
NASA

1
00:06:21,189 --> 00:05:58,570
[Music]

2
00:06:24,070 --> 00:06:21,990
good afternoon

3
00:06:26,790 --> 00:06:24,080
i'm ken appel with nasa communications

4
00:06:29,749 --> 00:06:26,800
here at kennedy space center in florida

5
00:06:32,230 --> 00:06:29,759
and welcome to the crs 21 nasa social

6
00:06:34,469 --> 00:06:32,240
science and station q a show where you

7
00:06:35,590 --> 00:06:34,479
can ask questions to our participating

8
00:06:37,590 --> 00:06:35,600
science research

9
00:06:39,909 --> 00:06:37,600
and commercial mission partners here

10
00:06:41,830 --> 00:06:39,919
today with us

11
00:06:44,150 --> 00:06:41,840
spacex is preparing to launch their

12
00:06:45,430 --> 00:06:44,160
upgraded cargo dragon spacecraft for the

13
00:06:48,150 --> 00:06:45,440

first time

14
00:06:50,230 --> 00:06:48,160
filled with tons of supplies 6 400

15
00:06:51,830 --> 00:06:50,240
pounds to be exact and it's not all

16
00:06:54,950 --> 00:06:51,840
holiday food although some

17
00:06:57,110 --> 00:06:54,960
is it's mainly supplies tools research

18
00:07:01,110 --> 00:06:57,120
science for not only nasa

19
00:07:02,070 --> 00:07:01,120
but academia as well as other government

20
00:07:05,189 --> 00:07:02,080
organizations

21
00:07:07,589 --> 00:07:05,199
and even commercial partners

22
00:07:10,070 --> 00:07:07,599
so for today's show we're going to dive

23
00:07:13,270 --> 00:07:10,080
into how the station is a cutting edge

24
00:07:13,990 --> 00:07:13,280
laboratory and how it's evolved into a

25
00:07:17,350 --> 00:07:14,000
catalyst

26
00:07:20,870 --> 00:07:17,360
for a low earth orbit economy

27
00:07:24,230 --> 00:07:20,880
now crs 21 stands for commercial

28
00:07:26,390 --> 00:07:24,240
resupply services mission to the

29
00:07:29,350 --> 00:07:26,400
international space station for nasa now

30
00:07:29,990 --> 00:07:29,360
crs 21 it is spacex's 21st cargo

31
00:07:32,629 --> 00:07:30,000
resupply

32
00:07:34,390 --> 00:07:32,639
mission for nasa but that does not mean

33
00:07:44,940 --> 00:07:34,400
that this mission doesn't come without

34
00:08:10,830 --> 00:07:44,950
many unique firsts

35
00:08:10,840 --> 00:08:15,580
so

36
00:08:20,050 --> 00:08:19,900
[Music]

37
00:08:43,110 --> 00:08:20,060
[Applause]

