number of different pharma for

1128
00:39:25,109 --> 00:39:22,720
various things one of them is muscle

1129
00:39:27,109 --> 00:39:25,119
wasting diseases as we talked about and

1130
00:39:28,630 --> 00:39:27,119
osteoporosis is another

1131
00:39:30,950 --> 00:39:28,640
we also think stem cells might be an

1132
00:39:33,190 --> 00:39:30,960
area of interest for pharma as well so i

1133
00:39:35,589 --> 00:39:33,200
think the more we can develop and

1134
00:39:37,510 --> 00:39:35,599
partner with nasa and partner with with

1135
00:39:39,349 --> 00:39:37,520
industry to figure out what they

1136
00:39:41,030 --> 00:39:39,359
actually need

1137
00:39:42,550 --> 00:39:41,040
i think we can entice them so we're

1138
00:39:44,390 --> 00:39:42,560

going to build things that they actually

1139
00:39:46,870 --> 00:39:44,400
can use

1140
00:39:48,630 --> 00:39:46,880
not that they might use

1141
00:39:50,550 --> 00:39:48,640
okay let's uh let's go to the phone line

1142
00:39:53,030 --> 00:39:50,560
and take a question from tarek malik

1143
00:39:55,270 --> 00:39:53,040
tarek are you there

1144
00:39:58,310 --> 00:39:55,280
yes thank you very much tarek malek from

1145
00:40:01,109 --> 00:39:58,320
space.com and i think i have a question

1146
00:40:05,030 --> 00:40:01,119
that may be either for dr robinson or or

1147
00:40:07,190 --> 00:40:05,040
dr smith um i'm curious how the uh

1148
00:40:07,910 --> 00:40:07,200
demonstration flight what with the the

1149
00:40:17,030 --> 00:40:07,920
the

1150
00:40:19,030 --> 00:40:17,040
you know from from a camps uh a capsule

1151
00:40:21,829 --> 00:40:19,040
uh like dragon on getting it back from

1152
00:40:23,910 --> 00:40:21,839
the ocean getting it back to houston uh

1153
00:40:26,870 --> 00:40:23,920
and and into the the hands of your

1154
00:40:28,550 --> 00:40:26,880
scientist uh how that process uh went

1155
00:40:31,349 --> 00:40:28,560
you know in terms of smoothly and then

1156
00:40:34,390 --> 00:40:31,359
also um just just how

1157
00:40:37,750 --> 00:40:34,400
uh how important it is to to really have

1158
00:40:40,550 --> 00:40:37,760
maybe a a a more

1159
00:40:42,870 --> 00:40:40,560
frequent schedule of samples returning

1160
00:40:44,790 --> 00:40:42,880
back on a regular basis from either

1161
00:40:47,270 --> 00:40:44,800
dragon or in the future cygnus as well

1162
00:40:51,750 --> 00:40:50,630
sure so uh tarik this is julie

1163
00:40:53,910 --> 00:40:51,760

the uh

1164
00:40:55,349 --> 00:40:53,920
you know the tests went really well it's

1165
00:40:57,109 --> 00:40:55,359
actually not that difficult on the

1166
00:40:59,510 --> 00:40:57,119
ground um because what we can do is take

1167
00:41:01,190 --> 00:40:59,520
the cold bags uh these freezer bags and

1168
00:41:03,670 --> 00:41:01,200
throw them right in a freezer that keeps

1169
00:41:05,829 --> 00:41:03,680
them cold until the we get the capsule

1170
00:41:07,750 --> 00:41:05,839
until spacex gets the capsules ashore

1171
00:41:09,510 --> 00:41:07,760
then we can offload those and transport

1172
00:41:12,470 --> 00:41:09,520
them back to the users

1173
00:41:14,390 --> 00:41:12,480
with the freezers um we plug them in and

1174
00:41:16,230 --> 00:41:14,400
we did a test of that to see how well

1175
00:41:17,910 --> 00:41:16,240
things held temperature and so we really

1176
00:41:20,390 --> 00:41:17,920
felt confident that we could bring home

1177
00:41:22,309 --> 00:41:20,400
these essentially priceless samples and

1178
00:41:24,390 --> 00:41:22,319
that we'll be able to do so routinely

1179
00:41:26,230 --> 00:41:24,400
it's been a great performance by spacex

1180
00:41:28,069 --> 00:41:26,240
to help us get all of those logistics

1181
00:41:30,710 --> 00:41:28,079
worked out and the other great thing is

1182
00:41:32,790 --> 00:41:30,720
as we move towards these routine spacex

1183
00:41:35,510 --> 00:41:32,800
flights we're also working closely with

1184
00:41:37,670 --> 00:41:35,520
them to add additional capabilities that

1185
00:41:39,990 --> 00:41:37,680
we may need to support our research

1186
00:41:41,750 --> 00:41:40,000
community so for example because of the

1187
