



1  
00:00:55,980 --> 00:01:00,860  
started

2  
00:01:00,870 --> 00:01:08,289  
[Music]

3  
00:01:19,450 --> 00:01:09,900  
I feel funny

4  
00:01:19,460 --> 00:01:27,530  
quality we copy on the ground

5  
00:01:27,540 --> 00:01:32,390  
[Music]

6  
00:01:32,400 --> 00:01:38,330  
um

7  
00:01:38,340 --> 00:01:50,170  
foreign

8  
00:02:04,789 --> 00:01:55,350  
[Music]

9  
00:02:10,070 --> 00:02:07,550  
good afternoon and welcome to NASA's

10  
00:02:11,930 --> 00:02:10,080  
Kennedy Space Center in Florida I'm

11  
00:02:16,070 --> 00:02:11,940  
Jasmine Hopkins and you are watching

12  
00:02:17,690 --> 00:02:16,080  
NASA's SpaceX crew 6 social panel the

13  
00:02:20,089 --> 00:02:17,700

Acoustics Mission will carry NASA

14  
00:02:23,270 --> 00:02:20,099  
astronauts Steve Bowen and Woody hoberg

15  
00:02:26,089 --> 00:02:23,280  
as well as UAE astronaut Sultan on the

16  
00:02:28,250 --> 00:02:26,099  
ADI and Ross Cosmos Cosmonaut Andre

17  
00:02:31,150 --> 00:02:28,260  
feridev to the International Space

18  
00:02:34,430 --> 00:02:31,160  
Station for a six-month science Mission

19  
00:02:38,869 --> 00:02:34,440  
liftoff is targeted for this Monday that

20  
00:02:40,670 --> 00:02:38,879  
is February 27th at 1 45 A.M

21  
00:02:42,790 --> 00:02:40,680  
thanks so much for joining us and today

22  
00:02:45,890 --> 00:02:42,800  
we are joined by NASA leadership

23  
00:02:48,110 --> 00:02:45,900  
astronaut rajachari International Space

24  
00:02:49,790 --> 00:02:48,120  
Station scientists representatives from

25  
00:02:53,030 --> 00:02:49,800  
the International International

26  
00:02:55,369 --> 00:02:53,040  
laboratory from the ISS National Lab and

27  
00:02:57,470 --> 00:02:55,379  
a group of digital content creators

28  
00:03:00,290 --> 00:02:57,480  
visiting NASA's Kennedy Space Center as

29  
00:03:01,910 --> 00:03:00,300  
part of our NASA social program we are

30  
00:03:03,710 --> 00:03:01,920  
so glad to have you all here joining us

31  
00:03:05,630 --> 00:03:03,720  
in the room today

32  
00:03:08,210 --> 00:03:05,640  
here to tell us more about what it means

33  
00:03:10,190 --> 00:03:08,220  
to be part of the NASA family or a team

34  
00:03:12,830 --> 00:03:10,200  
member here at Nasa we will start with

35  
00:03:14,990 --> 00:03:12,840  
shuttle astronaut and NASA's associate

36  
00:03:17,390 --> 00:03:15,000  
administrator Bob Cubana well thanks

37  
00:03:20,030 --> 00:03:17,400  
Jasmine it's a real pleasure to be down

38  
00:03:22,430 --> 00:03:20,040

here in out of Washington in home in

39

00:03:23,809 --> 00:03:22,440

Florida this is just absolutely the best

40

00:03:24,949 --> 00:03:23,819

place going especially when you're

41

00:03:27,470 --> 00:03:24,959

launching Crews to the International

42

00:03:29,330 --> 00:03:27,480

Space Station there's just so much cool

43

00:03:31,009 --> 00:03:29,340

stuff going on down here and it's it's

44

00:03:33,050 --> 00:03:31,019

always fun for me to get out of the

45

00:03:35,390 --> 00:03:33,060

office and come down and be able to to

46

00:03:37,430 --> 00:03:35,400

talk to the team here and see real

47

00:03:40,449 --> 00:03:37,440

flight our hardware and see firsthand

48

00:03:43,789 --> 00:03:40,459

all the cool stuff that NASA is doing

49

00:03:46,009 --> 00:03:43,799

I I can't imagine not being part of

50

00:03:48,050 --> 00:03:46,019

America's space program today what an

51  
00:03:49,789 --> 00:03:48,060  
exciting time when you look at all that

52  
00:03:51,589 --> 00:03:49,799  
we're accomplishing you know we got

53  
00:03:52,970 --> 00:03:51,599  
Crews flying on the crew dragon to the

54  
00:03:55,490 --> 00:03:52,980  
International Space Station hopefully

55  
00:03:56,990 --> 00:03:55,500  
we're going to get Boeing flying here in

56  
00:03:58,190 --> 00:03:57,000  
the very near future on a crude test

57  
00:04:00,050 --> 00:03:58,200  
flight to the International Space

58  
00:04:02,089 --> 00:04:00,060  
Station we had that awesome Artemis

59  
00:04:04,789 --> 00:04:02,099  
launch last year and we're getting ready

60  
00:04:08,330 --> 00:04:04,799  
for Artemis 2 with the the Orion

61  
00:04:10,309 --> 00:04:08,340  
spacecraft on a crude flight accrued

62  
00:04:13,070 --> 00:04:10,319  
test flight to the moon for the first

63  
00:04:14,809 --> 00:04:13,080

time in many years and it just it just

64

00:04:16,490 --> 00:04:14,819

keeps going on and on and you throw all

65

00:04:19,370 --> 00:04:16,500

the great science missions on top of

66

00:04:21,590 --> 00:04:19,380

that narrow stuff we're doing uh NASA is

67

00:04:23,689 --> 00:04:21,600

the place to be but more than anything

68

00:04:25,790 --> 00:04:23,699

it's just fun to get home and be with

69

00:04:27,350 --> 00:04:25,800

all of you absolutely Bob NASA

70

00:04:30,170 --> 00:04:27,360

definitely is the place to be right now

71

00:04:32,810 --> 00:04:30,180

let's send it over to rajachary thanks

72

00:04:34,430 --> 00:04:32,820

Jasmine yeah and like uh Colonel Cabana

73

00:04:35,990 --> 00:04:34,440

said it's always a joy to come to

74

00:04:38,150 --> 00:04:36,000

Kennedy Space Center it's always fun to

75

00:04:39,950 --> 00:04:38,160

fly in and see where the Ops actually

76

00:04:41,150 --> 00:04:39,960

happen so we train in Houston but

77

00:04:42,290 --> 00:04:41,160

there's nothing like coming to Kennedy

78

00:04:43,730 --> 00:04:42,300

where you've actually launched the

79

00:04:45,409 --> 00:04:43,740

rocket and do the thing you've been

80

00:04:46,969 --> 00:04:45,419

training for so I'm excited to be here

81

00:04:48,830 --> 00:04:46,979

super excited to see Woody hoberg my

82

00:04:50,689 --> 00:04:48,840

classmate and fellow Turtle continue the

83

00:04:52,670 --> 00:04:50,699

line of turtles on the space station so

84

00:04:54,469 --> 00:04:52,680

we'll continue that tradition and super

85

00:04:56,570 --> 00:04:54,479

excited to him and see him and his crew

86

00:04:57,850 --> 00:04:56,580

launch tomorrow or well late tomorrow

87

00:05:00,710 --> 00:04:57,860

early Monday

88

00:05:03,290 --> 00:05:00,720

exactly very exciting Raja let's hear

89

00:05:06,650 --> 00:05:03,300

now from Dr Kurt Costello

90

00:05:09,050 --> 00:05:06,660

hi everybody I'm the ISS program Chief

91

00:05:11,150 --> 00:05:09,060

scientist and it's really exciting to

92

00:05:13,670 --> 00:05:11,160

come down here for these launches to see

93

00:05:16,550 --> 00:05:13,680

all the hard work that goes into putting

94

00:05:17,930 --> 00:05:16,560

together a payload mission for the

95

00:05:20,810 --> 00:05:17,940

International Space Station science

96

00:05:22,670 --> 00:05:20,820

pulling that all together and as as Bob

97

00:05:25,850 --> 00:05:22,680

and Raja here our great Representatives

98

00:05:27,590 --> 00:05:25,860

one of our most critical resources on

99

00:05:28,730 --> 00:05:27,600

the space station are the crew members

100

00:05:32,330 --> 00:05:28,740

themselves

101  
00:05:34,969 --> 00:05:32,340  
doing research with the crew members in

102  
00:05:37,310 --> 00:05:34,979  
in relation to human research trying to

103  
00:05:39,409 --> 00:05:37,320  
understand the risks to our crew members

104  
00:05:42,230 --> 00:05:39,419  
as we continue out farther into the

105  
00:05:44,510 --> 00:05:42,240  
solar system that is of Paramount

106  
00:05:46,370 --> 00:05:44,520  
importance for us but the crew will not

107  
00:05:48,770 --> 00:05:46,380  
only be doing human research they'll be

108  
00:05:52,249 --> 00:05:48,780  
helping out with some biology research

109  
00:05:55,249 --> 00:05:52,259  
some physical science research and even

110  
00:05:58,850 --> 00:05:55,259  
doing some groundbreaking Eva research

111  
00:06:00,050 --> 00:05:58,860  
we've never done really an Eva like this

112  
00:06:02,090 --> 00:06:00,060  
one coming up

113  
00:06:03,650 --> 00:06:02,100

back to you Jasmine lots of exciting

114

00:06:04,909 --> 00:06:03,660

science going up on this Mission Kurt

115

00:06:06,890 --> 00:06:04,919

now we're going to hear from Dana

116

00:06:09,469 --> 00:06:06,900

Hutcherson the deputy program manager

117

00:06:11,689 --> 00:06:09,479

for NASA's commercial crew program hey

118

00:06:14,210 --> 00:06:11,699

welcome and I'm very excited to be here

119

00:06:15,710 --> 00:06:14,220

she said I'm Dana Hutcherson Deputy

120

00:06:17,330 --> 00:06:15,720

program manager for commercial crew

121

00:06:19,550 --> 00:06:17,340

program I've been working with

122

00:06:22,070 --> 00:06:19,560

commercial crew program for almost 12

123

00:06:23,689 --> 00:06:22,080

years now and this is just one of our

124

00:06:26,029 --> 00:06:23,699

exciting moments getting ready and