38
00:08:47,990 --> 00:08:44,870

let's get started with an overview of

39
00:08:50,070 --> 00:08:48,000
today's show we are going to chat with

40
00:08:51,750 --> 00:08:50,080
guests from station science and the

41
00:08:53,190 --> 00:08:51,760
commercial sides of this mission

42
00:08:55,430 --> 00:08:53,200
you'll have the chance to ask them

43
00:08:57,269 --> 00:08:55,440
questions after their introductions

44
00:08:58,630 --> 00:08:57,279
so first from the station side we're

45
00:09:01,190 --> 00:08:58,640
going to speak with jennifer scott

46
00:09:04,230 --> 00:09:01,200
williams joining us from the iss

47
00:09:04,550 --> 00:09:04,240
program research office in houston texas

48
00:09:07,990 --> 00:09:04,560
where

49
00:09:09,269 --> 00:09:08,000
nasa's johnson space center is located

50
00:09:11,110 --> 00:09:09,279
then we're gonna head over to the

51
00:09:12,710 --> 00:09:11,120
commercial side and here back in the

52
00:09:15,910 --> 00:09:12,720
room with me at kennedy we have

53
00:09:17,829 --> 00:09:15,920
brock howe from nano racks

54
00:09:20,070 --> 00:09:17,839
and then heading back virtually we are

55
00:09:22,550 --> 00:09:20,080
going to talk science with pinar

56
00:09:24,870 --> 00:09:22,560
messi she is from the experiment heading

57
00:09:28,230 --> 00:09:24,880
to station that is studying brain

58
00:09:29,829 --> 00:09:28,240
organoids so now let's virtually meet

59
00:09:30,949 --> 00:09:29,839
these guests that are here to answer

60
00:09:32,630 --> 00:09:30,959
your questions

61
00:09:34,470 --> 00:09:32,640
there are three ways that you can submit

62
00:09:35,750 --> 00:09:34,480
questions if you're watching on youtube

63
00:09:38,310 --> 00:09:35,760

you can just submit

64
00:09:40,470 --> 00:09:38,320
a comment with the question if you are a

65
00:09:42,470 --> 00:09:40,480
part of our virtual nasa social

66
00:09:44,630 --> 00:09:42,480
facebook page you can submit questions

67
00:09:45,710 --> 00:09:44,640
there or you can go to twitter and use

68
00:09:49,110 --> 00:09:45,720
the hashtag

69
00:09:49,990 --> 00:09:49,120
asknasa so first we're going to

70
00:09:51,750 --> 00:09:50,000
virtually head to

71
00:09:54,710 --> 00:09:51,760
texas to hear from jennifer scott

72
00:09:57,670 --> 00:09:54,720
williams so jennifer

73
00:09:59,350 --> 00:09:57,680
we we just celebrated 20 years of

74
00:10:02,150 --> 00:09:59,360
continuous human presence

75
00:10:04,310 --> 00:10:02,160
on station which i find amazing that

76
00:10:06,630 --> 00:10:04,320
some folks watching today may have

77
00:10:08,470 --> 00:10:06,640
never lived on earth with every other

78
00:10:10,230 --> 00:10:08,480
human being at the same time

79
00:10:12,230 --> 00:10:10,240
um can you tell us a little bit of how

80
00:10:16,150 --> 00:10:12,240
you've seen the station evolve

81
00:10:17,269 --> 00:10:16,160
and of course tell us about your role

82
00:10:19,829 --> 00:10:17,279
all right well thank you for that

83
00:10:20,949 --> 00:10:19,839
question kenneth first let's reflect on

84
00:10:23,430 --> 00:10:20,959
that number

85
00:10:25,269 --> 00:10:23,440
20 years right think about where you

86
00:10:27,350 --> 00:10:25,279
were 20 years ago

87
00:10:29,590 --> 00:10:27,360
if you were here and consider that

88
00:10:30,310 --> 00:10:29,600

students that are graduating from high

89
00:10:33,190 --> 00:10:30,320
school

90
00:10:35,269 --> 00:10:33,200
this year have always known a continuous

91
00:10:38,310 --> 00:10:35,279
human presence in space

92
00:10:40,230 --> 00:10:38,320
so the iss started off as an idea

93
00:10:41,509 --> 00:10:40,240
right and so from there it grew to a

94
00:10:43,509 --> 00:10:41,519
concept and then

95
00:10:45,269 --> 00:10:43,519
evolved into an international

96
00:10:47,430 --> 00:10:45,279
engineering feat

97
00:10:48,710 --> 00:10:47,440
so it grew from two simple modules in

98
00:10:51,030 --> 00:10:48,720
1998

99
00:10:52,230 --> 00:10:51,040
uh the russian zarya and the american

100
00:10:55,430 --> 00:10:52,240
unity modules

101
00:10:56,389 --> 00:10:55,440
and then over 135 shuttle missions and

102
00:10:59,430 --> 00:10:56,399
cargo flights

103
00:11:01,269 --> 00:10:59,440
later we have the iss we see today

104
00:11:03,750 --> 00:11:01,279
and with the length of a football field

105
00:11:05,269 --> 00:11:03,760
from end to end and the habitable volume

106
00:11:08,470 --> 00:11:05,279
of a five-bedroom

107
00:11:11,910 --> 00:11:08,480
house we've since designated the station

108
00:11:13,110 --> 00:11:11,920
as a world-class orbiting microgravity

109
00:11:15,990 --> 00:11:13,120
and national

110
00:11:18,310 --> 00:11:16,000
laboratory where we've conducted over 3

111
00:11:21,590 --> 00:11:18,320
100 science experiments

112
00:11:23,350 --> 00:11:21,600
on board so my role i'm in charge of the

113
00:11:25,910 --> 00:11:23,360

team responsible for

114
00:11:27,269 --> 00:11:25,920
enabling technology demonstrations stem

115
00:11:30,230 --> 00:11:27,279
experiments

116
00:11:31,910 --> 00:11:30,240
external investigations and platforms

117
00:11:33,030 --> 00:11:31,920
which are things that fly outside the

118
00:11:35,269 --> 00:11:33,040
iss

119
00:11:36,069 --> 00:11:35,279
and some of our commercial activities as

120
00:11:39,350 --> 00:11:36,079
well

121
00:11:42,470 --> 00:11:39,360
we ensure that from kickoff or concept

122
00:11:45,670 --> 00:11:42,480
to touchdown return of data

123
00:11:46,550 --> 00:11:45,680
samples hardware whatever you need to

124
00:11:48,230 --> 00:11:46,560
the ground

125
00:11:49,990 --> 00:11:48,240
we make sure that these experiments have

126
00:11:51,509 --> 00:11:50,000
the funding the support

127
00:11:55,670 --> 00:11:51,519
and the assistance needed to be

128
00:11:58,230 --> 00:11:55,680
completed successfully on the iss

129
00:12:00,310 --> 00:11:58,240
jennifer thank you now back here at

130
00:12:02,949 --> 00:12:00,320
kennedy with me i have brock cow

131
00:12:04,870 --> 00:12:02,959
in the room he is the program manager of

132
00:12:07,190 --> 00:12:04,880
the first ever commercially funded

133
00:12:08,790 --> 00:12:07,200
and operated airlock heading to station

134
00:12:10,870 --> 00:12:08,800
tomorrow so brock

135
00:12:12,710 --> 00:12:10,880
simply put what is an airlock and you

136
00:12:13,990 --> 00:12:12,720
have this super cool model of bishop can

137
00:12:16,710 --> 00:12:14,000
you walk us through it

138
00:12:18,310 --> 00:12:16,720

sure thanks kenneth i appreciate it and

139
00:12:20,069 --> 00:12:18,320
yeah the bishop airlock is going to be

140
00:12:21,509 --> 00:12:20,079
the brand new module for the

141
00:12:22,949 --> 00:12:21,519
international space station

142
00:12:25,030 --> 00:12:22,959
and it'll be commercially owned and

143
00:12:26,389 --> 00:12:25,040
operated by nanoracks our company and

144
00:12:28,310 --> 00:12:26,399
we're really excited about bringing this

145
00:12:30,389 --> 00:12:28,320
capability to the space station

146
00:12:31,750 --> 00:12:30,399
now the airlock is not science per se

147
00:12:32,790 --> 00:12:31,760
that we're going to hear about later on

148
00:12:35,110 --> 00:12:32,800
this afternoon

149
00:12:35,829 --> 00:12:35,120
but rather an enabling technology to

150
00:12:37,990 --> 00:12:35,839
allow

151
00:12:39,829 --> 00:12:38,000
scientists to have capabilities and

152
00:12:40,949 --> 00:12:39,839
features that they've never had before

153
00:12:44,550 --> 00:12:40,959
on the iss

154
00:12:45,990 --> 00:12:44,560
capturing on jennifer's discussion about

155
00:12:48,389 --> 00:12:46,000
20 years of a

156
00:12:49,750 --> 00:12:48,399
world-class laboratory in space what i

157
00:12:51,430 --> 00:12:49,760
think is really neat about is it

158
00:12:53,590 --> 00:12:51,440
continues to evolve and

159
00:12:55,269 --> 00:12:53,600
and expand and so we're continuing to

160
00:12:57,350 --> 00:12:55,279
expand that science and giving those

161
00:12:59,269 --> 00:12:57,360
scientists and crew capabilities

162
00:13:00,710 --> 00:12:59,279
uh that they've never seen before so

163
00:13:02,550 --> 00:13:00,720

we'll continue to grow that

164
00:13:04,389 --> 00:13:02,560
nanoracks is really proud to be part of

165
00:13:05,750 --> 00:13:04,399
that and expand it in a way that's

166
00:13:08,230 --> 00:13:05,760
commercial

167