00:41:43,750 --> 00:41:41,760
interest from pharma we know that we

1188
00:41:45,190 --> 00:41:43,760

need more freezer capacity than we had

1189
00:41:46,790 --> 00:41:45,200
originally planned and so we're working

1190
00:41:48,790 --> 00:41:46,800
to extend that and that will happen in a

1191
00:41:51,109 --> 00:41:48,800
couple of flights also

1192
00:41:52,870 --> 00:41:51,119
as we add more animal capacity to do

1193
00:41:56,550 --> 00:41:52,880
animal research in the program we work

1194
00:41:56,560 --> 00:42:00,230
tara do you have a follow-up

1195
00:42:03,030 --> 00:42:01,270
no that answers my question thank you

1196
00:42:04,870 --> 00:42:03,040
very much okay thank you

1197
00:42:06,470 --> 00:42:04,880
back here at kennedy space center jeff

1198
00:42:07,910 --> 00:42:06,480
fallon space review for dr yateman can

1199
00:42:09,990 --> 00:42:07,920
you give us a timeline for some of these

1200
00:42:11,990 --> 00:42:10,000
future research opportunities how soon

1201
00:42:13,589 --> 00:42:12,000
will some of these possibilities and

1202
00:42:15,670 --> 00:42:13,599
life sciences and other areas actually

1203
00:42:19,190 --> 00:42:15,680
be flying to the space station

1204
00:42:20,870 --> 00:42:19,200
so um i think that the timeline is i'm

1205
00:42:24,630 --> 00:42:20,880
going to give them the right increments

1206
00:42:25,750 --> 00:42:24,640
i think 37 38 as we're talking about so

1207
00:42:26,710 --> 00:42:25,760
um

1208
00:42:28,950 --> 00:42:26,720
uh

1209
00:42:30,950 --> 00:42:28,960
not too far away um it gives us enough

1210
00:42:32,950 --> 00:42:30,960
time to uh to

1211
00:42:34,550 --> 00:42:32,960
get rfps out

1212
00:42:36,630 --> 00:42:34,560
sort through some of these

1213
00:42:38,550 --> 00:42:36,640

experiments find the best ones and get

1214
00:42:40,790 --> 00:42:38,560
them up there also prepare the equipment

1215
00:42:42,710 --> 00:42:40,800
and do all the integration required to

1216
00:42:44,230 --> 00:42:42,720
get the right equipment up there

1217
00:42:47,109 --> 00:42:44,240
and for those of you who don't speak

1218
00:42:48,630 --> 00:42:47,119
increment that's a your way

1219
00:42:50,390 --> 00:42:48,640
okay

1220
00:42:52,630 --> 00:42:50,400
over here

1221
00:42:54,230 --> 00:42:52,640
hi i'm charles parker with brevard times

1222
00:42:57,349 --> 00:42:54,240
and also i'm the director of the da

1223
00:42:59,670 --> 00:42:57,359
vinci aerospace davinci academy of based

1224
00:43:01,589 --> 00:42:59,680
technology at meredith high school

1225
00:43:03,270 --> 00:43:01,599
and i wanted to talk dr robinson dr

1226
00:43:05,030 --> 00:43:03,280
yeoman talk a little bit more about the

1227
00:43:06,550 --> 00:43:05,040
cost of cubesats

1228
00:43:08,710 --> 00:43:06,560
and

1229
00:43:11,589 --> 00:43:08,720
any collaboration that high school

1230
00:43:12,390 --> 00:43:11,599
academies aerospace academies can do

1231
00:43:13,990 --> 00:43:12,400
to help

1232
00:43:16,230 --> 00:43:14,000
help us get

1233
00:43:19,670 --> 00:43:16,240
in space

1234
00:43:21,829 --> 00:43:19,680
cubesat costs yeah so uh certainly the

1235
00:43:23,589 --> 00:43:21,839
uh you know the cubesat example that i

1236
00:43:26,790 --> 00:43:23,599
talked about today cost about thirty

1237
00:43:28,630 --> 00:43:26,800
thousand dollars uh there are an you

1238
00:43:29,990 --> 00:43:28,640

know number of cubesat launch

1239
00:43:33,030 --> 00:43:30,000
opportunities that have been able by

1240
00:43:35,510 --> 00:43:33,040
something we call jsod the uh it's

1241
00:43:37,510 --> 00:43:35,520
basically a little launcher that's on

1242
00:43:39,670 --> 00:43:37,520
the gem module so now what we can do is

1243
00:43:41,990 --> 00:43:39,680
we can launch these cubesats in excess

1244
00:43:44,390 --> 00:43:42,000
capacity that we have at any time we put

1245
00:43:47,030 --> 00:43:44,400
them in this launcher they go out uh

1246
00:43:49,109 --> 00:43:47,040
through the gem airlock on the kibo

1247
00:43:50,390 --> 00:43:49,119
module they can go out there's a robotic

1248
00:43:52,309 --> 00:43:50,400
arm that puts them out into this

1249