125

00:06:28,189 --> 00:06:26,039

preparing for this Mission we're getting

126

00:06:30,950 --> 00:06:28,199

ready for our sixth rotational mission

127

00:06:33,710 --> 00:06:30,960

of taking astronauts to the National

128

00:06:35,990 --> 00:06:33,720

Space Station from U.S soil and it's our

129

00:06:39,770 --> 00:06:36,000

seventh crude flight so this is really a

130

00:06:41,990 --> 00:06:39,780

cool opportunity for us and as Colonel

131

00:06:44,450 --> 00:06:42,000

Cabana said we're also very excited to

132

00:06:48,110 --> 00:06:44,460

also bring on board very closely behind

133

00:06:50,930 --> 00:06:48,120

that Boeing the Starliner on CST 100 and

134

00:06:53,570 --> 00:06:50,940

getting that crude flight test up here

135

00:06:55,670 --> 00:06:53,580

in in the springtime so it's a very

136

00:06:57,170 --> 00:06:55,680

exciting time for us and I can tell you

137

00:06:58,550 --> 00:06:57,180

we talked to the crew this morning

138

00:07:00,469 --> 00:06:58,560

they're doing really well they're

139

00:07:03,230 --> 00:07:00,479

excited to get ready for this 6 month

140

00:07:05,150 --> 00:07:03,240

Mission the vehicle is doing well as

141

00:07:07,129 --> 00:07:05,160

well we're the teams are off now

142

00:07:08,689 --> 00:07:07,139

preparing doing the last final things

143

00:07:11,090 --> 00:07:08,699

and checkouts that they need to do to

144

00:07:12,650 --> 00:07:11,100

get ready for the for the mission and

145

00:07:15,110 --> 00:07:12,660

actually our engineers and scientists

146

00:07:17,270 --> 00:07:15,120

are back behind today working on

147

00:07:18,650 --> 00:07:17,280

checking all of the boxes making sure

148

00:07:20,390 --> 00:07:18,660

everything is ready to go they're in

149

00:07:22,490 --> 00:07:20,400

boards right now just doing the final

150

00:07:24,650 --> 00:07:22,500

checks we'll have some review a couple

151  
00:07:27,469 --> 00:07:24,660  
more reviews as we head into the launch

152  
00:07:29,749 --> 00:07:27,479  
on early Monday morning so very excited

153  
00:07:31,790 --> 00:07:29,759  
to be here and a good time for us to be

154  
00:07:32,990 --> 00:07:31,800  
here at Kennedy Space Center thanks so

155  
00:07:34,790 --> 00:07:33,000  
much Dana it's nice to hear that we're

156  
00:07:36,230 --> 00:07:34,800  
looking good for Monday and last but

157  
00:07:38,629 --> 00:07:36,240  
certainly not least we have Patrick

158  
00:07:41,089 --> 00:07:38,639  
O'Neill from the ISS National Laboratory

159  
00:07:42,830 --> 00:07:41,099  
Patrick well thanks Jasmine and first

160  
00:07:44,629 --> 00:07:42,840  
and foremost for those of you who are

161  
00:07:46,969 --> 00:07:44,639  
not from Florida welcome to Florida I

162  
00:07:48,890 --> 00:07:46,979  
hope that we have a fun smoking fire in

163  
00:07:50,150 --> 00:07:48,900

a couple of days but uh very excited to

164

00:07:52,129 --> 00:07:50,160

go out there and spend some time with

165

00:07:53,629 --> 00:07:52,139

you all one of the questions I like to

166

00:07:55,490 --> 00:07:53,639

ask when I have a chance to meet with

167

00:07:57,650 --> 00:07:55,500

this type of a group is prior to coming

168

00:08:00,529 --> 00:07:57,660

out here who knew that the space station

169

00:08:02,270 --> 00:08:00,539

was a National Laboratory

170

00:08:04,610 --> 00:08:02,280

so most of the time yeah it's like 50

171

00:08:06,350 --> 00:08:04,620

50-ish or so and and so it's an

172

00:08:08,390 --> 00:08:06,360

opportunity for us to you know provide

173

00:08:10,189 --> 00:08:08,400

some education on what a National Lab in

174

00:08:11,270 --> 00:08:10,199

space actually does and so I'm excited

175

00:08:12,710 --> 00:08:11,280

to go out and talk with you about some

176

00:08:14,629 --> 00:08:12,720

of the science that we help to support

177

00:08:16,730 --> 00:08:14,639

and sponsor how we work in partnership

178

00:08:18,290 --> 00:08:16,740

with NASA and how it is that we're all

179

00:08:20,270 --> 00:08:18,300

able to collectively utilize the space

180

00:08:21,950 --> 00:08:20,280

station to bring value to humanity and

181

00:08:24,110 --> 00:08:21,960

drive business models in low earth orbit

182

00:08:25,850 --> 00:08:24,120

thanks Jasmine of course and thank you

183

00:08:28,369 --> 00:08:25,860

all for those open remarks that brings

184

00:08:30,290 --> 00:08:28,379

us to the fun part of today's panel the

185

00:08:32,029 --> 00:08:30,300

question and answer as I said at the

186

00:08:34,370 --> 00:08:32,039

beginning we have a lot of content

187

00:08:35,570 --> 00:08:34,380

creators here in the room today so if

188

00:08:37,610 --> 00:08:35,580

you would like to ask a question please

189

00:08:39,110 --> 00:08:37,620

raise your hand and we have a microphone

190

00:08:40,790 --> 00:08:39,120

that will get to you you can introduce

191

00:08:42,709 --> 00:08:40,800

yourself and please say who you would

192

00:08:44,089 --> 00:08:42,719

like to answer your question if you're

193

00:08:47,449 --> 00:08:44,099

watching online please join the

194

00:08:50,690 --> 00:08:47,459

conversation using ask NASA

195

00:08:52,190 --> 00:08:50,700

all right so let's get it started

196

00:08:54,949 --> 00:08:52,200

well hi thanks for being here my name is

197

00:08:56,329 --> 00:08:54,959

Mike verkest and for uh about 28 years

198

00:08:57,650 --> 00:08:56,339

or so I've been involved in the

199

00:08:59,509 --> 00:08:57,660

Emergency Medical Services I'm a

200

00:09:00,769 --> 00:08:59,519

paramedic and in the fire service and I

201  
00:09:02,570 --> 00:09:00,779  
wanted to speak to it I'm not sure who

202  
00:09:05,449 --> 00:09:02,580  
would be best to answer uh maybe the

203  
00:09:07,550 --> 00:09:05,459  
colonel maybe Raj but um we we've

204  
00:09:09,949 --> 00:09:07,560  
started employing checklists for our

205  
00:09:12,170 --> 00:09:09,959  
high Acuity low occurrence procedures

206  
00:09:14,329 --> 00:09:12,180  
things like that and

207  
00:09:16,850 --> 00:09:14,339  
um I find it interesting that Pilots

208  
00:09:18,530 --> 00:09:16,860  
anyone in aviation they use checklists

209  
00:09:20,449 --> 00:09:18,540  
for everything so maybe you could just

210  
00:09:23,150 --> 00:09:20,459  
speak to a little bit about human

211  
00:09:26,269 --> 00:09:23,160  
factors why checklists are important why

212  
00:09:27,949 --> 00:09:26,279  
people should trust those checklists and

213  
00:09:29,570 --> 00:09:27,959

use them and not pretend like they they

214

00:09:31,070 --> 00:09:29,580

know all the stuff

215

00:09:32,810 --> 00:09:31,080

thank you all right I'm going to start

216

00:09:34,790 --> 00:09:32,820

if you don't mind Mike and then Rush can

217

00:09:37,430 --> 00:09:34,800

chime in but one of the things that it's

218

00:09:39,470 --> 00:09:37,440

come out of uh flying actually is crew

219

00:09:42,170 --> 00:09:39,480

resource management and it's transferred

220

00:09:44,449 --> 00:09:42,180

over into emergency operating rooms

221

00:09:46,670 --> 00:09:44,459

there was a problem in aviation for a

222

00:09:50,030 --> 00:09:46,680

while where you had these very senior

223

00:09:53,570 --> 00:09:50,040

captains and you'd have a junior co-capt

224

00:09:55,190 --> 00:09:53,580

and pilot co-pilot on board that the

225

00:09:58,370 --> 00:09:55,200

crew would not question the captain

226

00:10:00,230 --> 00:09:58,380

because he was so senior and even when

227

00:10:02,389 --> 00:10:00,240

there's something going wrong and

228

00:10:04,310 --> 00:10:02,399

learning how to work together as a team

229

00:10:06,170 --> 00:10:04,320

is crucial and that's how we train for

230

00:10:08,030 --> 00:10:06,180

our place space flights also I'm gonna

231

00:10:09,110 --> 00:10:08,040

let Raj go into that but checklists are

232

00:10:11,570 --> 00:10:09,120

critical

233

00:10:13,610 --> 00:10:11,580

um you know the really important stuff

234

00:10:15,889 --> 00:10:13,620

you memorize but you always get the

235

00:10:17,870 --> 00:10:15,899

checklist out and do it right and I had

236

00:10:20,090 --> 00:10:17,880

a rule when I flew Raj can talk about

237

00:10:22,490 --> 00:10:20,100

his but we always had like a two-man

238

00:10:25,070 --> 00:10:22,500

rule where I had somebody with the

239

00:10:26,630 --> 00:10:25,080

checklist verifying when I my checklist

240

00:10:27,889 --> 00:10:26,640

that I actually had my hand on the right

241

00:10:29,269 --> 00:10:27,899

switch and we were doing the right thing

242

00:10:30,710 --> 00:10:29,279

so that we did everything in the proper

243

00:10:31,970 --> 00:10:30,720

order and one of the real problems that

244

00:10:33,410 --> 00:10:31,980