00:13:09,990 --> 00:13:08,240
in nature so what is the air the airlock

168
00:13:11,910 --> 00:13:10,000
really and in general simple terms is a

169
00:13:13,350 --> 00:13:11,920
way to get equipment and people from the

170
00:13:13,829 --> 00:13:13,360
inside of the space station to the

171
00:13:16,069 --> 00:13:13,839
outside

172
00:13:17,670 --> 00:13:16,079
it's like a doorway to space so here's

173
00:13:19,350 --> 00:13:17,680
your doorway to space

174
00:13:21,030 --> 00:13:19,360
the bishop airlock is going to be a

175
00:13:23,430 --> 00:13:21,040
really large door

176
00:13:24,069 --> 00:13:23,440
that we haven't seen before to get there

177
00:13:26,870 --> 00:13:24,079
to space

178
00:13:28,310 --> 00:13:26,880
so if we capture in as kind of mentioned

179
00:13:30,949 --> 00:13:28,320
before about the model here

180
00:13:32,790 --> 00:13:30,959
so we have a 1 10 scale model of the

181
00:13:35,030 --> 00:13:32,800
nanoracks airlock

182
00:13:36,310 --> 00:13:35,040
to give you a perspective of size of the

183
00:13:38,389 --> 00:13:36,320
uh of the airlock

184
00:13:40,069 --> 00:13:38,399
um jennifer talked about a five-bedroom

185
00:13:41,750 --> 00:13:40,079
house what the airlock's gonna bring is

186
00:13:43,750 --> 00:13:41,760
about a new office space

187
00:13:44,870 --> 00:13:43,760
volume to that international space

188
00:13:47,670 --> 00:13:44,880

station house

189
00:13:48,870 --> 00:13:47,680
a working area for the crew working area

190
00:13:50,870 --> 00:13:48,880
for the scientists

191
00:13:52,629 --> 00:13:50,880
and capabilities within the airlock to

192
00:13:53,509 --> 00:13:52,639
be able to support those kind of science

193
00:13:55,189 --> 00:13:53,519
activities

194
00:13:57,509 --> 00:13:55,199
so let's talk about the the airlock

195
00:14:01,030 --> 00:13:57,519
model a little bit itself we got

196
00:14:03,750 --> 00:14:01,040
a crew member here old school nature

197
00:14:05,590 --> 00:14:03,760
in in the space world uh crew member to

198
00:14:06,550 --> 00:14:05,600
uh help us kind of illustrate the size

199
00:14:08,790 --> 00:14:06,560
of the airlock so

200
00:14:11,350 --> 00:14:08,800
the airlock itself is what we call bell

201
00:14:13,990 --> 00:14:11,360
jar type design so if i look at the

202
00:14:15,350 --> 00:14:14,000
the air lock it's um it's kind of a

203
00:14:17,030 --> 00:14:15,360
shape like a bell drive like you might

204
00:14:18,470 --> 00:14:17,040
have done in chemistry or physics back

205
00:14:20,389 --> 00:14:18,480
in your school days

206
00:14:21,670 --> 00:14:20,399
it's wide open on the inside that's the

207
00:14:24,310 --> 00:14:21,680
area for the scientists and the

208
00:14:26,310 --> 00:14:24,320
experimenters to work in

209
00:14:27,910 --> 00:14:26,320
walking ourselves around the airlock in

210
00:14:30,550 --> 00:14:27,920
the structure so the

211
00:14:32,150 --> 00:14:30,560
the entire airlock is designed and built

212
00:14:32,790 --> 00:14:32,160
and tested by the nanoracks team in

213
00:14:35,110 --> 00:14:32,800

houston

214
00:14:37,110 --> 00:14:35,120
uh but we have a lot of support that was

215
00:14:38,310 --> 00:14:37,120
going on throughout the design and build

216
00:14:40,629 --> 00:14:38,320
of this hardware so

217
00:14:42,389 --> 00:14:40,639
um for instance the common birthing

218
00:14:43,670 --> 00:14:42,399
mechanism that you see here at the front

219
00:14:45,509 --> 00:14:43,680
this is the device that will actually

220
00:14:47,990 --> 00:14:45,519
attach us to the space station

221
00:14:49,750 --> 00:14:48,000
uh the little orange ring that you see

222
00:14:51,430 --> 00:14:49,760
around the sides that's the seal that

223
00:14:53,189 --> 00:14:51,440
will seal us to the space station

224
00:14:54,949 --> 00:14:53,199
the bolts that are 16 bolts there are

225
00:14:56,550 --> 00:14:54,959
lining that ring will actually bolt us

226
00:14:58,310 --> 00:14:56,560
to the space station itself

227
00:15:00,150 --> 00:14:58,320
as well that's provided by our partners

228
00:15:01,829 --> 00:15:00,160
boeing and huntsville

229
00:15:03,750 --> 00:15:01,839
and if we look at the inside again the

230
00:15:06,069 --> 00:15:03,760
inside is wide open but we have avionics

231
00:15:09,350 --> 00:15:06,079
and electronics on the inside built by

232
00:15:10,870 --> 00:15:09,360
the nanoracks team the um the avionics

233
00:15:12,710 --> 00:15:10,880
allow us to interface with those

234
00:15:14,470 --> 00:15:12,720
experiments and give command and control

235
00:15:16,069 --> 00:15:14,480
capabilities for those experiments that

236
00:15:17,590 --> 00:15:16,079
are going inside the airlock

237
00:15:19,829 --> 00:15:17,600
on the outside kind of the air lock

238
00:15:20,790 --> 00:15:19,839

again forms the the shape of the air

239
00:15:22,790 --> 00:15:20,800
lock

240
00:15:25,030 --> 00:15:22,800
its size to fit in the dragon trunk it

241
00:15:27,829 --> 00:15:25,040
takes up the entire trunk of the uh

242
00:15:29,590 --> 00:15:27,839
the spacex dragon vehicle on the outside

243
00:15:31,189 --> 00:15:29,600
you'll notice a couple grapple fixtures

244
00:15:31,990 --> 00:15:31,199
outside were totally robotically

245
00:15:33,749 --> 00:15:32,000
controlled

246
00:15:35,749 --> 00:15:33,759
and operated by the space station

247
00:15:37,590 --> 00:15:35,759
robotic arm and so those are used to

248
00:15:39,189 --> 00:15:37,600
handle the air lock on the outside

249
00:15:41,269 --> 00:15:39,199
there's of course eva handrails to

250
00:15:42,870 --> 00:15:41,279
support the crew members on that

251
00:15:45,189 --> 00:15:42,880
there's wi-fi antennas that provide

252
00:15:47,110 --> 00:15:45,199
communications when we're out on the arm

253
00:15:48,710 --> 00:15:47,120
there's also some external payload

254
00:15:51,990 --> 00:15:48,720
mounts on the outside

255
00:15:53,350 --> 00:15:52,000
that provide interfaces for external

256
00:15:54,069 --> 00:15:53,360
payloads as well and those are provided

257
00:15:56,150 --> 00:15:54,079
by partners

258
00:15:58,949 --> 00:15:56,160
oceaneering the entire structure was

259
00:16:00,870 --> 00:15:58,959
built by talis olynyk in italy

260
00:16:02,150 --> 00:16:00,880
and we have a host of other partners

261
00:16:04,069 --> 00:16:02,160
that are helping us out

262
00:16:05,430 --> 00:16:04,079
uh to get us here so lots of people that

263
00:16:06,870 --> 00:16:05,440

are cheering us on

264
00:16:08,790 --> 00:16:06,880
for the launch tomorrow to get there

265
00:16:11,269 --> 00:16:08,800
we're excited about that now how do we

266
00:16:13,110 --> 00:16:11,279
use this as an airlock so

267
00:16:14,790 --> 00:16:13,120
if you use an airlock you need to

268
00:16:16,550 --> 00:16:14,800
transport the

269
00:16:18,150 --> 00:16:16,560
cargo and equipment into the airlock and

270
00:16:18,870 --> 00:16:18,160
then it's transferred to the outside so

271
00:16:20,870 --> 00:16:18,880
we'll use

272
00:16:22,470 --> 00:16:20,880
our crew member here so after we get on

273
00:16:24,389 --> 00:16:22,480
board the space station the crew member

274
00:16:26,310 --> 00:16:24,399
would open the hatch to node three

275
00:16:27,910 --> 00:16:26,320
uh they would they would then float into

276
00:16:29,350 --> 00:16:27,920
the air locking kind of get a rough

277
00:16:30,790 --> 00:16:29,360
perspective of size

278
00:16:34,629 --> 00:16:30,800
with our crew member in there install

279
00:16:39,670 --> 00:16:37,990
close the hatch and then the

280
00:16:41,350 --> 00:16:39,680
the airlock would be depressurized and

281
00:16:42,470 --> 00:16:41,360
actually pulled off of the stack of the

282
00:16:44,710 --> 00:16:42,480
iss

283
00:16:46,629 --> 00:16:44,720
by the robotic arm go out and deploy

284
00:16:48,710 --> 00:16:46,639
satellites maneuver equipment and then

285
00:16:49,670 --> 00:16:48,720
come back to node three back to our home

286
00:16:52,550 --> 00:16:49,680
at node 3

287
00:16:54,150 --> 00:16:52,560
and and rebirth us there i think they

288
00:16:56,389 --> 00:16:54,160

have a good picture

289
00:16:58,470 --> 00:16:56,399
online that shows kind of a relative

290
00:17:00,310 --> 00:16:58,480
size of the airlock there it is

291
00:17:02,230 --> 00:17:00,320
just prior to berthing at node 3. you

292
00:17:04,150 --> 00:17:02,240
can see the hatch is closed on node 3.