00:43:53,670 --> 00:43:52,319
launcher actually the launcher comes in

1250
00:43:56,710 --> 00:43:53,680
and they load it up and and then it goes

1251
00:43:58,870 --> 00:43:56,720
out and so it's it's relatively you know

1252
00:44:01,109 --> 00:43:58,880
crew doesn't take a lot of crew effort

1253
00:44:02,630 --> 00:44:01,119
and uh and it's so it's a great system

1254
00:44:03,510 --> 00:44:02,640
uh to take advantage of that and there

1255
00:44:04,870 --> 00:44:03,520
have been

1256
00:44:06,230 --> 00:44:04,880
a lot of different educational

1257
00:44:08,150 --> 00:44:06,240
organizations that have been working on

1258
00:44:10,069 --> 00:44:08,160
building cubesats and have had trouble

1259
00:44:12,470 --> 00:44:10,079
finding launch opportunities so it's a

1260
00:44:14,309 --> 00:44:12,480
pretty pretty good capability to add for

1261
00:44:15,990 --> 00:44:14,319
both education value but also for

1262
00:44:18,710 --> 00:44:16,000
science value there are

1263
00:44:20,390 --> 00:44:18,720

scientifically based cubesats uh both

1264
00:44:21,750 --> 00:44:20,400
being launched that were launched uh

1265
00:44:24,069 --> 00:44:21,760
this week and and being under

1266
00:44:26,230 --> 00:44:24,079
development as well

1267
00:44:27,750 --> 00:44:26,240
and uh just to add for for your students

1268
00:44:29,030 --> 00:44:27,760
i mean the the big change that's

1269
00:44:31,270 --> 00:44:29,040
happened in the last year are the

1270
00:44:33,349 --> 00:44:31,280
numbers of kinds of contests

1271
00:44:34,630 --> 00:44:33,359
and the rigor with which the winners of

1272
00:44:35,990 --> 00:44:34,640
those contests have developed their

1273
00:44:37,670 --> 00:44:36,000
science so i i would definitely

1274
00:44:39,190 --> 00:44:37,680
encourage anyone from the aerospace

1275
00:44:40,870 --> 00:44:39,200
academy to keep up on those contests and

1276
00:44:42,550 --> 00:44:40,880
start getting your students to apply as

1277
00:44:44,069 --> 00:44:42,560
just mentioned that next year cases is

1278
00:44:45,349 --> 00:44:44,079
going to support a five-week middle

1279
00:44:48,150 --> 00:44:45,359
school camp

1280
00:44:49,349 --> 00:44:48,160
with three to five locations nationwide

1281
00:44:53,829 --> 00:44:49,359
and there's going to be a final middle

1282
00:44:53,839 --> 00:44:57,829
for some of these activities

1283
00:45:01,430 --> 00:44:59,910
mark ratterman with talking space

1284
00:45:03,190 --> 00:45:01,440
it's kind of hard to direct this

1285
00:45:04,790 --> 00:45:03,200
question to one panel member because

1286
00:45:06,630 --> 00:45:04,800
you've all touched on it and i know it

1287
00:45:08,790 --> 00:45:06,640
goes away from where we are right now

1288
00:45:10,150 --> 00:45:08,800

with with what we know and what research

1289
00:45:13,109 --> 00:45:10,160
has brought us

1290
00:45:15,270 --> 00:45:13,119
but might there be an advantage to in

1291
00:45:17,109 --> 00:45:15,280
the future designing spacecraft that

1292
00:45:19,750 --> 00:45:17,119
would have some spin or something to

1293
00:45:21,990 --> 00:45:19,760
generate a slight gravity component that

1294
00:45:24,470 --> 00:45:22,000
would mitigate some of the need for the

1295
00:45:26,870 --> 00:45:24,480
the heart exercise for the

1296
00:45:29,109 --> 00:45:26,880
the concerns with bone loss and and

1297
00:45:30,230 --> 00:45:29,119
muscle loss uh just an open question

1298
00:45:32,069 --> 00:45:30,240
please

1299
00:45:33,270 --> 00:45:32,079
um you know we've had some teams at nasa

1300
00:45:35,109 --> 00:45:33,280
that have looked at that pretty

1301
00:45:36,710 --> 00:45:35,119
intensively the

1302
00:45:38,710 --> 00:45:36,720
without getting really technical the

1303
00:45:41,030 --> 00:45:38,720
simple way that i can explain it is it

1304
00:45:42,470 --> 00:45:41,040
it's a lot easier looking in 2001 a

1305
00:45:45,030 --> 00:45:42,480
space odyssey than it is when you

1306
00:45:47,190 --> 00:45:45,040
actually get down to the engineering so

1307
00:45:48,870 --> 00:45:47,200
there are two challenges with it one is

1308
00:45:50,550 --> 00:45:48,880
when you're spinning a system all your

1309