you can run into is when you have a

245

00:10:34,910 --> 00:10:33,420

break in your habit patterns where

246

00:10:36,889 --> 00:10:34,920

you're going through a checklist and

247

00:10:38,990 --> 00:10:36,899

something interrupts you and it's really

248

00:10:41,389 --> 00:10:39,000

critical that you make sure that you go

249

00:10:43,130 --> 00:10:41,399

in at the same point that you left off

250

00:10:45,470 --> 00:10:43,140

and you don't leave something out or can

251  
00:10:46,910 --> 00:10:45,480  
have really severe consequences down the

252  
00:10:48,410 --> 00:10:46,920  
road Raj you want to add to that yeah

253  
00:10:49,850 --> 00:10:48,420  
absolutely so I think you're exactly

254  
00:10:51,650 --> 00:10:49,860  
right so you mentioned like some

255  
00:10:53,389 --> 00:10:51,660  
critical things so there's a handful of

256  
00:10:55,910 --> 00:10:53,399  
things and then the Air Force we call it

257  
00:10:57,290 --> 00:10:55,920  
bold face uh places called like critical

258  
00:10:59,030 --> 00:10:57,300  
action time so there may be a handful of

259  
00:11:00,530 --> 00:10:59,040  
things you do an immediate button push

260  
00:11:01,910 --> 00:11:00,540  
or something like that and the dragon

261  
00:11:03,230 --> 00:11:01,920  
will be like hitting the fire response

262  
00:11:05,030 --> 00:11:03,240  
button that would be like an idiot thing

263  
00:11:06,530 --> 00:11:05,040

but everything beyond that the system is

264

00:11:08,269 --> 00:11:06,540

so complicated and really especially on

265

00:11:10,610 --> 00:11:08,279

the space station you are working with

266

00:11:13,009 --> 00:11:10,620

such a myriad of systems payloads people

267

00:11:15,230 --> 00:11:13,019

the ground you really don't want us not

268

00:11:16,790 --> 00:11:15,240

using a checklist you want it is so

269

00:11:18,829 --> 00:11:16,800

complicated you can very quickly make

270

00:11:21,350 --> 00:11:18,839

the situation worse and there's very

271

00:11:23,090 --> 00:11:21,360

very few emergencies that would be

272

00:11:24,530 --> 00:11:23,100

benefit from you rushing and so if

273

00:11:25,970 --> 00:11:24,540

nothing else we have a saying in the Air

274

00:11:27,230 --> 00:11:25,980

Force it's like turn the clock so the

275

00:11:29,269 --> 00:11:27,240

first thing to do in emergency is like

276

00:11:32,210 --> 00:11:29,279

hack a clock do something just to kind

277

00:11:34,370 --> 00:11:32,220

of have a two or three second let that

278

00:11:36,170 --> 00:11:34,380

sort of like the lizard brain part of

279

00:11:38,509 --> 00:11:36,180

your body that wants to react and do

280

00:11:40,550 --> 00:11:38,519

something stupid just take a breath

281

00:11:42,350 --> 00:11:40,560

think for a second and then and then go

282

00:11:44,150 --> 00:11:42,360

and the checklist helps with that and

283

00:11:45,889 --> 00:11:44,160

exactly like Colonel Cabana said we we

284

00:11:47,870 --> 00:11:45,899

either verify you with the ground with

285

00:11:51,850 --> 00:11:47,880

another crewmate pretty much every step

286

00:11:54,590 --> 00:11:51,860

and it just adds a layer of you know

287

00:11:55,910 --> 00:11:54,600

a layer of certainty to it and to make

288

00:11:58,250 --> 00:11:55,920

sure that you don't wind up in a bad

289

00:12:00,470 --> 00:11:58,260

path especially uh when the space

290

00:12:03,290 --> 00:12:00,480

station miles we are we are the eyes and

291

00:12:05,329 --> 00:12:03,300

ears and doers but the ground has way

292

00:12:07,069 --> 00:12:05,339

more insight into the overall system and

293

00:12:08,990 --> 00:12:07,079

so it's if you're not in sync with the

294

00:12:10,790 --> 00:12:09,000

ground it's really easy to go down you

295

00:12:12,710 --> 00:12:10,800

know whether maybe you're coming up in

296

00:12:14,210 --> 00:12:12,720

eclipse or you know the solar panels or

297

00:12:15,410 --> 00:12:14,220

at some different angle and you don't

298

00:12:17,269 --> 00:12:15,420

know all that information without

299

00:12:19,569 --> 00:12:17,279

following the checklist and talking to

300

00:12:24,110 --> 00:12:21,470

thank you for answering that question

301

00:12:25,550 --> 00:12:24,120

next here in the room

302

00:12:28,190 --> 00:12:25,560

we've got some hands in the back row

303

00:12:31,970 --> 00:12:30,230

I asked Kyle Shay I'm from Tulsa

304

00:12:33,829 --> 00:12:31,980

Community College I have a question for

305

00:12:35,810 --> 00:12:33,839

uh Dr Kurt just Stella here you

306

00:12:38,329 --> 00:12:35,820

mentioned in your intro that you are

307

00:12:40,190 --> 00:12:38,339

doing some groundbreaking Eva research

308

00:12:41,990 --> 00:12:40,200

on ISS with this one that's Mission can

309

00:12:45,410 --> 00:12:42,000

you elaborate on that

310

00:12:47,889 --> 00:12:45,420

sure um the the research investigation I

311

00:12:51,290 --> 00:12:47,899

was mentioning is called ISS external

312

00:12:53,329 --> 00:12:51,300

microorganisms and it's a question that

313

00:12:56,389 --> 00:12:53,339

was raised by the researchers here at

314

00:13:00,470 --> 00:12:56,399

Johnson Space Center as to what is the

315

00:13:04,009 --> 00:13:00,480

survivability of bacteria and fungi that

316

00:13:06,590 --> 00:13:04,019

we all carry with us as humans no matter

317

00:13:08,810 --> 00:13:06,600

how clean we try try and be as humans

318

00:13:11,470 --> 00:13:08,820

we're going to carry around these things

319

00:13:14,210 --> 00:13:11,480

think of it as your own little pig pen

320

00:13:17,449 --> 00:13:14,220

you're bringing these things along and

321

00:13:20,030 --> 00:13:17,459

obviously when air and other items are

322

00:13:23,150 --> 00:13:20,040

vented from a spacecraft they're

323

00:13:25,810 --> 00:13:23,160

exposing that population to space so we

324

00:13:29,810 --> 00:13:25,820

want to know if it's survivable

325

00:13:32,449 --> 00:13:29,820

if it manages to reproduce outside we're

326

00:13:35,449 --> 00:13:32,459

going to be taking samples using an Eva

327

00:13:37,490 --> 00:13:35,459

swab tool at several locations around

328

00:13:39,829 --> 00:13:37,500

the airlock and we'll also be doing two

329

00:13:41,930 --> 00:13:39,839

control samples outside just exposing

330

00:13:43,610 --> 00:13:41,940

them to the vacuum of space and we

331

00:13:45,889 --> 00:13:43,620

really want to know this for planetary

332

00:13:48,290 --> 00:13:45,899

protection measures we want to know as

333

00:13:49,970 --> 00:13:48,300

we go to the moon and not so much on the

334

00:13:53,090 --> 00:13:49,980

moon because it's it's really harsh

335

00:13:55,190 --> 00:13:53,100

there but on Mars where our primary goal

336

00:13:57,110 --> 00:13:55,200

one of them is to search for how life

337

00:13:58,910 --> 00:13:57,120

might have developed there we want to

338

00:14:00,710 --> 00:13:58,920

know that we're checking for life that

339

00:14:02,930 --> 00:14:00,720

developed there and not life that we

340

00:14:04,910 --> 00:14:02,940

brought along with us so this is an

341

00:14:06,730 --> 00:14:04,920

exciting study it's the first time we've

342

00:14:09,769 --> 00:14:06,740

done sampling of the space station

343

00:14:11,870 --> 00:14:09,779

externally on the U.S side and we're

344

00:14:14,690 --> 00:14:11,880

hoping to learn a lot from it

345

00:14:19,690 --> 00:14:14,700

thank you so much Dr Costello I see some

346

00:14:25,610 --> 00:14:22,910

Commander Cabana and astronachary thank

347

00:14:27,949 --> 00:14:25,620

you very much my name is Jim Reed you

348

00:14:30,050 --> 00:14:27,959

might recognize a call sign and for bfr

349

00:14:32,150 --> 00:14:30,060

I'm part of amateur radio on the

350

00:14:33,590 --> 00:14:32,160

International Space Station team and I

351

00:14:35,930 --> 00:14:33,600

want to thank you very much for your

352

00:14:38,269 --> 00:14:35,940

support of Colonel Cabana SRX and

353

00:14:41,030 --> 00:14:38,279

Astronaut Chari the heiress program when

354

00:14:43,970 --> 00:14:41,040

you were up can you talk a little bit

355

00:14:46,550 --> 00:14:43,980

about how your experience with amateur

356

00:14:48,050 --> 00:14:46,560

radio and NASA going together as well as

357

00:14:51,290 --> 00:14:48,060

I don't know if you're aware but the

358

00:14:54,170 --> 00:14:51,300

40th anniversary of ham radio contact

359

00:14:55,670 --> 00:14:54,180

from human space flight is coming up at

360

00:14:56,870 --> 00:14:55,680

the end of the year and any thoughts on

361

00:15:01,910 --> 00:14:56,880

that as well

362

00:15:05,389 --> 00:15:01,920

well I'll go first kc5 hbv uh

363

00:15:08,090 --> 00:15:05,399

I think what it did on the shuttle it it

364

00:15:10,610 --> 00:15:08,100