293
00:17:05,270 --> 00:17:04,160
that gives you a relative size of how

294
00:17:07,029 --> 00:17:05,280
big the airlock is

295
00:17:08,789 --> 00:17:07,039
with respect to the rest of the station

296
00:17:09,189 --> 00:17:08,799
modules so we really look forward to

297
00:17:12,710 --> 00:17:09,199
this

298
00:17:15,990 --> 00:17:12,720
i'd be remiss if i don't uh

299
00:17:17,669 --> 00:17:16,000
give a shout out to nasa our

300
00:17:19,750 --> 00:17:17,679
greatest partner probably of all of them

301
00:17:21,829 --> 00:17:19,760
to fully embrace the commercial

302
00:17:22,949 --> 00:17:21,839
low earth orbit effort and have faith in

303
00:17:25,429 --> 00:17:22,959
nanoracks about

304
00:17:27,189 --> 00:17:25,439
uh five years ago to really think that

305
00:17:28,230 --> 00:17:27,199
we can really pull this off and now here

306
00:17:30,549 --> 00:17:28,240
we are today

307
00:17:32,390 --> 00:17:30,559
super excited about the launch and

308
00:17:34,470 --> 00:17:32,400
really again thank you to nasa

309
00:17:36,310 --> 00:17:34,480
for helping us out along the way thanks

310
00:17:38,789 --> 00:17:36,320
brock and so for our viewers at home who

311
00:17:41,029 --> 00:17:38,799
may be familiar with the station

312
00:17:41,990 --> 00:17:41,039
we already have three airlocks on the

313
00:17:43,909 --> 00:17:42,000

station can you

314
00:17:45,750 --> 00:17:43,919
explain what makes this one stand out

315
00:17:46,150 --> 00:17:45,760
and what special capabilities that it

316
00:17:47,590 --> 00:17:46,160
has

317
00:17:48,870 --> 00:17:47,600
okay great yeah great question great

318
00:17:49,990 --> 00:17:48,880
question yeah there's three airlocks on

319
00:17:52,789 --> 00:17:50,000
board the space station

320
00:17:54,390 --> 00:17:52,799
there's uh two for uh eva for spacewalks

321
00:17:55,270 --> 00:17:54,400
so one on the russian segment one on the

322
00:17:57,669 --> 00:17:55,280
us segment

323
00:17:58,789 --> 00:17:57,679
and then there's a cargo airlock inside

324
00:18:02,549 --> 00:17:58,799
the kibo

325
00:18:04,230 --> 00:18:02,559
module on the japanese experiment module

326
00:18:05,590 --> 00:18:04,240
nanoracks has been a frequent user of

327
00:18:07,270 --> 00:18:05,600
that of that

328
00:18:09,430 --> 00:18:07,280
airlock but it's got a little bit

329
00:18:11,430 --> 00:18:09,440
limited capabilities it can maneuver a

330
00:18:13,270 --> 00:18:11,440
payload about the size of a microwave so

331
00:18:16,870 --> 00:18:13,280
we continue down that path of

332
00:18:18,470 --> 00:18:16,880
of a a house analogy where

333
00:18:20,470 --> 00:18:18,480
the keyboard airlock can handle about

334
00:18:21,590 --> 00:18:20,480
something about the size of a microwave

335
00:18:23,350 --> 00:18:21,600
oven going outside

336
00:18:24,390 --> 00:18:23,360
now the new bishop airlock will handle

337
00:18:25,270 --> 00:18:24,400
something about the size of a

338
00:18:26,870 --> 00:18:25,280

refrigerator

339
00:18:29,190 --> 00:18:26,880
so if i use a little bit but a little

340
00:18:31,510 --> 00:18:29,200
bit of the more models of perspective so

341
00:18:33,669 --> 00:18:31,520
to scale this is about as big as a piece

342
00:18:35,510 --> 00:18:33,679
of cargo that you can deliver to

343
00:18:37,510 --> 00:18:35,520
through the kibo air lock right now if i

344
00:18:39,110 --> 00:18:37,520
if i install that into the air lock

345
00:18:41,029 --> 00:18:39,120
you might be able to see it within there

346
00:18:42,789 --> 00:18:41,039
it's pretty small within

347
00:18:45,029 --> 00:18:42,799
within the size of the airlock itself

348
00:18:46,310 --> 00:18:45,039
now what that does is we can then have

349
00:18:48,310 --> 00:18:46,320
payloads that more

350
00:18:50,789 --> 00:18:48,320
maybe on more of the size of what we see

351
00:18:51,830 --> 00:18:50,799
here again refrigerator freezer kind of

352
00:18:53,669 --> 00:18:51,840
size payloads or

353
00:18:55,669 --> 00:18:53,679
multiples of these which would save crew

354
00:18:56,070 --> 00:18:55,679
time so we have a lot more capability

355
00:18:57,909 --> 00:18:56,080
now

356
00:18:59,750 --> 00:18:57,919
that there never has been before to be

357
00:19:01,430 --> 00:18:59,760
able to deploy things outside maneuver

358
00:19:03,190 --> 00:19:01,440
equipment outside as well

359
00:19:04,950 --> 00:19:03,200
awesome so jennifer i want to bring you

360
00:19:07,029 --> 00:19:04,960
into this i have a question why is it

361
00:19:09,990 --> 00:19:07,039
important for nasa to enable commercial

362
00:19:11,990 --> 00:19:10,000
activity like this

363
00:19:13,669 --> 00:19:12,000

right so nasa is opening the

364
00:19:14,950 --> 00:19:13,679
international space station for

365
00:19:17,510 --> 00:19:14,960
commercial business so

366
00:19:20,310 --> 00:19:17,520
industry can accelerate a thriving

367
00:19:22,470 --> 00:19:20,320
commercial economy in low earth orbit

368
00:19:24,630 --> 00:19:22,480
so we've already got more than 50

369
00:19:25,510 --> 00:19:24,640
companies conducting commercial research

370
00:19:27,590 --> 00:19:25,520
and development

371
00:19:28,870 --> 00:19:27,600
on the space station via the iss

372
00:19:31,270 --> 00:19:28,880
national lab

373
00:19:32,549 --> 00:19:31,280
and their results look very promising

374
00:19:34,310 --> 00:19:32,559
nasa has worked with 10 different

375
00:19:36,870 --> 00:19:34,320
companies to install more than 14

376
00:19:38,549 --> 00:19:36,880
commercial facilities just like one that

377
00:19:39,590 --> 00:19:38,559
brock is mentioning with nanoracks

378
00:19:41,990 --> 00:19:39,600
airlock

379
00:19:42,789 --> 00:19:42,000
on station that support nasa and iss

380
00:19:46,470 --> 00:19:42,799
national lab

381
00:19:47,430 --> 00:19:46,480
initiatives now because the iss national

382
00:19:49,830 --> 00:19:47,440
lab mandate

383
00:19:50,710 --> 00:19:49,840
is limited to research and development

384
00:19:52,950 --> 00:19:50,720
there's a new

385
00:19:54,789 --> 00:19:52,960
nasa directive that enables commercial

386
00:19:57,350 --> 00:19:54,799
manufacturing and production

387
00:19:58,789 --> 00:19:57,360
and allow both nasa and private

388
00:20:00,310 --> 00:19:58,799

astronauts to conduct additional

389
00:20:03,350 --> 00:20:00,320
commercial activities

390
00:20:05,830 --> 00:20:03,360
on board the iss so this directive

391
00:20:07,270 --> 00:20:05,840
also sets prices for industry use of us

392
00:20:07,990 --> 00:20:07,280
government resources on the space

393
00:20:10,950 --> 00:20:08,000
station

394
00:20:11,909 --> 00:20:10,960
for commercial and marketing activities

395
00:20:14,789 --> 00:20:11,919
all of this

396
00:20:15,990 --> 00:20:14,799
allows nasa to fully focus on its goal

397
00:20:20,870 --> 00:20:16,000
of landing the first

398
00:20:22,950 --> 00:20:20,880
woman and next man on the moon by 2024

399
00:20:24,390 --> 00:20:22,960
and there we hope american companies

400
00:20:26,950 --> 00:20:24,400
will play an essential role in

401
00:20:29,669 --> 00:20:26,960
establishing a sustainable presence

402
00:20:31,990 --> 00:20:29,679
so it's important for nasa to enable

403
00:20:33,190 --> 00:20:32,000
commercial activity on the iss in order

404
00:20:35,110 --> 00:20:33,200
to number one

405
00:20:37,590 --> 00:20:35,120
get the government out of the way and

406
00:20:40,630 --> 00:20:37,600
allow space commerce industry to

407
00:20:42,950 --> 00:20:40,640
really take shape and then also too to

408
00:20:47,110 --> 00:20:42,960
allow nasa to focus its resources

409
00:20:48,549 --> 00:20:47,120
on exploration thanks jennifer and thank

410
00:20:50,470 --> 00:20:48,559
you brock

411
00:20:52,549 --> 00:20:50,480
so we've heard from the station and

412
00:20:53,270 --> 00:20:52,559
commercial sides of this mission so now

413
00:20:55,990 --> 00:20:53,280

let's talk

414
00:20:57,270 --> 00:20:56,000
science we are going to hear from pinar

415
00:20:59,990 --> 00:20:57,280
messi

416
00:21:02,470 --> 00:21:00,000
she is from the effect of microgravity

417
00:21:04,630 --> 00:21:02,480
on human brain organoids experiment

418
00:21:07,110 --> 00:21:04,640
heading up to station tomorrow

419
00:21:09,350 --> 00:21:07,120
so hey there and welcome for joining us

420
00:21:11,190 --> 00:21:09,360
and can you tell us a bit more about

421
00:21:12,630 --> 00:21:11,200
what you're studying and why it's

422
00:21:15,669 --> 00:21:12,640
necessary to do this

423
00:21:18,390 --> 00:21:15,679
in microgravity hi

424
00:21:19,990 --> 00:21:18,400
kenna thank you so much um and i'm very

425
00:21:23,669 --> 00:21:20,000
excited to be here

426
00:21:24,310 --> 00:21:23,679
uh so basically at uc san diego we are

427
00:21:26,789 --> 00:21:24,320
studying

428
00:21:28,870 --> 00:21:26,799
um the human brain the human brain how

429
00:21:30,789 --> 00:21:28,880
it's developing

430
00:21:33,350 --> 00:21:30,799
do that by using what we call brain

431
00:21:36,789 --> 00:21:33,360
organoids so brain organoids are

432
00:21:39,590 --> 00:21:36,799
um three dimensional strokes that are uh

433
00:21:40,549 --> 00:21:39,600
obtained from uh most of the time human

434
00:21:42,710 --> 00:21:40,559
skin cells

435
00:21:44,470 --> 00:21:42,720
that go through a process that we call

436
00:21:46,789 --> 00:21:44,480
cellular reprogramming

437
00:21:49,510 --> 00:21:46,799
that makes them become stem cells and

438
00:21:51,909 --> 00:21:49,520

from basically those stem cells we can

439
00:21:53,830 --> 00:21:51,919
uh date virtually any cell type in the

440
00:21:55,190 --> 00:21:53,840
body and here in the lab since we're

441