00:45:52,309 --> 00:45:50,560
fluid physics changes again because

1310
00:45:54,470 --> 00:45:52,319
you're basically operating a centrifuge

1311
00:45:56,069 --> 00:45:54,480
so your thermal loops your pumps all

1312
00:45:58,150 --> 00:45:56,079
your liquids you have to design

1313
00:46:00,470 --> 00:45:58,160

completely differently than we do today

1314
00:46:01,750 --> 00:46:00,480
for space or than we do on earth

1315
00:46:03,750 --> 00:46:01,760
so there's a set of engineering

1316
00:46:05,270 --> 00:46:03,760
challenges there's also a set of human

1317
00:46:07,109 --> 00:46:05,280
challenges because

1318
00:46:09,349 --> 00:46:07,119
when you're spinning you get a vector

1319
00:46:10,870 --> 00:46:09,359
that goes just one direction if you turn

1320
00:46:12,790 --> 00:46:10,880
your head a little bit it's like being

1321
00:46:15,510 --> 00:46:12,800
on an amusement park ride so it's not

1322
00:46:17,670 --> 00:46:15,520
the panacea for the human response

1323
00:46:19,670 --> 00:46:17,680
either in fact it could be worse than uh

1324
00:46:22,069 --> 00:46:19,680
microgravity pretty significantly so

1325
00:46:23,030 --> 00:46:22,079
that's a short answer

1326
00:46:25,349 --> 00:46:23,040
marcia

1327
00:46:27,990 --> 00:46:25,359
an associated press for those meals

1328
00:46:30,069 --> 00:46:28,000
going up um are those all american style

1329
00:46:32,790 --> 00:46:30,079
meals or are there other partners who

1330
00:46:33,670 --> 00:46:32,800
are contributing japanese food european

1331
00:46:35,510 --> 00:46:33,680
uh

1332
00:46:37,430 --> 00:46:35,520
canadian i i didn't hear the first the

1333
00:46:40,790 --> 00:46:37,440
food the food food going up is that all

1334
00:46:43,349 --> 00:46:40,800
u.s supplied food uh well we we do our

1335
00:46:45,190 --> 00:46:43,359
food as us os food for the u.s operating

1336
00:46:46,710 --> 00:46:45,200
segment and then russian food typically

1337
00:46:49,510 --> 00:46:46,720
launches on the progress

1338
00:46:51,829 --> 00:46:49,520

um and that does always include a mix of

1339
00:46:53,270 --> 00:46:51,839
things provided across the partnership

1340
00:46:55,349 --> 00:46:53,280
but i don't know the specifics of

1341
00:46:58,470 --> 00:46:55,359
exactly what's in these foods for dr

1342
00:47:00,630 --> 00:46:58,480
smith you're a nutritionist correct um

1343
00:47:02,150 --> 00:47:00,640
out of you know all the years that

1344
00:47:04,309 --> 00:47:02,160
astronauts have been living on this

1345
00:47:06,550 --> 00:47:04,319
space station full time what what have

1346
00:47:09,349 --> 00:47:06,560
you learned about nutrition is there any

1347
00:47:10,710 --> 00:47:09,359
particular diet that seems to be more

1348
00:47:12,950 --> 00:47:10,720
conducive to

1349
00:47:15,910 --> 00:47:12,960
a robust space life coming back and all

1350
00:47:17,750 --> 00:47:15,920
that um i don't know whether you want to

1351
00:47:19,589 --> 00:47:17,760
get any i'm just interested and curious

1352
00:47:22,630 --> 00:47:19,599
to know what's working and what what

1353
00:47:25,430 --> 00:47:22,640
isn't working regarding food

1354
00:47:26,230 --> 00:47:25,440
there's a lot of things we've learned um

1355
00:47:27,190 --> 00:47:26,240
and

1356
00:47:29,670 --> 00:47:27,200
you know when i meet with the crews

1357
00:47:31,349 --> 00:47:29,680
pre-flight the first thing i tell them

1358
00:47:33,510 --> 00:47:31,359
is if i can only tell you one thing it

1359
00:47:35,589 --> 00:47:33,520
said you need to eat that getting enough

1360
00:47:36,870 --> 00:47:35,599
calories getting enough food

1361
00:47:38,309 --> 00:47:36,880
everything else will come along all the

1362
00:47:39,829 --> 00:47:38,319
vitamins and minerals come along with

1363
00:47:41,510 --> 00:47:39,839

that so that

1364
00:47:43,030 --> 00:47:41,520
we're typically not cherry-picking of

1365
00:47:44,230 --> 00:47:43,040
you know eat some more of this to get

1366
00:47:46,309 --> 00:47:44,240
more

1367
00:47:47,349 --> 00:47:46,319
vanadium

1368
00:47:48,870 --> 00:47:47,359
so

1369
00:47:50,309 --> 00:47:48,880
energy consumption is the biggest thing

1370