allows us to reach a a group of students

365

00:15:12,350 --> 00:15:10,620

of folks on the ground it just generates

366

00:15:14,509 --> 00:15:12,360

interest in science and engineering and

367

00:15:16,430 --> 00:15:14,519

you know when you go along with what is

368

00:15:18,350 --> 00:15:16,440

required for to build a radio to operate

369

00:15:20,210 --> 00:15:18,360

a radio and communicate with somebody in

370

00:15:23,569 --> 00:15:20,220

space that's really cool and to be able

371

00:15:25,250 --> 00:15:23,579

to reach down to students from space and

372

00:15:27,350 --> 00:15:25,260

be able to share with them over

373

00:15:29,269 --> 00:15:27,360

shortwave radio I thought it was really

374

00:15:30,769 --> 00:15:29,279

a fun thing to do yeah I enjoy it I

375

00:15:33,050 --> 00:15:30,779

think it's uh you mentioned it's kind of

376

00:15:35,930 --> 00:15:33,060

a Capstone project for for students and

377

00:15:37,189 --> 00:15:35,940

it's a it's a cool thing to actually do

378

00:15:38,870 --> 00:15:37,199

with the project so you're not just

379

00:15:40,009 --> 00:15:38,880

building a radio or you know going

380

00:15:41,329 --> 00:15:40,019

through the mechanics of it you actually

381

00:15:42,949 --> 00:15:41,339

get to use it at the end and then to

382

00:15:44,990 --> 00:15:42,959

talk to the space station was is pretty

383

00:15:47,689 --> 00:15:45,000

awesome I got to talk to some Japanese

384

00:15:48,710 --> 00:15:47,699

students uh and it was it yeah it was

385

00:15:50,870 --> 00:15:48,720

definitely a highlight oh you actually

386

00:15:52,610 --> 00:15:50,880

we used it in one of our Sims as well

387

00:15:54,530 --> 00:15:52,620

because if you lose space to ground

388

00:15:56,870 --> 00:15:54,540

loops and the Russian com system you can

389

00:16:00,050 --> 00:15:56,880

actually use the ham radio so that's a

390

00:16:01,370 --> 00:16:00,060

it is a tertiary a quadriary backup if

391

00:16:02,870 --> 00:16:01,380

you if you will and you have to then

392

00:16:04,310 --> 00:16:02,880

convince the person on the ground that

393

00:16:06,230 --> 00:16:04,320

you're not hoaxing him like no kidding

394

00:16:07,430 --> 00:16:06,240

this is the ISS go call someone call

395

00:16:09,290 --> 00:16:07,440

Houston

396

00:16:10,490 --> 00:16:09,300

um but uh yeah so it's got a it's got a

397

00:16:13,430 --> 00:16:10,500

practical side too other than the

398

00:16:15,009 --> 00:16:13,440

educational part thanks for asking Jim

399

00:16:17,030 --> 00:16:15,019

yeah thank you both for those answers

400

00:16:20,269 --> 00:16:17,040

any more questions in the room I see

401

00:16:23,150 --> 00:16:20,279

some hands over here in this corner

402

00:16:24,769 --> 00:16:23,160

hi my name is Jen cotton I was a science

403

00:16:26,810 --> 00:16:24,779

teacher here in Brevard County so I just

404

00:16:28,670 --> 00:16:26,820

wanted to tell you all thank you for

405

00:16:30,350 --> 00:16:28,680

sending student projects up on this

406

00:16:32,329 --> 00:16:30,360

Mission and making those dreams come

407

00:16:34,550 --> 00:16:32,339

true for those kids I know as a child

408

00:16:36,530 --> 00:16:34,560

being a science nerd that is something

409

00:16:38,329 --> 00:16:36,540

that would have been amazing I have

410

00:16:42,470 --> 00:16:38,339

something for our scientists up here in

411

00:16:45,530 --> 00:16:42,480

ISS how do you manage a project from

412

00:16:47,870 --> 00:16:45,540

conception of a question to data

413

00:16:50,449 --> 00:16:47,880

collection and Analysis when you're

414

00:16:52,970 --> 00:16:50,459

rotating out staff and as a chief

415

00:16:54,889 --> 00:16:52,980

scientist on a traditional Expeditions

416

00:16:58,129 --> 00:16:54,899

you're going to be the one on the ship

417

00:17:01,370 --> 00:16:58,139

or on the facility working at how does

418

00:17:07,370 --> 00:17:05,210

I I think that was for me and I'll say I

419

00:17:10,069 --> 00:17:07,380

I have not gotten to go on an expedition

420

00:17:12,829 --> 00:17:10,079

yet it would be most enjoyable to do so

421

00:17:15,350 --> 00:17:12,839

but um uh no that's that's a great

422

00:17:17,990 --> 00:17:15,360

question the way NASA works is we have a

423

00:17:20,390 --> 00:17:18,000

number of science sponsors uh from

424

00:17:22,850 --> 00:17:20,400

within the agency and also through our

425

00:17:25,970 --> 00:17:22,860

ISS National Laboratory partner we've

426

00:17:28,610 --> 00:17:25,980

got other government agencies commercial

427

00:17:32,990 --> 00:17:28,620

entities that want to fly science to ISS

428

00:17:35,330 --> 00:17:33,000

so you it's a it's a really big problem

429

00:17:36,710 --> 00:17:35,340

because you have to integrate across all

430

00:17:39,230 --> 00:17:36,720

of these different agencies different

431

00:17:41,029 --> 00:17:39,240

divisions within the agency that all

432

00:17:44,270 --> 00:17:41,039

have uh you know they start with a

433

00:17:48,169 --> 00:17:44,280

hypothesis and uh then then a scientist

434

00:17:50,510 --> 00:17:48,179

uh gets selected uh is given a grant or

435

00:17:52,970 --> 00:17:50,520

is sometimes in the case of commercial

436

00:17:54,830 --> 00:17:52,980

paying their own way now and they're

437

00:17:55,570 --> 00:17:54,840

coming forward with their project of

438

00:17:58,490 --> 00:17:55,580

course

439

00:18:00,650 --> 00:17:58,500

most often they've never done research

440

00:18:02,870 --> 00:18:00,660

in microgravity before they have no idea

441

00:18:04,970 --> 00:18:02,880

what it takes to get from their

442

00:18:07,370 --> 00:18:04,980

laboratory benchtop experiment that

443

00:18:09,289 --> 00:18:07,380

they're doing on the ground to the space

444

00:18:12,409 --> 00:18:09,299

station and to be able to operate that

445

00:18:13,690 --> 00:18:12,419

safely to be able to contain all the

446

00:18:16,370 --> 00:18:13,700

harmful

447

00:18:18,770 --> 00:18:16,380

components potentially of that to be

448

00:18:21,110 --> 00:18:18,780

able to conform to the Space Station's

449

00:18:24,110 --> 00:18:21,120

electrical systems Data Systems things

450

00:18:26,930 --> 00:18:24,120

like that and that's really where the

451  
00:18:29,630 --> 00:18:26,940  
ISS program office comes in we help them

452  
00:18:31,430 --> 00:18:29,640  
navigate all of those those minefields

453  
00:18:34,370 --> 00:18:31,440  
along along the way get them packaged

454  
00:18:36,529 --> 00:18:34,380  
get them prepped work with our folks at

455  
00:18:39,169 --> 00:18:36,539  
Marshall to get procedures for the crew

456  
00:18:41,390 --> 00:18:39,179  
to be able to operate the payload safely

457  
00:18:43,669 --> 00:18:41,400  
and then all of that comes together in

458  
00:18:45,830 --> 00:18:43,679  
these wonderful missions the Expeditions

459  
00:18:47,750 --> 00:18:45,840  
that we have and then even then we're

460  
00:18:49,310 --> 00:18:47,760  
still not done we've got samples that

461  
00:18:52,730 --> 00:18:49,320  
now need to come back down to the ground

462  
00:18:54,770 --> 00:18:52,740  
for analysis so there are a lot of folks

463  
00:18:56,930 --> 00:18:54,780

on the logistics side that help us pack

464

00:18:59,450 --> 00:18:56,940

everything so we can get the absolute

465

00:19:01,669 --> 00:18:59,460

efficiency out of the vehicles that we

466

00:19:02,930 --> 00:19:01,679

need they return those samples and then

467

00:19:05,210 --> 00:19:02,940

the scientists finally have their

468

00:19:07,789 --> 00:19:05,220

samples for analysis so it is a really

469

00:19:09,830 --> 00:19:07,799

big process and again there are many

470

00:19:10,970 --> 00:19:09,840

many different sponsors for the space

471

00:19:12,830 --> 00:19:10,980

station and I don't know if you wanted

472

00:19:14,390 --> 00:19:12,840

to add on the National Labs yeah I can

473

00:19:16,730 --> 00:19:14,400

definitely add to that um and actually

474

00:19:17,750 --> 00:19:16,740

this is a great question and it also

475

00:19:19,730 --> 00:19:17,760

kind of got me thinking about the

476

00:19:20,810 --> 00:19:19,740

question you had about checklists and so

477

00:19:22,070 --> 00:19:20,820

you know think about it from a

478

00:19:23,990 --> 00:19:22,080

standpoint if you wanted to send this

479

00:19:25,549 --> 00:19:24,000

pen to the space station you can't just

480

00:19:27,529 --> 00:19:25,559

send this thing up by itself it has to

481

00:19:29,570 --> 00:19:27,539

go in Flight certified Hardware there's

482

00:19:32,210 --> 00:19:29,580

a variety of companies entities that can

483

00:19:34,430 --> 00:19:32,220

work alongside a research team to be

484

00:19:35,510 --> 00:19:34,440