00:21:58,230 --> 00:21:55,200
studying the human brain

442
00:21:59,830 --> 00:21:58,240
we are making brain cells and

443
00:22:02,310 --> 00:21:59,840
these three-dimensional structures

444
00:22:02,870 --> 00:22:02,320
called brain organoids that are able to

445
00:22:05,430 --> 00:22:02,880
mimic

446
00:22:06,390 --> 00:22:05,440
both the cellular variety but also the

447
00:22:09,830 --> 00:22:06,400
function

448
00:22:11,270 --> 00:22:09,840
of a developing human brain so why do we

449
00:22:14,390 --> 00:22:11,280
want to send them

450
00:22:15,190 --> 00:22:14,400
uh the iss because there's actually many

451
00:22:17,669 --> 00:22:15,200
reasons

452
00:22:18,230 --> 00:22:17,679
uh first of all uh there are actually no

453
00:22:20,310 --> 00:22:18,240
other

454
00:22:21,350 --> 00:22:20,320
way for us to step up microgravity here

455
00:22:23,350 --> 00:22:21,360
on earth

456
00:22:24,549 --> 00:22:23,360
so that's one of the main reasons uh the

457
00:22:27,909 --> 00:22:24,559
other reason that

458
00:22:28,549 --> 00:22:27,919
you might have bought it before uh it

459
00:22:31,669 --> 00:22:28,559
looks like

460
00:22:34,789 --> 00:22:31,679
long periods of time spent in space

461
00:22:36,870 --> 00:22:34,799
of mightly traded aging and this is

462
00:22:40,870 --> 00:22:36,880
actually an important feature for us to

463
00:22:42,950 --> 00:22:40,880

uh use and harness to make better models

464
00:22:44,549 --> 00:22:42,960
because as i was telling you we are able

465
00:22:46,630 --> 00:22:44,559
to make these brain organoids but these

466
00:22:49,190 --> 00:22:46,640
brain organoids are mainly

467
00:22:50,789 --> 00:22:49,200
mimicking the very early stages of the

468
00:22:52,870 --> 00:22:50,799
human brain development

469
00:22:55,510 --> 00:22:52,880
so there might not be well suited to

470
00:22:57,110 --> 00:22:55,520
study

471
00:22:59,590 --> 00:22:57,120
diseases such as neurodegenerative

472
00:23:01,350 --> 00:22:59,600
diseases for which the age is the major

473
00:23:05,110 --> 00:23:01,360
risk factor

474
00:23:05,750 --> 00:23:05,120
so by a feature of spending time in

475
00:23:09,110 --> 00:23:05,760
space

476
00:23:11,110 --> 00:23:09,120
that leads to accelerated aging

477
00:23:12,789 --> 00:23:11,120
to make better human models to study

478
00:23:16,070 --> 00:23:12,799
those diseases as well

479
00:23:17,990 --> 00:23:16,080
uh another aspect of this study

480
00:23:19,430 --> 00:23:18,000
basically to provide an experimental

481
00:23:21,029 --> 00:23:19,440
model to see

482
00:23:22,630 --> 00:23:21,039
what are the impact what is the impact

483
00:23:25,830 --> 00:23:22,640
of microgravity

484
00:23:28,870 --> 00:23:25,840
on because so far we have heard

485
00:23:30,950 --> 00:23:28,880
um we have had some studies but we

486
00:23:32,950 --> 00:23:30,960
don't really have a mental model to

487
00:23:36,549 --> 00:23:32,960
really study what is going on

488
00:23:39,270 --> 00:23:36,559

at the cellular or molecular level

489
00:23:40,870 --> 00:23:39,280
and then finally of course uh we would

490
00:23:44,470 --> 00:23:40,880
like to be um

491
00:23:47,110 --> 00:23:44,480
prepared or be able to mitigate

492
00:23:49,430 --> 00:23:47,120
potential problems when we're gonna have

493
00:23:53,110 --> 00:23:49,440
longer periods of time in space or

494
00:23:53,669 --> 00:23:53,120
for space travel or colonization so we

495
00:23:58,230 --> 00:23:53,679
want to

496
00:24:00,310 --> 00:23:58,240
be able to have as much information

497
00:24:05,350 --> 00:24:00,320
as we can be able to mitigate those

498
00:24:07,190 --> 00:24:05,360
problems when the time comes

499
00:24:09,590 --> 00:24:07,200
thank you and now that we've heard from

500
00:24:11,909 --> 00:24:09,600
our station science and commercial

501
00:24:13,750 --> 00:24:11,919
representatives we want to hear from you

502
00:24:15,269 --> 00:24:13,760
submit your questions on the youtube

503
00:24:18,630 --> 00:24:15,279
stream in the comments

504
00:24:20,630 --> 00:24:18,640
on twitter using the hashtag asknasa

505
00:24:22,230 --> 00:24:20,640
or if you're part of our virtual nasa

506
00:24:23,750 --> 00:24:22,240
social facebook group you can ask

507
00:24:26,630 --> 00:24:23,760
questions there

508
00:24:28,310 --> 00:24:26,640
so our first question comes from youtube

509
00:24:28,950 --> 00:24:28,320
and i think jennifer this would be for

510
00:24:31,350 --> 00:24:28,960
you

511
00:24:36,310 --> 00:24:31,360
with a larger crew on board how many

512
00:24:39,830 --> 00:24:39,110
that's a great question so a larger crew

513
00:24:43,110 --> 00:24:39,840

on board

514
00:24:44,789 --> 00:24:43,120
is great for science we have more team

515
00:24:46,390 --> 00:24:44,799
members that can be scheduled for

516
00:24:49,669 --> 00:24:46,400
critical activities to

517
00:24:52,149 --> 00:24:49,679
keep the station going plus do

518
00:24:53,510 --> 00:24:52,159
all kinds of science experiments since

519
00:24:55,029 --> 00:24:53,520
we've only had the crew one team on

520
00:24:55,430 --> 00:24:55,039
board for a short time it's hard to give

521
00:24:58,070 --> 00:24:55,440
you an

522
00:25:00,070 --> 00:24:58,080
actual number but we estimate that the

523
00:25:02,789 --> 00:25:00,080
additional crew time will allow us to

524
00:25:04,789 --> 00:25:02,799
more than double the amount of science

525
00:25:07,669 --> 00:25:04,799
that we've been able to do in the past

526
00:25:10,070 --> 00:25:07,679
so we are so thrilled and so excited for

527
00:25:11,750 --> 00:25:10,080
science

528
00:25:13,909 --> 00:25:11,760
thank you and speaking of more crew

529
00:25:14,789 --> 00:25:13,919
members on board i find it amazing that

530
00:25:17,750 --> 00:25:14,799
tomorrow

531
00:25:19,350 --> 00:25:17,760
on launch day of this grocery and

532
00:25:21,110 --> 00:25:19,360
supplies haul

533
00:25:23,110 --> 00:25:21,120
we actually just three weeks ago had

534
00:25:24,390 --> 00:25:23,120
astronauts launched from that very same

535
00:25:25,590 --> 00:25:24,400
pad

536
00:25:26,950 --> 00:25:25,600
and like i just mentioned they're the

537
00:25:28,149 --> 00:25:26,960
ones that are going to have to unload

538
00:25:29,750 --> 00:25:28,159

the grocery haul and

539
00:25:31,269 --> 00:25:29,760
supply haul so i think that's really

540
00:25:33,510 --> 00:25:31,279
cool um

541
00:25:34,710 --> 00:25:33,520
so our next question brock this is gonna

542
00:25:38,070 --> 00:25:34,720
be for you

543
00:25:40,149 --> 00:25:38,080
and it is

544
00:25:43,190 --> 00:25:40,159
can we use the bishop airlock to get rid

545
00:25:45,190 --> 00:25:43,200
of some of the trash on the iss

546
00:25:47,029 --> 00:25:45,200
so that's a great question too so so

547
00:25:48,390 --> 00:25:47,039
yeah actually one of the very first uses

548
00:25:50,870 --> 00:25:48,400
of the airlock might be actually

549
00:25:52,470 --> 00:25:50,880
deploying trash off the space station so

550
00:25:53,990 --> 00:25:52,480
we think a lot about the science that

551
00:25:55,909 --> 00:25:54,000
goes on with the uh

552
00:25:57,830 --> 00:25:55,919
with the space station and it's in a you

553
00:26:00,070 --> 00:25:57,840
know a world-renowned

554
00:26:01,269 --> 00:26:00,080
uh national laboratory but in order to

555
00:26:02,630 --> 00:26:01,279
do that science sometimes you got to

556
00:26:04,149 --> 00:26:02,640
clean up your house a little bit right

557
00:26:06,549 --> 00:26:04,159
so you have to

558
00:26:07,909 --> 00:26:06,559
maintain a clean working environment so

559
00:26:10,310 --> 00:26:07,919
one of the aspects of

560
00:26:11,190 --> 00:26:10,320
trash that's unique is that if you think

561
00:26:12,549 --> 00:26:11,200
about your trash

562
00:26:14,310 --> 00:26:12,559
at your house so putting this kind of

563
00:26:15,990 --> 00:26:14,320

layman's terminal our terms um

564
00:26:17,590 --> 00:26:16,000
your trash truck shows up maybe once a

565
00:26:19,830 --> 00:26:17,600
week maybe twice a week it

566
00:26:21,029 --> 00:26:19,840
comes pretty regular right so but for

567
00:26:23,029 --> 00:26:21,039
the space station

568
00:26:37,110 --> 00:26:23,039
the cargo vehicles are going to go into

569
00:26:41,110 --> 00:26:38,630
capability you available again we talk

570
00:26:43,590 --> 00:26:41,120
about five times the size of the

571
00:26:44,950 --> 00:26:43,600
japanese airlock is the ability to maybe

572
00:26:46,630 --> 00:26:44,960
get rid of trash and so this is the

573
00:26:48,549 --> 00:26:46,640
model that we were talking about for the

574
00:26:50,230 --> 00:26:48,559
actual trash bag it's a very large trash

575
00:26:51,430 --> 00:26:50,240
bag we're talking about 600 pounds of

576
00:26:52,070 --> 00:26:51,440
trash a little bit bigger than your

577
00:26:54,149 --> 00:26:52,080
trash can

578
00:26:55,909 --> 00:26:54,159
in your in your kitchen so we're talking

579
00:26:56,789 --> 00:26:55,919
about a large amount of trash to be able

580
00:26:58,549 --> 00:26:56,799
to deploy

581
00:27:01,190 --> 00:26:58,559
out of the air lock so this trash bag

582
00:27:02,950 --> 00:27:01,200
would fit inside of the air lock

583
00:27:04,470 --> 00:27:02,960
and then would be deployed out of the

584
00:27:06,870 --> 00:27:04,480
air lock and they would

585
00:27:07,590 --> 00:27:06,880
just like any other kind of satellite

586
00:27:09,029 --> 00:27:07,600
deployment

587
00:27:11,190 --> 00:27:09,039
it would eventually orbit the earth

588
00:27:12,630 --> 00:27:11,200

eventually orbit would degrade and it

589
00:27:13,750 --> 00:27:12,640
would burn up in the atmosphere but that

590