00:47:52,549 --> 00:47:50,319
and that's again what we tend to drive

1371
00:47:53,910 --> 00:47:52,559
home and that is one of the things that

1372
00:47:56,790 --> 00:47:53,920
was highlighted in the paper that just

1373
00:47:59,030 --> 00:47:56,800
came out that the crews that ate well

1374
00:48:00,309 --> 00:47:59,040
and exercised hard they maintained their

1375
00:48:01,430 --> 00:48:00,319
body mass meaning they didn't lose

1376
00:48:03,190 --> 00:48:01,440
weight

1377
00:48:05,030 --> 00:48:03,200
they came back leaner they came back

1378
00:48:07,030 --> 00:48:05,040
with less fat

1379
00:48:08,150 --> 00:48:07,040
and and came back in again in pretty

1380
00:48:09,670 --> 00:48:08,160
good shape

1381
00:48:11,829 --> 00:48:09,680
um beyond that there's a number of

1382
00:48:14,390 --> 00:48:11,839
things that we've we've learned either

1383
00:48:15,270 --> 00:48:14,400
uh in a preliminary way or more defined

1384
00:48:17,750 --> 00:48:15,280
way

1385
00:48:19,109 --> 00:48:17,760
from a bone perspective um a couple

1386
00:48:21,030 --> 00:48:19,119
things come to mind we published a paper

1387
00:48:22,870 --> 00:48:21,040
a few years ago showing that the more

1388
00:48:25,109 --> 00:48:22,880

fish you eat during space flight the

1389
00:48:28,710 --> 00:48:25,119
less bone you lose and that likely ties

1390
00:48:30,230 --> 00:48:28,720
back in with omega-3 fatty acids

1391
00:48:32,630 --> 00:48:30,240
we've got a study going on right now

1392
00:48:34,950 --> 00:48:32,640
looking at the role of animal protein

1393
00:48:36,630 --> 00:48:34,960
and potassium which is the pro-k

1394
00:48:38,069 --> 00:48:36,640
experiment that i talked about

1395
00:48:40,230 --> 00:48:38,079
using the ratio of those two things of

1396
00:48:41,910 --> 00:48:40,240
the diet to help mitigate bone loss

1397
00:48:43,349 --> 00:48:41,920
uh we're partnering with our european

1398
00:48:45,990 --> 00:48:43,359
colleagues who have done experiments

1399
00:48:49,510 --> 00:48:46,000
looking at lowering sodium intake as a

1400
00:48:50,630 --> 00:48:49,520
way to mitigate again bone loss so

1401
00:48:53,510 --> 00:48:50,640
there's a number of things that i think

1402
00:48:55,430 --> 00:48:53,520
we could optimize when it comes to

1403
00:48:56,710 --> 00:48:55,440
trying to help bone the most and then

1404
00:48:58,390 --> 00:48:56,720
there's a number of other factors as

1405
00:49:00,390 --> 00:48:58,400
well oxidative stress is still an issue

1406
00:49:01,670 --> 00:49:00,400
that we need to look harder at

1407
00:49:03,109 --> 00:49:01,680
there's some

1408
00:49:04,470 --> 00:49:03,119
potential nutrition components that

1409
00:49:05,750 --> 00:49:04,480
we've identified that we're looking at

1410
00:49:08,470 --> 00:49:05,760
further with relation to the vision

1411
00:49:11,270 --> 00:49:08,480
issues during flight um so while we've

1412
00:49:12,790 --> 00:49:11,280
learned a lot um we still have a lot we

1413
00:49:15,589 --> 00:49:12,800

still have a long ways to go but we're

1414
00:49:20,710 --> 00:49:16,470
james

1415
00:49:22,390 --> 00:49:20,720
robinson again um

1416
00:49:24,870 --> 00:49:22,400
are there based on the way dragon

1417
00:49:27,109 --> 00:49:24,880
re-enters and and splashes down

1418
00:49:29,349 --> 00:49:27,119
uh compared to the the shuttle's landing

1419
00:49:30,950 --> 00:49:29,359
profile are there any samples any

1420
00:49:33,190 --> 00:49:30,960
research that's considered too too

1421
00:49:35,510 --> 00:49:33,200
delicate that that can't withstand uh

1422
00:49:37,030 --> 00:49:35,520
return on dragon and so

1423
00:49:39,670 --> 00:49:37,040
maybe you just wouldn't bother including

1424
00:49:41,030 --> 00:49:39,680
them on on a in down mass and maybe dr

1425
00:49:42,069 --> 00:49:41,040
gateman i wonder if that might be true

1426
00:49:45,270 --> 00:49:42,079
for uh

1427
00:49:46,710 --> 00:49:45,280
protein crystals

1428
00:49:49,190 --> 00:49:46,720
uh like it is

1429
00:49:51,109 --> 00:49:49,200
it has been a concern in the past that

1430
00:49:54,230 --> 00:49:51,119
the the the sheer forces coming back

1431
00:49:56,390 --> 00:49:54,240