able to take this pen and say okay we're

485

00:19:37,970 --> 00:19:35,520

going to send this to the space station

486

00:19:40,490 --> 00:19:37,980

in this facility and it's going to do X

487

00:19:42,470 --> 00:19:40,500

Y and Z so oftentimes as Dr Costello

488

00:19:44,570 --> 00:19:42,480

alluded to you might have an initial

489

00:19:46,130 --> 00:19:44,580

concept of what you want to do but there

490

00:19:48,529 --> 00:19:46,140

are constraints some what it is that you

491

00:19:50,870 --> 00:19:48,539

have the availability to leverage on the

492

00:19:52,490 --> 00:19:50,880

space station so there's again NASA

493

00:19:54,169 --> 00:19:52,500

there's ISS National Lab there's other

494

00:19:56,210 --> 00:19:54,179

sponsors there's companies that can all

495

00:19:58,430 --> 00:19:56,220

work alongside a research team to be

496

00:20:00,350 --> 00:19:58,440

able to take their their thought and

497

00:20:03,110 --> 00:20:00,360

make it reality so it really is a

498

00:20:04,730 --> 00:20:03,120

collaborate collaborative effort from a

499

00:20:06,770 --> 00:20:04,740

lot of entities that all work in unison

500

00:20:09,650 --> 00:20:06,780

to again try to make this this come to

501  
00:20:12,289 --> 00:20:09,660  
fruition so and you you also alluded to

502  
00:20:14,029 --> 00:20:12,299  
student investigations from a National

503  
00:20:15,650 --> 00:20:14,039  
Lab perspective we actually put out a

504  
00:20:17,810 --> 00:20:15,660  
variety of research announcements that

505  
00:20:20,690 --> 00:20:17,820  
are focused specifically towards either

506  
00:20:22,370 --> 00:20:20,700  
education or Workforce Development so

507  
00:20:24,110 --> 00:20:22,380  
and there's also a lot of programs we

508  
00:20:25,669 --> 00:20:24,120  
work with through the students Baseline

509  
00:20:27,049 --> 00:20:25,679  
experiments program there's going to be

510  
00:20:30,049 --> 00:20:27,059  
an investigation that's launching later

511  
00:20:31,250 --> 00:20:30,059  
this summer from genes in space which is

512  
00:20:32,570 --> 00:20:31,260  
as it sounds you're going to be

513  
00:20:35,450 --> 00:20:32,580

launching genetic experiments to the

514

00:20:37,250 --> 00:20:35,460

space station so you really do open up a

515

00:20:38,930 --> 00:20:37,260

wide array of opportunities for students

516

00:20:41,090 --> 00:20:38,940

to get involved both from an engineering

517

00:20:43,310 --> 00:20:41,100

side of the house as well as uh from

518

00:20:44,630 --> 00:20:43,320

actually launching science itself and

519

00:20:45,950 --> 00:20:44,640

and even having the opportunity to

520

00:20:46,970 --> 00:20:45,960

potentially publish some of those

521

00:20:48,470 --> 00:20:46,980

findings

522

00:20:49,430 --> 00:20:48,480

um so and at the end of the day I think

523

00:20:51,289 --> 00:20:49,440

that that's ultimately what we're

524

00:20:52,909 --> 00:20:51,299

looking for is uh we're kind of dubbing

525

00:20:55,430 --> 00:20:52,919

this the decade of results on the space

526  
00:20:56,630 --> 00:20:55,440  
station so anytime we have the chance to

527  
00:20:59,029 --> 00:20:56,640  
talk about some of those results people

528  
00:21:01,850 --> 00:20:59,039  
want to bring that out to the community

529  
00:21:03,710 --> 00:21:01,860  
thanks so much Kurt and Patrick

530  
00:21:05,150 --> 00:21:03,720  
got some more in the back and then also

531  
00:21:07,070 --> 00:21:05,160  
in the front here

532  
00:21:08,930 --> 00:21:07,080  
my name is James brierton from Charlotte

533  
00:21:10,669 --> 00:21:08,940  
North Carolina my question is for Raj

534  
00:21:12,950 --> 00:21:10,679  
your trained professional but as a human

535  
00:21:14,390 --> 00:21:12,960  
being I wonder what it's like dealing

536  
00:21:16,370 --> 00:21:14,400  
with the suspense waiting to find out

537  
00:21:18,350 --> 00:21:16,380  
who's going to fly Artemis 2 3 and

538  
00:21:19,789 --> 00:21:18,360

Beyond it's actually pretty easy because

539

00:21:21,409 --> 00:21:19,799

I'd be happy for with anyone in the

540

00:21:23,510 --> 00:21:21,419

office to do it I mean I think the the

541

00:21:25,010 --> 00:21:23,520

whole reason I applied again twice I

542

00:21:26,750 --> 00:21:25,020

applied once and didn't make it in the

543

00:21:29,570 --> 00:21:26,760

reason I applied again was everyone in

544

00:21:31,190 --> 00:21:29,580

the office is awesome so I would yeah I

545

00:21:33,409 --> 00:21:31,200

I don't think it matters who it is we'll

546

00:21:35,750 --> 00:21:33,419

all be excited and all fall in line to

547

00:21:37,130 --> 00:21:35,760

support that person and those people I

548

00:21:38,930 --> 00:21:37,140

think you know we were actually talking

549

00:21:40,250 --> 00:21:38,940

I was talking to some of the PA folks I

550

00:21:41,810 --> 00:21:40,260

think the most common misconception

551  
00:21:43,970 --> 00:21:41,820  
about astronauts is that our job is to

552  
00:21:45,110 --> 00:21:43,980  
fly in space that is a job but most of

553  
00:21:46,370 --> 00:21:45,120  
our jobs not flying in space you

554  
00:21:48,350 --> 00:21:46,380  
mentioned 28 years which is the same

555  
00:21:50,270 --> 00:21:48,360  
number Tom marshburn who was my pilot on

556  
00:21:52,610 --> 00:21:50,280  
crew 3 was in the office and so out of

557  
00:21:55,490 --> 00:21:52,620  
28 years in the office he flew like 500

558  
00:21:56,570 --> 00:21:55,500  
some days but that that's a when you

559  
00:21:58,490 --> 00:21:56,580  
look at the percentage that's a small

560  
00:21:59,810 --> 00:21:58,500  
amount but it's flying in space is

561  
00:22:01,850 --> 00:21:59,820  
awesome don't be wrong but we love our

562  
00:22:02,990 --> 00:22:01,860  
day job so whether it was helping with a

563  
00:22:05,090 --> 00:22:03,000

commercial crew and working with Dana

564

00:22:07,190 --> 00:22:05,100

before I flew or helping with hls and

565

00:22:09,710 --> 00:22:07,200

Orlando now that is super exciting stuff

566

00:22:11,510 --> 00:22:09,720

and so yeah I would love to get assigned

567

00:22:13,730 --> 00:22:11,520

to Artemis everyone would but I'll we

568

00:22:16,789 --> 00:22:13,740

also love our job

569

00:22:19,190 --> 00:22:16,799

thanks so much Raja

570

00:22:21,470 --> 00:22:19,200

hi uh my name is Blake I run a YouTube

571

00:22:23,510 --> 00:22:21,480

channel called uh Professor marbles I do

572

00:22:24,890 --> 00:22:23,520

elementary science experiments and I

573

00:22:25,970 --> 00:22:24,900

have a question from a fifth grade

574

00:22:28,909 --> 00:22:25,980

student

575

00:22:31,730 --> 00:22:28,919

it's for our astronaut friend they want

576  
00:22:36,950 --> 00:22:33,529  
they want to know how does it feel when

577  
00:22:38,830 --> 00:22:36,960  
you come back is it fun or scary uh so I

578  
00:22:41,029 --> 00:22:38,840  
thought it was awesome

579  
00:22:42,590 --> 00:22:41,039  
so I thought it was way better than

580  
00:22:46,029 --> 00:22:42,600  
launch and it's because you're

581  
00:22:48,590 --> 00:22:46,039  
deconditioned and so your brain

582  
00:22:49,850 --> 00:22:48,600  
interprets so the fluid in your ear

583  
00:22:51,770 --> 00:22:49,860  
canals is still moving when you're in

584  
00:22:52,549 --> 00:22:51,780  
space but your brain kind of interprets

585  
00:22:54,230 --> 00:22:52,559  
it differently so when you're coming

586  
00:22:55,909 --> 00:22:54,240  
back even though the capsule is kind of

587  
00:22:57,289 --> 00:22:55,919  
just doing this through the air it feels

588  
00:22:59,390 --> 00:22:57,299

like someone's got you by the heel and

589

00:23:01,490 --> 00:22:59,400

just like went like winging you all over

590

00:23:03,529 --> 00:23:01,500

the place so I will say like the bad

591

00:23:05,210 --> 00:23:03,539

side about being a fighter pilot is

592

00:23:07,010 --> 00:23:05,220

theme parks and amusement parks are

593

00:23:09,890 --> 00:23:07,020

pretty lame so I ride with my kids and

594

00:23:11,210 --> 00:23:09,900

it's like okay like this is boring and

595

00:23:13,490 --> 00:23:11,220

so that was the first time in a long

596

00:23:15,169 --> 00:23:13,500

time that I was like this is awesome I

597

00:23:15,950 --> 00:23:15,179

don't know what's going on this I like

598

00:23:21,049 --> 00:23:15,960

it

599

00:23:22,789 --> 00:23:21,059

takes about 24 to 48 hours for that to

600

00:23:24,710 --> 00:23:22,799

go away and then about a week to get

601  
00:23:27,890 --> 00:23:24,720  
like stability back and then about a

602  
00:23:29,630 --> 00:23:27,900  
month for my kind of full functioning if

603  
00:23:31,669 --> 00:23:29,640  
you will and then potential years for

604  