00:27:15,350 --> 00:27:13,760
would allow the crew

591
00:27:17,110 --> 00:27:15,360
then to be able to remove that trash

592
00:27:18,870 --> 00:27:17,120
whenever they need to rather than

593
00:27:19,750 --> 00:27:18,880
waiting for the next cargo vehicle to

594
00:27:22,950 --> 00:27:19,760
come get to him

595
00:27:24,950 --> 00:27:22,960
thanks brock our next question um

596
00:27:26,470 --> 00:27:24,960
it comes from the virtual nasa social

597
00:27:29,830 --> 00:27:26,480
facebook group

598
00:27:31,190 --> 00:27:29,840
and it is for pnr is it true that cells

599
00:27:35,029 --> 00:27:31,200
and tissues in the body

600
00:27:37,830 --> 00:27:35,039
age more quickly in space

601
00:27:40,870 --> 00:27:37,840
so this is actually a very good question

602
00:27:43,190 --> 00:27:40,880
it looks like from the earlier

603
00:27:44,950 --> 00:27:43,200
and also the more recently the nasa twin

604
00:27:47,430 --> 00:27:44,960
study it looks like

605
00:27:48,549 --> 00:27:47,440
there is indeed an accelerated aging

606
00:27:51,830 --> 00:27:48,559
there are signs

607
00:27:54,549 --> 00:27:51,840
of accelerated aging such as a

608
00:27:55,909 --> 00:27:54,559
shortening of these pieces of our

609
00:27:59,029 --> 00:27:55,919
chromosome called

610
00:28:01,510 --> 00:27:59,039
telomeres that are basically

611
00:28:02,149 --> 00:28:01,520
are decreasing in size at each similar

612
00:28:04,470 --> 00:28:02,159
division

613
00:28:05,750 --> 00:28:04,480

and at one point when it's the critical

614
00:28:09,029 --> 00:28:05,760
size they actually

615
00:28:12,789 --> 00:28:09,039
will will go to die

616
00:28:15,350 --> 00:28:12,799
so that's kind of like a way to see

617
00:28:16,630 --> 00:28:15,360
how fast they're aging and this is

618
00:28:17,750 --> 00:28:16,640
actually some of the things that we're

619
00:28:19,830 --> 00:28:17,760
going to look into

620
00:28:21,750 --> 00:28:19,840
in our brain organoids to see if we can

621
00:28:27,750 --> 00:28:21,760
reproduce those

622
00:28:34,149 --> 00:28:30,870
thank you and for jennifer this might be

623
00:28:35,590 --> 00:28:34,159
for you um what kinds of food will be

624
00:28:40,630 --> 00:28:35,600
sent up on this mission

625
00:28:46,230 --> 00:28:44,310
oh i love to talk about food

626
00:28:47,750 --> 00:28:46,240
so before they launch each crew member

627
00:28:50,070 --> 00:28:47,760
has the opportunity to work with the

628
00:28:51,830 --> 00:28:50,080
food lab to create their own menu

629
00:28:53,590 --> 00:28:51,840
and the astronauts get to pick from a

630
00:28:57,029 --> 00:28:53,600
list of items that

631
00:28:59,110 --> 00:28:57,039
you know include anything that's already

632
00:29:01,269 --> 00:28:59,120
been flown or anything that is on the

633
00:29:02,789 --> 00:29:01,279
menu from previous flights but also

634
00:29:03,750 --> 00:29:02,799
things that they like and special

635
00:29:05,669 --> 00:29:03,760
requests

636
00:29:08,230 --> 00:29:05,679
so for this mission we've got some fresh

637
00:29:09,590 --> 00:29:08,240
apples and oranges and lemons going up

638
00:29:11,510 --> 00:29:09,600

because the astronauts really don't get

639
00:29:13,510 --> 00:29:11,520
an opportunity to eat

640
00:29:14,870 --> 00:29:13,520
fresh fruits and vegetables while

641
00:29:16,470 --> 00:29:14,880
they're in space

642
00:29:18,149 --> 00:29:16,480
there's also going to be some prepared

643
00:29:20,789 --> 00:29:18,159
foods for the holiday season

644
00:29:21,669 --> 00:29:20,799
including fixings for a turkey dinner

645
00:29:24,389 --> 00:29:21,679
and some

646
00:29:27,269 --> 00:29:24,399
fun desserts so stay tuned for pictures

647
00:29:30,470 --> 00:29:27,279
from that

648
00:29:32,310 --> 00:29:30,480
thanks jennifer our next question comes

649
00:29:34,149 --> 00:29:32,320
from twitter and remember you can ask

650
00:29:37,269 --> 00:29:34,159
questions on twitter using the hashtag

651
00:29:38,310 --> 00:29:37,279
asknasa and it is for brock here in the

652
00:29:40,470 --> 00:29:38,320
room with me

653
00:29:42,070 --> 00:29:40,480
how long will it take to install the new

654
00:29:44,149 --> 00:29:42,080
doorway to space

655
00:29:45,110 --> 00:29:44,159
okay so the operation once we get on

656
00:29:47,190 --> 00:29:45,120
orbit uh

657
00:29:49,430 --> 00:29:47,200
again it's all robotically controlled it

658
00:29:51,350 --> 00:29:49,440
will take roughly a week

659
00:29:52,630 --> 00:29:51,360
to get the airlock out and fully

660
00:29:54,230 --> 00:29:52,640
commissioned and opened up for

661
00:29:56,389 --> 00:29:54,240
operations now a lot of that is leak

662
00:29:58,230 --> 00:29:56,399
check so it will take about a day

663
00:30:00,710 --> 00:29:58,240

for the robotic arm to grapple the air

664
00:30:02,470 --> 00:30:00,720
lock maneuver it over to node three

665
00:30:03,990 --> 00:30:02,480
and birth it to node three now the next

666
00:30:05,669 --> 00:30:04,000
critical part is actually the leak

667
00:30:07,350 --> 00:30:05,679
checks since we're a brand new module we

668
00:30:08,710 --> 00:30:07,360
want to tread carefully here right to

669
00:30:11,110 --> 00:30:08,720
ensure crew safety so

670
00:30:13,269 --> 00:30:11,120
we will spend several days worth of leak

671
00:30:16,070 --> 00:30:13,279
checks to ensure that the air lock is

672
00:30:17,269 --> 00:30:16,080
leak sound and that will have it present

673
00:30:18,630 --> 00:30:17,279
no danger to the crew

674
00:30:19,990 --> 00:30:18,640
and after that the crew will open the

675
00:30:20,630 --> 00:30:20,000
hatch and they'll be able to transfer

676
00:30:21,990 --> 00:30:20,640
into

677
00:30:23,430 --> 00:30:22,000
and then finish the commissioning of

678
00:30:25,350 --> 00:30:23,440
their lock so roughly about a week

679
00:30:27,669 --> 00:30:25,360
before we're fully up and running ready

680
00:30:30,310 --> 00:30:27,679
to do science on board the airlock

681
00:30:31,190 --> 00:30:30,320
thank you our next question comes from

682
00:30:33,750 --> 00:30:31,200
twitter

683
00:30:37,430 --> 00:30:33,760
and for pinar will this be the first

684
00:30:39,909 --> 00:30:37,440
time you send organoids to space

685
00:30:40,549 --> 00:30:39,919
actually this is our second mission um

686
00:30:44,070 --> 00:30:40,559
so we

687
00:30:47,590 --> 00:30:44,080
already flew a payload in on

688
00:30:49,830 --> 00:30:47,600

crs 18 i think

689
00:30:51,510 --> 00:30:49,840
and we are this is actually one of the

690
00:30:52,710 --> 00:30:51,520
reasons why we're sending a second

691
00:30:54,950 --> 00:30:52,720
payload now

692
00:30:56,549 --> 00:30:54,960
it's uh first of all to see if we can

693
00:30:59,590 --> 00:30:56,559
reproduce the results from the

694
00:31:02,870 --> 00:30:59,600
initial mission um unfortunately i'm not

695
00:31:04,549 --> 00:31:02,880
able to share a lot of the like

696
00:31:06,870 --> 00:31:04,559
the results yet because they're not

697
00:31:08,710 --> 00:31:06,880
published yet and we also want to be

698
00:31:10,070 --> 00:31:08,720
to make sure that what we are seeing is

699
00:31:12,470 --> 00:31:10,080
reproducible

700
00:31:14,389 --> 00:31:12,480
uh before we can share anything but yes

701
00:31:18,389 --> 00:31:14,399
so this is our second mission

702
00:31:22,630 --> 00:31:18,399
and um we are now able to accommodate uh

703
00:31:25,029 --> 00:31:22,640
more samples with um upgraded version

704
00:31:26,070 --> 00:31:25,039
of our cube lab which i have not

705
00:31:28,710 --> 00:31:26,080
mentioned before but

706
00:31:29,909 --> 00:31:28,720
for this project we actually partnered

707
00:31:33,350 --> 00:31:29,919
with a company

708
00:31:36,470 --> 00:31:33,360
called space tango and their their

709
00:31:37,430 --> 00:31:36,480
company who are specialized in building

710
00:31:40,789 --> 00:31:37,440
custom-built

711
00:31:44,630 --> 00:31:40,799
uh cube labs so these are basically

712
00:31:47,430 --> 00:31:44,640
shoe size shoe box size devices

713
00:31:49,269 --> 00:31:47,440

that are able to miniaturize our whole

714
00:31:51,269 --> 00:31:49,279
tissue culture room into a

715
00:31:52,549 --> 00:31:51,279
well shoebox size device called the cube

716
00:31:55,669 --> 00:31:52,559
lab uh

717
00:31:56,470 --> 00:31:55,679
and so right now uh from the previous

718
00:31:59,669 --> 00:31:56,480
mission

719
00:32:02,789 --> 00:31:59,679
uh we are able to have a better um

720
00:32:05,830 --> 00:32:02,799
capacities and also as i was mentioning

721
00:32:07,990 --> 00:32:05,840
more samples so we are very excited to

722
00:32:12,070 --> 00:32:08,000
to be able to test all this and see if

723
00:32:14,070 --> 00:32:12,080
we can actually reproduce our results

724
00:32:15,509 --> 00:32:14,080
thank you and our next question comes

725
00:32:18,149 --> 00:32:15,519
from twitter again

726
00:32:19,909 --> 00:32:18,159
um it's for jennifer i saw the crews

727
00:32:25,110 --> 00:32:19,919
harvesting radishes right now

728
00:32:29,430 --> 00:32:27,110
that's another good question so the crew

729
00:32:32,310 --> 00:32:29,440
is actually starting up another crop of

730
00:32:34,389 --> 00:32:32,320
radishes in the advanced plant habitat

731
00:32:36,230 --> 00:32:34,399
having more samples helps us get better

732
00:32:37,750 --> 00:32:36,240
science so a second crop is being

733
00:32:40,389 --> 00:32:37,760
activated right now

734
00:32:41,909 --> 00:32:40,399
and should be done in about a month the

735
00:32:43,990 --> 00:32:41,919
radishes are going to be sent back to

736
00:32:45,990 --> 00:32:44,000
earth so our researchers can study them

737
00:32:47,990 --> 00:32:46,000
later in 2021.