down might um just destroy the the

1432
00:49:57,510 --> 00:49:56,400
crystals the fine crystals that are made

1433
00:49:59,589 --> 00:49:57,520
so you know one interest is to

1434
00:50:01,589 --> 00:49:59,599
potentially image some of these crystals

1435
00:50:03,030 --> 00:50:01,599
up in space before they come back down

1436
00:50:04,790 --> 00:50:03,040
um so that's that's one thing we're

1437
00:50:06,549 --> 00:50:04,800
looking into

1438
00:50:09,190 --> 00:50:06,559

yeah so i mean it isn't as smooth of a

1439
00:50:11,670 --> 00:50:09,200
ride as landing on the shuttle was but

1440
00:50:14,069 --> 00:50:11,680
it is um enveloped by the kinds of

1441
00:50:16,230 --> 00:50:14,079
requirements uh that we get for launch

1442
00:50:18,549 --> 00:50:16,240
as well so we do worry about it for

1443
00:50:21,670 --> 00:50:18,559
certain sensitive samples like some some

1444
00:50:23,430 --> 00:50:21,680
proteins but you can also pack smart and

1445
00:50:25,030 --> 00:50:23,440
pack things up have things padded and so

1446
00:50:27,190 --> 00:50:25,040
forth and take care of at least that

1447
00:50:28,069 --> 00:50:27,200
last you know it's that landing part

1448
00:50:29,670 --> 00:50:28,079
that's

1449
00:50:30,870 --> 00:50:29,680
plus the vibration and shaking those are

1450
00:50:32,390 --> 00:50:30,880
the two kind of components that could

1451
00:50:33,670 --> 00:50:32,400
damage things so

1452
00:50:34,549 --> 00:50:33,680
so overall

1453
00:50:36,470 --> 00:50:34,559
uh

1454
00:50:37,430 --> 00:50:36,480
things that can launch well can land

1455
00:50:38,549 --> 00:50:37,440
well

1456
00:50:40,230 --> 00:50:38,559
it's just a few there are a few

1457
00:50:43,510 --> 00:50:40,240
exceptions of things where you think

1458
00:50:48,630 --> 00:50:46,309
hi john walker was from the zod news and

1459
00:50:52,870 --> 00:50:48,640
countdown today my question has to be

1460
00:50:55,109 --> 00:50:52,880
about the bone loss and mass density

1461
00:50:57,109 --> 00:50:55,119
when you were talking about it doesn't

1462
00:50:58,549 --> 00:50:57,119
have an effect when they return back to

1463
00:51:00,150 --> 00:50:58,559

earth um

1464
00:51:02,230 --> 00:51:00,160
how long does it usually take a crew

1465
00:51:04,470 --> 00:51:02,240
member or an astronaut to get that

1466
00:51:08,549 --> 00:51:04,480
strength back or get that density back

1467
00:51:11,990 --> 00:51:09,829
those are really two different questions

1468
00:51:13,510 --> 00:51:12,000
and it gets into some of the the way we

1469
00:51:15,589 --> 00:51:13,520
image bones

1470
00:51:17,109 --> 00:51:15,599
but what we showed in the paper last

1471
00:51:18,630 --> 00:51:17,119
month partnering with the bone lab and

1472
00:51:20,790 --> 00:51:18,640
with the exercise lab

1473
00:51:23,430 --> 00:51:20,800
is that you can maintain bone mineral

1474
00:51:25,030 --> 00:51:23,440
density there is there is still a

1475
00:51:26,950 --> 00:51:25,040
question of whether or not that bone is

1476
00:51:28,870 --> 00:51:26,960
as strong as it was before flight

1477
00:51:30,390 --> 00:51:28,880
because there's some biochemical changes

1478
00:51:32,390 --> 00:51:30,400
that we picked up in the blood and urine

1479
00:51:35,190 --> 00:51:32,400
which suggest that

1480
00:51:39,190 --> 00:51:35,200
it's not the same as

1481
00:51:41,109 --> 00:51:39,200
to having gravity okay what we're doing

1482
00:51:43,670 --> 00:51:41,119
is the exercise is

1483
00:51:45,510 --> 00:51:43,680
increasing bone formation which balances

1484
00:51:48,069 --> 00:51:45,520
out the increase in bone breakdown which

1485
00:51:49,109 --> 00:51:48,079
is still happening so we we don't know

1486
00:51:50,870 --> 00:51:49,119
enough about strength and there there's

1487
00:51:52,790 --> 00:51:50,880
studies that are being being implemented

1488
00:51:54,870 --> 00:51:52,800

right now to look at bone strength to

1489
00:51:56,630 --> 00:51:54,880
see if we're improving that

1490
00:51:58,069 --> 00:51:56,640
to go back to the the other part of your

1491
00:52:00,150 --> 00:51:58,079
question

1492
00:52:01,750 --> 00:52:00,160
we typically it's been estimated it