00:23:34,330 --> 00:23:31,679  
bone loss so it's it's different phases

605  
00:23:37,310 --> 00:23:34,340  
for what recovery you're talking about

606  
00:23:38,870 --> 00:23:37,320  
and I know Kurt knows all about the

607  
00:23:40,310 --> 00:23:38,880  
human science we're doing but as soon as

608  
00:23:42,409 --> 00:23:40,320  
we come back there's things going into

609  
00:23:43,610 --> 00:23:42,419  
us anything coming out of us is getting

610  
00:23:46,610 --> 00:23:43,620  
collected because there's a whole lot of

611  
00:23:50,029 --> 00:23:47,990  
oh thank you so much for that answer

612  
00:23:54,409 --> 00:23:50,039  
Raja

613  
00:23:59,029 --> 00:23:57,350

hi I'm Sarah I'm from Philadelphia but I

614

00:24:01,070 --> 00:23:59,039

actually live in Italy so I flew all the

615

00:24:02,810 --> 00:24:01,080

way over here to see you guys

616

00:24:05,029 --> 00:24:02,820

um I do have a question

617

00:24:07,850 --> 00:24:05,039

sorry my voice a little bit down

618

00:24:11,810 --> 00:24:07,860

um do you ever get time to manually fly

619

00:24:13,909 --> 00:24:11,820

the dragon spacecraft in orbit

620

00:24:16,190 --> 00:24:13,919

uh well so Dana can probably speak more

621

00:24:18,710 --> 00:24:16,200

to the like the setup of it I'll say if

622

00:24:21,529 --> 00:24:18,720

everything goes correctly then no that's

623

00:24:23,090 --> 00:24:21,539

not that's not required I'd say very

624

00:24:25,430 --> 00:24:23,100

much like all of our training at NASA or

625

00:24:27,950 --> 00:24:25,440

in the Department of Defense we train 99

626  
00:24:29,330 --> 00:24:27,960  
of our training is spent on the one

627  
00:24:30,529 --> 00:24:29,340  
percent thing that you hope never

628  
00:24:31,630 --> 00:24:30,539  
happens

629  
00:24:34,430 --> 00:24:31,640  
um so

630  
00:24:36,529 --> 00:24:34,440  
that yes if everything goes correctly no

631  
00:24:38,690 --> 00:24:36,539  
Dana can probably speak to like the demo

632  
00:24:40,250 --> 00:24:38,700  
too did do some manual flying yeah I

633  
00:24:41,750 --> 00:24:40,260  
would just say that you know one of the

634  
00:24:43,789 --> 00:24:41,760  
thing requirements that we had is to

635  
00:24:45,649 --> 00:24:43,799  
have this backup capability should the

636  
00:24:48,230 --> 00:24:45,659  
should you need that contingency where

637  
00:24:50,149 --> 00:24:48,240  
we would need to to manually fly but the

638  
00:24:52,310 --> 00:24:50,159

hope is is that it's all autonomous and

639

00:24:55,010 --> 00:24:52,320

that everything is working very smooth

640

00:24:56,630 --> 00:24:55,020

and operationally

641

00:24:57,590 --> 00:24:56,640

thank you both we actually have one

642

00:25:00,830 --> 00:24:57,600

question that we want to take from

643

00:25:03,230 --> 00:25:00,840

Twitter real quick for uh Dana today is

644

00:25:05,690 --> 00:25:03,240

introduce a girl to engineering day so

645

00:25:07,909 --> 00:25:05,700

that's a very important observance uh

646

00:25:10,370 --> 00:25:07,919

what do you love about being an engineer

647

00:25:12,110 --> 00:25:10,380

oh man there's so many things but

648

00:25:14,690 --> 00:25:12,120

um you know it was kind of a dream of

649

00:25:16,850 --> 00:25:14,700

mine when I was young uh I was always

650

00:25:18,230 --> 00:25:16,860

interested in science and math and I'm

651  
00:25:19,669 --> 00:25:18,240  
sorry for the teachers that are out

652  
00:25:21,950 --> 00:25:19,679  
there but I was not the best in the

653  
00:25:24,169 --> 00:25:21,960  
class I was not the the top of the class

654  
00:25:27,409 --> 00:25:24,179  
you know I was always loving the space

655  
00:25:29,690 --> 00:25:27,419  
or the science and math but I really got

656  
00:25:32,630 --> 00:25:29,700  
interested in in engineering after

657  
00:25:34,730 --> 00:25:32,640  
talking to some other women leaders and

658  
00:25:37,430 --> 00:25:34,740  
women Engineers too I had an assignment

659  
00:25:39,769 --> 00:25:37,440  
in high school to go and talk to some

660  
00:25:42,049 --> 00:25:39,779  
professional interests that you have and

661  
00:25:43,549 --> 00:25:42,059  
talk to some people I interviewed a

662  
00:25:45,470 --> 00:25:43,559  
couple of folks and three of them

663  
00:25:47,390 --> 00:25:45,480

happened to be women engineers and I

664

00:25:50,510 --> 00:25:47,400

decided pretty much that day that was

665

00:25:53,029 --> 00:25:50,520

what I wanted to go do so I went to a a

666

00:25:56,330 --> 00:25:53,039

college or university nearby my hometown

667

00:25:58,669 --> 00:25:56,340

at Georgia Tech and decided coming out

668

00:26:01,070 --> 00:25:58,679

of there that I wanted to combine my

669

00:26:03,409 --> 00:26:01,080

love of engineering and how how things

670

00:26:06,350 --> 00:26:03,419

work and understanding like the science

671

00:26:08,630 --> 00:26:06,360

behind how things work and combine that

672

00:26:10,909 --> 00:26:08,640

with my love of space and it up down

673

00:26:13,010 --> 00:26:10,919

here at Kennedy Space Center about 20

674

00:26:15,470 --> 00:26:13,020

years 22 years ago or so

675

00:26:17,330 --> 00:26:15,480

nice thank you so much Dana

676

00:26:18,470 --> 00:26:17,340

back to the room we have some here in

677

00:26:20,330 --> 00:26:18,480

the front

678

00:26:23,690 --> 00:26:20,340

hello my name is John Nubian from New

679

00:26:25,250 --> 00:26:23,700

York City a question for overall ISS and

680

00:26:27,289 --> 00:26:25,260

into the science what is the most

681

00:26:30,049 --> 00:26:27,299

significant experiment to come out of

682

00:26:32,510 --> 00:26:30,059

the ISS since it's been in orbit and for

683

00:26:34,970 --> 00:26:32,520

this launch or this Mission specifically

684

00:26:37,010 --> 00:26:34,980

besides the Eva experiment what other

685

00:26:40,250 --> 00:26:37,020

experiment is uh are you looking forward

686

00:26:45,470 --> 00:26:42,649

that's a tough question to answer not

687

00:26:47,330 --> 00:26:45,480

not because there isn't a lot of stuff

688

00:26:50,149 --> 00:26:47,340

that that has been very exciting but

689

00:26:53,990 --> 00:26:50,159

it's because of that uh we've had over 3

690

00:26:56,930 --> 00:26:54,000

500 investigations fly to the ISS and

691

00:26:59,210 --> 00:26:56,940

some of them have been really important

692

00:27:02,210 --> 00:26:59,220

for developing not only benefits for

693

00:27:04,850 --> 00:27:02,220

NASA to to continue our exploration

694

00:27:06,230 --> 00:27:04,860

Mission but to return benefits to the

695

00:27:08,870 --> 00:27:06,240

Earth and some of the ones you might

696

00:27:11,390 --> 00:27:08,880

have heard about recently are some

697

00:27:13,430 --> 00:27:11,400

protein crystallization experiments

698

00:27:17,230 --> 00:27:13,440

where we're looking at how to make

699

00:27:20,409 --> 00:27:17,240

infusions of a cancer drug keytruda

700

00:27:23,390 --> 00:27:20,419

which is normally given through infusion

701

00:27:26,990 --> 00:27:23,400

by making the particles more

702

00:27:28,970 --> 00:27:27,000

standardized and smaller we're trying to

703

00:27:31,850 --> 00:27:28,980

get to a method where you can give that

704

00:27:35,510 --> 00:27:31,860

by injection instead of a clinical

705

00:27:38,269 --> 00:27:35,520

setting that that takes time and is

706

00:27:39,950 --> 00:27:38,279

considerably more painful than an

707

00:27:42,289 --> 00:27:39,960

injection would be so we're trying to

708

00:27:44,450 --> 00:27:42,299

really really use the benefits of the

709

00:27:46,250 --> 00:27:44,460

microgravity environment to return

710

00:27:48,710 --> 00:27:46,260

benefits for people here on Earth

711

00:27:49,970 --> 00:27:48,720

there's a great publication that we just

712

00:27:53,930 --> 00:27:49,980

put out last year it's called the

713

00:27:56,630 --> 00:27:53,940

benefits of for Humanity 2022 and this

714

00:27:59,810 --> 00:27:56,640

highlights a lot of those stories about

715

00:28:03,710 --> 00:27:59,820

our research and how it returns benefits

716

00:28:07,010 --> 00:28:03,720

to the human population now we're doing

717

00:28:08,930 --> 00:28:07,020

some other great research on on this

718

00:28:11,990 --> 00:28:08,940

increment we've got an investigation

719

00:28:13,789 --> 00:28:12,000

going up called brick 26 and brick

720

00:28:15,409 --> 00:28:13,799

stands for biological research in

721

00:28:17,330 --> 00:28:15,419

canisters so when you think about it

722

00:28:19,730 --> 00:28:17,340

there are petri dishes but in these

723

00:28:22,870 --> 00:28:19,740

petri dishes we're putting up a

724

00:28:25,130 --> 00:28:22,880

bactillus subtilis

725

00:28:27,230 --> 00:28:25,140

microorganism and we're looking at it