738
00:32:49,350 --> 00:32:48,000

um something else to look out for maybe

739
00:32:51,350 --> 00:32:49,360
in the coming year

740
00:32:53,430 --> 00:32:51,360
are things that are going to be up for

741
00:32:55,990 --> 00:32:53,440
harvest a little bit later so

742
00:32:58,470 --> 00:32:56,000
an array of plants such as red romaine

743
00:32:59,830 --> 00:32:58,480
lettuce and wasabi mustard and red

744
00:33:02,230 --> 00:32:59,840
russian kale

745
00:33:03,029 --> 00:33:02,240
our japanese counterparts are also

746
00:33:05,269 --> 00:33:03,039
growing some

747
00:33:06,710 --> 00:33:05,279
asian herbs in space i think it's a

748
00:33:08,830 --> 00:33:06,720
special kind of basil

749
00:33:10,149 --> 00:33:08,840
so be on the lookout for those things as

750
00:33:12,230 --> 00:33:10,159
well

751
00:33:14,389 --> 00:33:12,240
i have a follow-up to that question

752
00:33:16,310 --> 00:33:14,399
jennifer and it comes from twitter too

753
00:33:18,710 --> 00:33:16,320
does the food grown on the space station

754
00:33:19,190 --> 00:33:18,720
have the same nutritional value as it

755
00:33:22,389 --> 00:33:19,200
does

756
00:33:24,070 --> 00:33:22,399
on earth well that's a really great

757
00:33:24,870 --> 00:33:24,080
question and actually that's one of the

758
00:33:28,230 --> 00:33:24,880
reasons why

759
00:33:30,789 --> 00:33:28,240
that why we grow plants on on the iss

760
00:33:33,269 --> 00:33:30,799
is to do that to study whether or not

761
00:33:33,830 --> 00:33:33,279
that nutritional content is the same or

762
00:33:35,669 --> 00:33:33,840
better

763
00:33:37,269 --> 00:33:35,679

um we're still waiting results and there

764
00:33:39,190 --> 00:33:37,279
some of the results have been published

765
00:33:41,110 --> 00:33:39,200
but that's exactly what we're trying to

766
00:33:44,230 --> 00:33:41,120
figure out is if the nutritional content

767
00:33:46,070 --> 00:33:44,240
is the same or different

768
00:33:47,269 --> 00:33:46,080
thanks jennifer and brock back to you

769
00:33:49,110 --> 00:33:47,279
here in the room

770
00:33:50,630 --> 00:33:49,120
we have a question from our virtual nasa

771
00:33:52,310 --> 00:33:50,640
social facebook page

772
00:33:54,630 --> 00:33:52,320
and they want to know um a little more

773
00:33:56,710 --> 00:33:54,640
about the robotic arm

774
00:33:59,350 --> 00:33:56,720
okay uh we're talking just to clarify a

775
00:34:02,630 --> 00:33:59,360
little bit the robotic arm used by iss

776
00:34:04,470 --> 00:34:02,640
or nanowrimo okay so for the future

777
00:34:06,070 --> 00:34:04,480
okay so so one that one of the really

778
00:34:08,149 --> 00:34:06,080
cool things is being a commercial

779
00:34:09,430 --> 00:34:08,159
venture one of our very first payloads

780
00:34:11,030 --> 00:34:09,440
for the airlock is actually going to be

781
00:34:12,869 --> 00:34:11,040
a commercial payload it'll be

782
00:34:16,389 --> 00:34:12,879
what we call a technology demonstration

783
00:34:18,629 --> 00:34:16,399
payload of a robotic arm

784
00:34:19,510 --> 00:34:18,639
hosted by our customer gitai who's out

785
00:34:20,869 --> 00:34:19,520
of japan

786
00:34:22,470 --> 00:34:20,879
they're going to do a technology

787
00:34:23,990 --> 00:34:22,480
demonstration inside the airline

788
00:34:26,389 --> 00:34:24,000

actually when it's birth so the airlock

789
00:34:29,589 --> 00:34:26,399
is being used not as an airlock per se

790
00:34:31,030 --> 00:34:29,599
but rather a science platform to do

791
00:34:33,990 --> 00:34:31,040
experiments within the airlock

792
00:34:35,589 --> 00:34:34,000
so guitar is a really cool arm it's done

793
00:34:37,270 --> 00:34:35,599
a lot of competitions

794
00:34:39,430 --> 00:34:37,280
down here on the earth they want to take

795
00:34:42,629 --> 00:34:39,440
it to microgravity and try it out as

796
00:34:44,790 --> 00:34:42,639
a a technology demonstration

797
00:34:47,030 --> 00:34:44,800
the goal eventually is that this robotic

798
00:34:49,829 --> 00:34:47,040
arm will be a aid to crew members

799
00:34:51,270 --> 00:34:49,839
that be able to work on um experiments

800
00:34:51,909 --> 00:34:51,280
in space so this arm is going to do

801
00:34:53,829 --> 00:34:51,919
things like

802
00:34:56,069 --> 00:34:53,839
plug in and out electrical connectors

803
00:34:57,829 --> 00:34:56,079
it's going to screw in bolts it's going

804
00:34:59,349 --> 00:34:57,839
to attach and assemble things that the

805
00:35:01,349 --> 00:34:59,359
crew would normally do

806
00:35:03,030 --> 00:35:01,359
but in this say in this instance the

807
00:35:04,790 --> 00:35:03,040
robot would be able to do that that thus

808
00:35:06,710 --> 00:35:04,800
freeing the crew members up to have more

809
00:35:08,550 --> 00:35:06,720
time to do other science on board so

810
00:35:10,390 --> 00:35:08,560
trying to maximize the science if you

811
00:35:12,150 --> 00:35:10,400
will uh so we're really excited about

812
00:35:14,230 --> 00:35:12,160
having them on board this summer

813
00:35:15,670 --> 00:35:14,240

inside the airlock and really doing some

814
00:35:17,670 --> 00:35:15,680
cool science on board

815
00:35:19,109 --> 00:35:17,680
so speaking of maximizing the science

816
00:35:21,510 --> 00:35:19,119
one thing that i think is so cool about

817
00:35:23,589 --> 00:35:21,520
bishop is that it's not just an airlock

818
00:35:24,870 --> 00:35:23,599
it does host experiments inside and out

819
00:35:27,109 --> 00:35:24,880
so right there on the model that he

820
00:35:28,710 --> 00:35:27,119
showed earlier those little blue parts

821
00:35:30,790 --> 00:35:28,720
they can actually host experiments

822
00:35:31,910 --> 00:35:30,800
outside right of the airlock which is

823
00:35:34,950 --> 00:35:31,920
really fun

824
00:35:38,790 --> 00:35:34,960
um so our next question is for pinar

825
00:35:41,430 --> 00:35:38,800
um we okay the questions from facebook

826
00:35:43,270 --> 00:35:41,440
um and how long will the experiment last

827
00:35:48,069 --> 00:35:43,280
for

828
00:35:51,750 --> 00:35:48,079
the last one was also

829
00:35:55,109 --> 00:35:51,760
this same duration we're gonna uh stay

830
00:35:57,349 --> 00:35:55,119
in the iss for 30 days but eventually

831
00:35:58,150 --> 00:35:57,359
uh in our hopefully next missions we

832
00:36:00,550 --> 00:35:58,160
would like to

833
00:36:01,430 --> 00:36:00,560
also have uh longer periods of time to

834
00:36:03,270 --> 00:36:01,440
see what

835
00:36:07,349 --> 00:36:03,280
will be the effect of that on these

836
00:36:11,349 --> 00:36:09,030
i was going to ask how long do the

837
00:36:12,630 --> 00:36:11,359
organoids survive for how long can they

838
00:36:15,109 --> 00:36:12,640

survive or that was another question

839
00:36:18,310 --> 00:36:15,119
that we got

840
00:36:18,710 --> 00:36:18,320
so these brain organized in the in the

841
00:36:21,430 --> 00:36:18,720