1493
00:52:03,109 --> 00:52:01,760
takes about two to three times the

1494
00:52:05,270 --> 00:52:03,119
length of the mission

1495
00:52:08,069 --> 00:52:05,280
to recover the bone so from a six month

1496
00:52:12,150 --> 00:52:08,079
flight we're looking at 12 to 18 months

1497
00:52:15,030 --> 00:52:12,160
to get back to full bone mineral density

1498
00:52:17,589 --> 00:52:15,040
nasa and the russian space agency

1499
00:52:19,990 --> 00:52:17,599
collaborate and compare data from long

1500
00:52:22,069 --> 00:52:20,000
duration flights from the past programs

1501
00:52:24,470 --> 00:52:22,079
to try to come to a result when it comes

1502
00:52:26,309 --> 00:52:24,480
to bone mass and density

1503
00:52:28,549 --> 00:52:26,319
we've we've cut we have a long history

1504
00:52:30,069 --> 00:52:28,559
of collaborating with the russians uh

1505
00:52:31,670 --> 00:52:30,079
going back into the 90s with the mere

1506
00:52:33,430 --> 00:52:31,680
programs

1507
00:52:34,870 --> 00:52:33,440
and especially on the medical side there

1508
00:52:36,950 --> 00:52:34,880
is a lot of discussion back and forth

1509
00:52:39,030 --> 00:52:36,960
between the programs with the research

1510
00:52:40,950 --> 00:52:39,040
endeavors at least our research tends to

1511
00:52:42,710 --> 00:52:40,960
be focused on the usos crews who are the

1512
00:52:46,230 --> 00:52:42,720
ones who participate

1513
00:52:50,790 --> 00:52:47,510

in the back

1514
00:52:52,470 --> 00:52:50,800
i'm rodney williams uh social media um

1515
00:52:55,270 --> 00:52:52,480
since we're on the subject of uh bone

1516
00:52:57,109 --> 00:52:55,280
you answered a couple of my questions um

1517
00:52:59,109 --> 00:52:57,119
what's what's the percentage difference

1518
00:53:01,190 --> 00:52:59,119
versus the early

1519
00:53:03,829 --> 00:53:01,200
space program and now since we've been

1520
00:53:05,430 --> 00:53:03,839
uh examining this that um

1521
00:53:06,950 --> 00:53:05,440
as far as bone loss what's the

1522
00:53:09,829 --> 00:53:06,960
percentage difference

1523
00:53:12,390 --> 00:53:09,839
okay if uh if i can have my the last

1524
00:53:15,349 --> 00:53:13,910
this is actually an image from the paper

1525
00:53:16,790 --> 00:53:15,359
that we published

1526
00:53:18,870 --> 00:53:16,800
it may take a minute

1527
00:53:19,910 --> 00:53:18,880
um but what we did in that paper is we

1528
00:53:22,069 --> 00:53:19,920
looked at

1529
00:53:23,510 --> 00:53:22,079
um normalized if we will bone mineral

1530
00:53:25,270 --> 00:53:23,520
density loss

1531
00:53:27,030 --> 00:53:25,280
per month because that scales it out by

1532
00:53:28,710 --> 00:53:27,040
the length of the mission

1533
00:53:30,549 --> 00:53:28,720
and what we have here is four bars and

1534
00:53:32,870 --> 00:53:30,559
the left is the mirror

1535
00:53:35,349 --> 00:53:32,880
uh the the middle two bars the crew

1536
00:53:37,990 --> 00:53:35,359
members exercising with the interim

1537
00:53:38,950 --> 00:53:38,000
resistive exercise device the ired as we

1538
00:53:40,870 --> 00:53:38,960

called it

1539
00:53:42,790 --> 00:53:40,880
and the reason there were two splits

1540
00:53:43,670 --> 00:53:42,800
there is because the the i red bar on

1541
00:53:45,829 --> 00:53:43,680
the right

1542
00:53:47,510 --> 00:53:45,839
expeditions 14 through 18

1543
00:53:49,109 --> 00:53:47,520
are crew members that we collected blood

1544
00:53:50,630 --> 00:53:49,119
and urine on during flight so that's why

1545
00:53:51,750 --> 00:53:50,640
we broke those out

1546
00:53:53,990 --> 00:53:51,760
and then you can see the advanced

1547
00:53:56,790 --> 00:53:54,000
resistive exercise device on the right

1548
00:53:58,549 --> 00:53:56,800
so just looking at that the average

1549
00:54:00,390 --> 00:53:58,559
whole body bone marrow density loss was

1550
00:54:02,630 --> 00:54:00,400
about a half a percent in those earlier

1551
00:54:04,470 --> 00:54:02,640
programs compared to essentially zero if

1552
00:54:06,150 --> 00:54:04,480
not a little bit positive in crew

1553
00:54:07,589 --> 00:54:06,160
members using the a red

1554
00:54:09,109 --> 00:54:07,599