726

00:28:30,169 --> 00:28:27,240

for some very very fundamental reasons

727

00:28:33,710 --> 00:28:30,179

we want to understand the the process

728

00:28:37,070 --> 00:28:33,720

behind DNA supercoiling and this is how

729

00:28:40,669 --> 00:28:37,080

dnas can really wound them while in

730

00:28:42,710 --> 00:28:40,679

themselves up tightly and more more

731

00:28:45,110 --> 00:28:42,720

efficiently pack themselves within a

732

00:28:48,289 --> 00:28:45,120

cell structure they can also get

733

00:28:50,450 --> 00:28:48,299

Negative supercoiling where they expand

734

00:28:53,210 --> 00:28:50,460

and get harder to pack so we're looking

735

00:28:55,549 --> 00:28:53,220

at the impact of microgravity on that

736

00:28:59,149 --> 00:28:55,559

feature so we can understand at a

737

00:29:01,450 --> 00:28:59,159

genetic level what's happening to our

738

00:29:04,070 --> 00:29:01,460

DNA in space flight

739

00:29:06,769 --> 00:29:04,080

and that is probably one of the most

740

00:29:08,570 --> 00:29:06,779

profound things that we found through

741

00:29:11,870 --> 00:29:08,580

years of space flight it's that

742

00:29:14,750 --> 00:29:11,880

microgravity in and of itself impacts

743

00:29:20,110 --> 00:29:14,760

every living organism on a cellular

744

00:29:23,810 --> 00:29:20,120

level so it is doing things the way we

745

00:29:26,510 --> 00:29:23,820

express genes changes our transcriptome

746

00:29:29,570 --> 00:29:26,520

exchange and that changes the overall

747

00:29:31,909 --> 00:29:29,580

organism now a lot of that as evidence

748

00:29:34,909 --> 00:29:31,919

shows is reversible but some of it we

749

00:29:39,169 --> 00:29:34,919

need to understand if it is a permanent

750

00:29:41,690 --> 00:29:39,179

what what that is doing to both our crew

751  
00:29:43,549 --> 00:29:41,700  
members and maybe their food sources so

752  
00:29:45,769 --> 00:29:43,559  
a lot of the plant research that we do

753  
00:29:48,169 --> 00:29:45,779  
there's an investigation called vegofi

754  
00:29:50,570 --> 00:29:48,179  
which is growing tomato plants is really

755  
00:29:52,669 --> 00:29:50,580  
how do we Supply our crew members with

756  
00:29:54,649 --> 00:29:52,679  
nutrients and are they as good as the

757  
00:29:56,690 --> 00:29:54,659  
Earth grown nutrients and can we use it

758  
00:29:58,370 --> 00:29:56,700  
to supplement diet for long duration

759  
00:29:59,990 --> 00:29:58,380  
exploration

760  
00:30:01,909 --> 00:30:00,000  
Patrick want to add anything from the

761  
00:30:02,990 --> 00:30:01,919  
National Life absolutely so uh you asked

762  
00:30:05,090 --> 00:30:03,000  
the perfect question because you

763  
00:30:06,529 --> 00:30:05,100

basically my entire cheat sheet is

764

00:30:08,510 --> 00:30:06,539

predicated on what it was that you just

765

00:30:09,769 --> 00:30:08,520

asked so thank you very much

766

00:30:11,450 --> 00:30:09,779

um yeah so from a National Lab

767

00:30:12,889 --> 00:30:11,460

perspective there's going to be a lot of

768

00:30:13,850 --> 00:30:12,899

Investigations that are flying over the

769

00:30:15,769 --> 00:30:13,860

next couple of months that the

770

00:30:17,570 --> 00:30:15,779

astronauts will be supporting

771

00:30:19,190 --> 00:30:17,580

um you you also asked too like you know

772

00:30:21,769 --> 00:30:19,200

what is one thing that really stands out

773

00:30:23,510 --> 00:30:21,779

uh a very long tenured project that has

774

00:30:25,789 --> 00:30:23,520

been happening for what 15 years I want

775

00:30:28,070 --> 00:30:25,799

to say is the Alpha Medic spectrometer

776

00:30:29,450 --> 00:30:28,080

or AMS so that's been going up for a

777

00:30:31,610 --> 00:30:29,460

very very long period of time so that's

778

00:30:33,710 --> 00:30:31,620

one example of a project that has a very

779

00:30:36,110 --> 00:30:33,720

long lifespan but projects will be

780

00:30:37,850 --> 00:30:36,120

flying during this increment uh anybody

781

00:30:40,490 --> 00:30:37,860

ever heard tissue chips

782

00:30:41,870 --> 00:30:40,500

so tissue chips oh I see Rachel in the

783

00:30:43,549 --> 00:30:41,880

background she was excited about that

784

00:30:45,110 --> 00:30:43,559

all right so tissue chips think of like

785

00:30:47,750 --> 00:30:45,120

a little thumb drive

786

00:30:48,710 --> 00:30:47,760

um it mimics the human physiology so

787

00:30:50,149 --> 00:30:48,720

you're basically having this little

788

00:30:52,430 --> 00:30:50,159

thumb drive where you can have human

789

00:30:53,690 --> 00:30:52,440

cells and tissues inside of them and

790

00:30:55,250 --> 00:30:53,700

you're going to be like floating around

791

00:30:57,950 --> 00:30:55,260

and thinking that you're in a normal

792

00:30:59,269 --> 00:30:57,960

human body and you're able to send this

793

00:31:01,190 --> 00:30:59,279

to the space station what's unique about

794

00:31:03,049 --> 00:31:01,200

this is that previously we've not really

795

00:31:05,510 --> 00:31:03,059

had an opportunity to do a lot of human

796

00:31:07,250 --> 00:31:05,520

testing of cells and tissues um the

797

00:31:09,549 --> 00:31:07,260

astronauts obviously a lot of things are

798

00:31:11,810 --> 00:31:09,559

done to ensure that their bodies are

799

00:31:13,669 --> 00:31:11,820

maintaining but that's not something

800

00:31:15,950 --> 00:31:13,679

that's open to the general population to

801  
00:31:17,389 --> 00:31:15,960  
leverage for investigative purposes so

802  
00:31:19,010 --> 00:31:17,399  
we were able to leverage these tissue

803  
00:31:20,630 --> 00:31:19,020  
chips by sending these human cells and

804  
00:31:22,730 --> 00:31:20,640  
tissues up so that that way we don't

805  
00:31:24,649 --> 00:31:22,740  
we're not Reliant upon model organisms

806  
00:31:26,570 --> 00:31:24,659  
or things of that nature but you're able

807  
00:31:28,070 --> 00:31:26,580  
to get that one-to-one comparison factor

808  
00:31:30,710 --> 00:31:28,080  
and possibly test things like

809  
00:31:33,470 --> 00:31:30,720  
Therapeutics or ways to mitigate

810  
00:31:34,669 --> 00:31:33,480  
elements like cardiac issues so on this

811  
00:31:36,110 --> 00:31:34,679  
Mission we will be having multiple

812  
00:31:37,669 --> 00:31:36,120  
tissue chip investigations that are

813  
00:31:38,870 --> 00:31:37,679

flying that are funded through one of

814

00:31:41,269 --> 00:31:38,880

the centers within the National

815

00:31:43,370 --> 00:31:41,279

Institutes of Health we also have a

816

00:31:44,690 --> 00:31:43,380

variety of Investigations that will be

817

00:31:46,490 --> 00:31:44,700

funded by the National Science

818

00:31:48,049 --> 00:31:46,500

Foundation looking at both tissue

819

00:31:50,389 --> 00:31:48,059

engineering as well as transport

820

00:31:51,350 --> 00:31:50,399

phenomena and physical sciences so it

821

00:31:55,130 --> 00:31:51,360

really demonstrates kind of that

822

00:31:56,210 --> 00:31:55,140

diversification of r d uh Dr Costello

823

00:31:57,169 --> 00:31:56,220

let's talk a little bit about some of

824

00:31:58,850 --> 00:31:57,179

the things that NASA is going to be

825

00:32:01,130 --> 00:31:58,860

focused on from an Eva perspective

826  
00:32:02,630 --> 00:32:01,140  
outside of the space station but we will

827  
00:32:04,190 --> 00:32:02,640  
also be sending a lot of payloads that

828  
00:32:06,110 --> 00:32:04,200  
will be leveraging this external

829  
00:32:07,909 --> 00:32:06,120  
platforms on stations where you will

830  
00:32:10,669 --> 00:32:07,919  
have extreme temperature variances

831  
00:32:14,810 --> 00:32:10,679  
Atomic oxygen spikes radiation spikes so

832  
00:32:16,789 --> 00:32:14,820  
you can truly put you know a material to

833  
00:32:19,250 --> 00:32:16,799  
the ultimate test and see how it reacts

834  
00:32:20,750 --> 00:32:19,260  
in that space environment and hopefully

835  
00:32:23,090 --> 00:32:20,760  
extrapolate that bring that down and

836  
00:32:26,330 --> 00:32:23,100  
create a better stronger product for for

837  
00:32:28,909 --> 00:32:26,340  
us here on Earth and then one of the

838  
00:32:29,810 --> 00:32:28,919

ones I think that it to me personally I

839

00:32:33,470 --> 00:32:29,820

think is almost kind of like the

840

00:32:35,450 --> 00:32:33,480

sci-fi-esque is we have a biofabrication

841

00:32:38,210 --> 00:32:35,460

facility on the space station so this is

842

00:32:40,010 --> 00:32:38,220

a bioprinter and the thought is that

843

00:32:41,990 --> 00:32:40,020

maybe that microgravity environment

844

00:32:45,230 --> 00:32:42,000

could help to allow for us to print

845

00:32:48,769 --> 00:32:45,240

things like tissues and and organs for

846