lab

842
00:36:22,470 --> 00:36:21,440
we are able to keep them in culture for

843
00:36:25,670 --> 00:36:22,480
up to

844
00:36:27,030 --> 00:36:25,680
more than a year two years so we are

845
00:36:29,589 --> 00:36:27,040
feeding them

846
00:36:31,430 --> 00:36:29,599
every couple of days and with proper

847
00:36:33,829 --> 00:36:31,440
care they are able to survive for a very

848
00:36:36,950 --> 00:36:33,839
long time actually

849
00:36:38,870 --> 00:36:36,960
awesome heading back over to jennifer we

850
00:36:40,550 --> 00:36:38,880
have a question from twitter

851
00:36:42,630 --> 00:36:40,560
what types of health issues can

852
00:36:43,270 --> 00:36:42,640
astronauts experience in microgravity on

853
00:36:45,030 --> 00:36:43,280
the station

854
00:36:47,829 --> 00:36:45,040
and what research are you doing to

855
00:36:53,829 --> 00:36:51,190
well fortunately our astronauts are very

856
00:36:55,589 --> 00:36:53,839
healthy fit individuals and they stay

857
00:36:58,230 --> 00:36:55,599
healthy in space

858
00:37:00,550 --> 00:36:58,240
of course microgravity can have some

859
00:37:01,829 --> 00:37:00,560
negative impacts on certain aspects of

860
00:37:04,390 --> 00:37:01,839
their physiology

861
00:37:06,150 --> 00:37:04,400
including their bone and muscle loss and

862
00:37:06,630 --> 00:37:06,160
in order to keep astronauts healthy and

863
00:37:09,349 --> 00:37:06,640

strong

864
00:37:10,069 --> 00:37:09,359
during their mission they exercise two

865
00:37:13,270 --> 00:37:10,079
hours

866
00:37:16,069 --> 00:37:13,280
every day aerobic and strength training

867
00:37:16,470 --> 00:37:16,079
and they have an optimized diet we do

868
00:37:19,510 --> 00:37:16,480
have

869
00:37:21,829 --> 00:37:19,520
science experiments on board that study

870
00:37:22,710 --> 00:37:21,839
the effects of microgravity on astronaut

871
00:37:26,230 --> 00:37:22,720
physiology

872
00:37:28,550 --> 00:37:26,240
such as ocular tests and

873
00:37:29,430 --> 00:37:28,560
blood tests and fluid shifts so we have

874
00:37:32,150 --> 00:37:29,440
various

875
00:37:34,470 --> 00:37:32,160
investigations on board that are in

876
00:37:36,150 --> 00:37:34,480
support of the human research program we

877
00:37:38,390 --> 00:37:36,160
have here at nasa but

878
00:37:40,310 --> 00:37:38,400
a lot of those activities are mitigated

879
00:37:42,870 --> 00:37:40,320
by what i said previously

880
00:37:45,670 --> 00:37:42,880
lots and lots of exercise lots of rest

881
00:37:47,829 --> 00:37:45,680
and a wonderful diet

882
00:37:49,349 --> 00:37:47,839
thanks jennifer and our last question is

883
00:37:50,950 --> 00:37:49,359
back to brock here in the room

884
00:37:53,270 --> 00:37:50,960
what is the most unique challenge you

885
00:37:54,550 --> 00:37:53,280
ran into while designing and building

886
00:37:56,790 --> 00:37:54,560
bishop

887
00:37:58,390 --> 00:37:56,800
so um yeah so another good question so

888
00:37:59,829 --> 00:37:58,400

when we started this about five years

889
00:38:00,470 --> 00:37:59,839
ago we kind of had a clean sheet of

890
00:38:02,870 --> 00:38:00,480
paper

891
00:38:03,990 --> 00:38:02,880
and nanoracks had the kind of audacity

892
00:38:05,910 --> 00:38:04,000
to say why don't we go build

893
00:38:07,750 --> 00:38:05,920
our own airlock well a lot of that was

894
00:38:10,470 --> 00:38:07,760
we're a small company at the time

895
00:38:11,910 --> 00:38:10,480
again trying to uh so at the time we

896
00:38:13,670 --> 00:38:11,920
were trying to build reputation and

897
00:38:15,030 --> 00:38:13,680
expand our capabilities we never built

898
00:38:17,190 --> 00:38:15,040
an airlock before right

899
00:38:18,630 --> 00:38:17,200
so it's a it's a challenge to build the

900
00:38:20,150 --> 00:38:18,640
team to

901
00:38:21,589 --> 00:38:20,160
be able to convince nasa it took us

902
00:38:23,270 --> 00:38:21,599
about a year to convince nasa that we

903
00:38:25,750 --> 00:38:23,280
could build the airlock on our own

904
00:38:27,270 --> 00:38:25,760
and that we could fund it and to have

905
00:38:27,750 --> 00:38:27,280
the technology and had the engineering

906
00:38:30,950 --> 00:38:27,760
team

907
00:38:32,470 --> 00:38:30,960
that happen we collaborated with a lot

908
00:38:35,270 --> 00:38:32,480
of partners

909
00:38:36,230 --> 00:38:35,280
that i mentioned earlier and just the um

910
00:38:37,430 --> 00:38:36,240
so that was probably the biggest

911
00:38:37,990 --> 00:38:37,440
challenge just getting everybody on

912
00:38:39,829 --> 00:38:38,000
board

913
00:38:41,030 --> 00:38:39,839

with the airlock itself and now here we

914
00:38:43,910 --> 00:38:41,040
are five years later

915
00:38:45,670 --> 00:38:43,920
it's really pretty cool um testimony to

916
00:38:47,030 --> 00:38:45,680
be able to work as a teamwork nasa

917
00:38:49,109 --> 00:38:47,040
embracing us

918
00:38:50,870 --> 00:38:49,119
in the commercial atmosphere there and

919
00:38:52,950 --> 00:38:50,880
they have the faith in us to be able to

920
00:38:53,670 --> 00:38:52,960
make that leap and and go on to building

921
00:38:55,829 --> 00:38:53,680
an airlock

922
00:38:57,270 --> 00:38:55,839
we look forward to using airlock on

923
00:38:57,589 --> 00:38:57,280
board but it's really a stepping stone

924
00:38:59,030 --> 00:38:57,599
to

925
00:39:00,710 --> 00:38:59,040
commercial space stations and we're

926
00:39:02,230 --> 00:39:00,720
planning on going forward

927
00:39:03,589 --> 00:39:02,240
even more this is not a stopping point

928
00:39:04,950 --> 00:39:03,599
this is a stepping stone to going

929
00:39:07,670 --> 00:39:04,960
forward so we're looking forward to

930
00:39:09,829 --> 00:39:07,680
future space stations commercialized

931
00:39:11,829 --> 00:39:09,839
thanks brock and thank you jennifer and

932
00:39:13,829 --> 00:39:11,839
pinar and thank you to everyone in our

933
00:39:15,670 --> 00:39:13,839
nasa social facebook group who's been

934
00:39:17,829 --> 00:39:15,680
following along i know there was over

935
00:39:19,990 --> 00:39:17,839
10 000 participants in that group so

936
00:39:22,150 --> 00:39:20,000
thanks so much for joining us

937
00:39:23,349 --> 00:39:22,160
and for more on these research payloads

938
00:39:26,710 --> 00:39:23,359

and others visit

939
00:39:30,230 --> 00:39:26,720
nasa.gov forward slash iss dash

940
00:39:33,589 --> 00:39:30,240
science crs 21 is targeted to lift off

941
00:39:35,829 --> 00:39:33,599
tomorrow at 11 39 a.m eastern time just

942
00:39:38,470 --> 00:39:35,839
a few miles behind me here at kennedy

943
00:39:41,510 --> 00:39:38,480
off of launch complex 39a

944
00:39:42,150 --> 00:39:41,520
and tune in launch is at 11 39 but we

945
00:39:44,870 --> 00:39:42,160
are beginning

946
00:39:45,910 --> 00:39:44,880
live launch coverage at 11 15 a.m and

947
00:39:49,750 --> 00:39:45,920
you can view that