and we also looked at again in the

1555
00:54:11,750 --> 00:54:09,119
publication we looked at specific

1556
00:54:13,910 --> 00:54:11,760
regions we looked at spine hip you name

1557
00:54:16,069 --> 00:54:13,920
it and saw the same types of trends but

1558
00:54:20,230 --> 00:54:16,079
there's nothing more striking than that

1559
00:54:20,240 --> 00:54:23,670
i didn't plant that question

1560
00:54:27,190 --> 00:54:25,349
all right um that's about all the time

1561
00:54:30,069 --> 00:54:27,200
we have julie would you like to make any

1562
00:54:31,910 --> 00:54:30,079
closing comments uh sure you know so we

1563
00:54:33,510 --> 00:54:31,920

we brought to you today four different

1564
00:54:35,510 --> 00:54:33,520
scientific perspectives of what's going

1565
00:54:37,910 --> 00:54:35,520
on on the space station and uh just to

1566
00:54:39,670 --> 00:54:37,920
kind of recap that we talked about the

1567
00:54:42,549 --> 00:54:39,680
diversity of disciplines there's no

1568
00:54:44,630 --> 00:54:42,559
other laboratory i know of with such

1569
00:54:46,470 --> 00:54:44,640
international breadth and such breadth

1570
00:54:48,230 --> 00:54:46,480
of disciplines that can do research that

1571
00:54:50,390 --> 00:54:48,240
can't be done anywhere else

1572
00:54:53,109 --> 00:54:50,400
then dr yeatman really talked about

1573
00:54:55,589 --> 00:54:53,119
opportunity with cases

1574
00:54:57,829 --> 00:54:55,599
growing offering new solicitations there

1575
00:54:59,750 --> 00:54:57,839
are opportunities far beyond what nasa's

1576
00:55:01,589 --> 00:54:59,760
been able to offer in the past that are

1577
00:55:03,030 --> 00:55:01,599
growing through cases management of the

1578
00:55:04,230 --> 00:55:03,040
national laboratory and that's a really

1579
00:55:05,829 --> 00:55:04,240
exciting

1580
00:55:07,190 --> 00:55:05,839
development over the last year and and

1581
00:55:10,069 --> 00:55:07,200
continuing on

1582
00:55:12,309 --> 00:55:10,079
and then um with dr nielsen price you

1583
00:55:13,750 --> 00:55:12,319
know she's an example of new

1584
00:55:15,430 --> 00:55:13,760
investigators that new investigators

1585
00:55:17,430 --> 00:55:15,440
who've never done work in space are are

1586
00:55:19,910 --> 00:55:17,440
getting access finding opportunities to

1587
00:55:21,430 --> 00:55:19,920
get the funding and and really ask basic

1588
00:55:23,109 --> 00:55:21,440

questions and that those experiments can

1589
00:55:24,710 --> 00:55:23,119
happen pretty quickly

1590
00:55:27,750 --> 00:55:24,720
and then finally

1591
00:55:29,109 --> 00:55:27,760
what you saw with dr smith was how our

1592
00:55:31,270 --> 00:55:29,119
long-term investigators that get

1593
00:55:33,349 --> 00:55:31,280
multiple flight opportunities over time

1594
00:55:35,510 --> 00:55:33,359
can really start moving fields forward

1595
00:55:37,430 --> 00:55:35,520
make advances stepwise and you really

1596
00:55:39,670 --> 00:55:37,440
see that coming out in his work so i

1597
00:55:40,630 --> 00:55:39,680
hope that that gives you overall a sense

1598
00:55:43,349 --> 00:55:40,640
of

1599
00:55:45,190 --> 00:55:43,359
iss as a dynamic and fully established

1600
00:55:46,630 --> 00:55:45,200
laboratory it's nothing like it was a

1601
00:55:48,950 --> 00:55:46,640
year ago when people were mostly still

1602
00:55:51,030 --> 00:55:48,960
talking about assembly it's really full

1603
00:55:52,630 --> 00:55:51,040
bore full speed ahead with lots of

1604
00:55:54,069 --> 00:55:52,640
opportunities

1605
00:55:55,430 --> 00:55:54,079
thanks thank you

1606
00:55:57,030 --> 00:55:55,440
and you can read a lot more about

1607
00:55:59,670 --> 00:55:57,040
research aboard the international space

1608
00:56:01,430 --> 00:55:59,680
station and the spacex crs-1 mission

1609
00:56:06,230 --> 00:56:01,440
that is launching to the space station

1610
00:56:08,630 --> 00:56:06,240
by going to our website at www.nasa.gov

1611
00:56:11,030 --> 00:56:08,640
station and our next televised event

1612
00:56:13,910 --> 00:56:11,040
coming up here on nasa television is the

1613
00:56:16,470 --> 00:56:13,920

spacex crs1 pre-launch news conference