00:32:51,049 --> 00:32:48,779

they can be transported from space to

847

00:32:52,370 --> 00:32:51,059

patients here on Earth now that's way

848

00:32:55,250 --> 00:32:52,380

down the road and that's you know again

849

00:32:56,450 --> 00:32:55,260

uh an exciting opportunity for us but

850

00:32:58,850 --> 00:32:56,460

it's that notion again that this

851  
00:33:01,250 --> 00:32:58,860  
microgravity environment can really open

852  
00:33:03,169 --> 00:33:01,260  
up avenues for experimentation that just

853  
00:33:04,850 --> 00:33:03,179  
can't be replicated in the same manner

854  
00:33:06,830 --> 00:33:04,860  
here on Earth and I think that's you

855  
00:33:07,850 --> 00:33:06,840  
know a pretty quick little breakdown of

856  
00:33:09,289 --> 00:33:07,860  
some of the signs that's going to be

857  
00:33:10,549 --> 00:33:09,299  
flying from a National Lab perspective

858  
00:33:12,289 --> 00:33:10,559  
but again it's going to be a really

859  
00:33:14,210 --> 00:33:12,299  
action-packed couple of months and the

860  
00:33:15,769 --> 00:33:14,220  
astronaut's going to be very busy

861  
00:33:17,450 --> 00:33:15,779  
Kurt Patrick thank you so much for

862  
00:33:18,769 --> 00:33:17,460  
tagging me that question we do have one

863  
00:33:21,110 --> 00:33:18,779

that we want to take from Facebook right

864

00:33:23,450 --> 00:33:21,120

now uh Shannon on Facebook wants to know

865

00:33:25,070 --> 00:33:23,460

can you tell me more about Artemis and I

866

00:33:28,070 --> 00:33:25,080

think Bob will start with you on that

867

00:33:30,830 --> 00:33:28,080

one all right so uh as everybody knows

868

00:33:33,590 --> 00:33:30,840

Artemis is a twin sister of Apollo and

869

00:33:37,090 --> 00:33:33,600

uh I think it's a very apt name for our

870

00:33:39,230 --> 00:33:37,100

next venture off to the lunar surface

871

00:33:40,610 --> 00:33:39,240

and I think you know one of the most

872

00:33:42,889 --> 00:33:40,620

important things about the Artemis

873

00:33:45,590 --> 00:33:42,899

program is when you look back on Apollo

874

00:33:47,750 --> 00:33:45,600

in the 60s and 70s it was a bunch of

875

00:33:49,909 --> 00:33:47,760

white military test pilots with some

876

00:33:52,610 --> 00:33:49,919

white scientists male scientists thrown

877

00:33:54,710 --> 00:33:52,620

in at the end and when I look at the

878

00:33:56,690 --> 00:33:54,720

first class of shuttle astronauts if

879

00:33:58,370 --> 00:33:56,700

anybody asked me what's the major thing

880

00:33:59,810 --> 00:33:58,380

the shuttle contributed to our space

881

00:34:02,090 --> 00:33:59,820

program I tell them it brought diversity

882

00:34:04,009 --> 00:34:02,100

to America's Space Program like I said

883

00:34:07,430 --> 00:34:04,019

first class had men women black white

884

00:34:08,869 --> 00:34:07,440

asian Hispanic and we have continued to

885

00:34:10,609 --> 00:34:08,879

build on that and this time when we go

886

00:34:12,950 --> 00:34:10,619

to the Moon everybody is going to be

887

00:34:15,169 --> 00:34:12,960

able to see themselves in the cruise

888

00:34:16,970 --> 00:34:15,179

that go to the Moon and how

889

00:34:19,730 --> 00:34:16,980

inspirational is that going to be for

890

00:34:21,649 --> 00:34:19,740

young girls and minorities when they can

891

00:34:23,510 --> 00:34:21,659

see that hey you know I could do that

892

00:34:25,669 --> 00:34:23,520

and I think that's going to be really

893

00:34:29,030 --> 00:34:25,679

important so I think everybody knows

894

00:34:32,030 --> 00:34:29,040

Artemis one was uh our uncrewed uh

895

00:34:34,909 --> 00:34:32,040

demonstration uh we went further from

896

00:34:37,730 --> 00:34:34,919

Earth than any human rated capsule has

897

00:34:41,030 --> 00:34:37,740

ever gone before did that skip reentry

898

00:34:42,889 --> 00:34:41,040

and we're analyzing all the data it's

899

00:34:44,750 --> 00:34:42,899

two years between Artemis one and

900

00:34:46,250 --> 00:34:44,760

Artemis 2 and that's because the

901  
00:34:48,050 --> 00:34:46,260  
decisions that were made in the past we

902  
00:34:50,810 --> 00:34:48,060  
have to get the avionics boxes out of

903  
00:34:53,629 --> 00:34:50,820  
Artemis one disassemble it test them out

904  
00:34:55,609 --> 00:34:53,639  
and then install them in Artemis 2 for

905  
00:34:57,770 --> 00:34:55,619  
its crude flight to the moon and then

906  
00:35:00,470 --> 00:34:57,780  
following hopefully within a year after

907  
00:35:02,030 --> 00:35:00,480  
uh that Artemis 2 launch with a crew to

908  
00:35:04,970 --> 00:35:02,040  
the moon on a test flight testing out

909  
00:35:07,010 --> 00:35:04,980  
the Orion spacecraft without landing on

910  
00:35:09,230 --> 00:35:07,020  
the moon we will then land on the moon

911  
00:35:11,030 --> 00:35:09,240  
on the next flight and pick up a Cadence

912  
00:35:13,069 --> 00:35:11,040  
after that we'd like to fly once a year

913  
00:35:15,470 --> 00:35:13,079

but I think the the neat thing about the

914

00:35:17,030 --> 00:35:15,480

RMS program is we're not doing it like

915

00:35:18,530 --> 00:35:17,040

Apollo it's not a two or three day

916

00:35:21,770 --> 00:35:18,540

camping trip on the moon we're going

917

00:35:24,050 --> 00:35:21,780

back in a sustainable manner for as long

918

00:35:26,690 --> 00:35:24,060

as weeks at a time we're going to have

919

00:35:28,490 --> 00:35:26,700

pressurized habitats on the moon a

920

00:35:31,069 --> 00:35:28,500

pressurized Rover

921

00:35:32,990 --> 00:35:31,079

um you know the Gateway is going to be

922

00:35:34,730 --> 00:35:33,000

in orbit around the Moon allowing access

923

00:35:36,470 --> 00:35:34,740

anywhere on the lunar surface we're

924

00:35:38,210 --> 00:35:36,480

going to the South Pole of the Moon as

925

00:35:40,790 --> 00:35:38,220

opposed to the Equator the equator is

926  
00:35:42,470 --> 00:35:40,800  
much easier to get to but we want to go

927  
00:35:44,329 --> 00:35:42,480  
to the South Pole because we believe

928  
00:35:47,089 --> 00:35:44,339  
there are tons of water ice there and

929  
00:35:48,470 --> 00:35:47,099  
water is hydrogen and oxygen it's Fuel

930  
00:35:51,109 --> 00:35:48,480  
and air to breathe and we want to be

931  
00:35:52,670 --> 00:35:51,119  
able to use the resources on the moon as

932  
00:35:55,010 --> 00:35:52,680  
we explore the moon so we don't have to

933  
00:35:58,370 --> 00:35:55,020  
carry as much with us so we we have more

934  
00:36:00,770 --> 00:35:58,380  
up Mass available for other things

935  
00:36:02,990 --> 00:36:00,780  
and the reason for going to the Moon is

936  
00:36:04,910 --> 00:36:03,000  
eventually we want to go on to Mars all

937  
00:36:06,410 --> 00:36:04,920  
right and we're using the moon as a

938  
00:36:08,329 --> 00:36:06,420

training ground to learn how to operate

939

00:36:09,890 --> 00:36:08,339

away from planet Earth on for an

940

00:36:12,829 --> 00:36:09,900

extended period of time so that we're

941

00:36:14,390 --> 00:36:12,839

successful when we go on to Mars I have

942

00:36:17,450 --> 00:36:14,400

to give our Deputy Administrator Pam

943

00:36:19,130 --> 00:36:17,460

melroy credit for uh our objective-based

944

00:36:20,569 --> 00:36:19,140

architecture that she has put in place

945

00:36:22,069 --> 00:36:20,579

and we've gone out to Industry we've

946

00:36:23,589 --> 00:36:22,079

gone to International Partners we've

947

00:36:27,829 --> 00:36:23,599

shared this we've been working on this

948

00:36:29,750 --> 00:36:27,839

gym free and the exploration team we're

949

00:36:31,550 --> 00:36:29,760

down here at the Kennedy Space Center a

950

00:36:33,410 --> 00:36:31,560

few weeks ago with folks coming in to

951  
00:36:35,630 --> 00:36:33,420  
look at what what are the objectives and

952  
00:36:37,370 --> 00:36:35,640  
then what are the requirements to meet

953  
00:36:39,770 --> 00:36:37,380  
those objectives so we're laying this

954  
00:36:43,190 --> 00:36:39,780  
out in a very methodical way so that it

955  
00:36:45,950 --> 00:36:43,200  
is uh you know it it sustains itself as

956  
00:36:47,230 --> 00:36:45,960  
it moves forward so I I think it's going

957  
00:36:50,690 --> 00:36:47,240  
to be absolutely

958  
00:36:52,130 --> 00:36:50,700  
amazing to see us return to the Moon in

959  
00:36:54,410 --> 00:36:52,140  
a sustainable way and eventually going

960  
00:36:56,089 --> 00:36:54,420  
on to Mars establishing that presence in

961  
00:36:58,730 --> 00:36:56,099  
our solar system beyond our home planet

962  
00:37:01,010 --> 00:36:58,740  
but we are going to the Moon sooner than

963  
00:37:04,190 --> 00:37:01,020

and I think many of you have heard of

964

00:37:06,170 --> 00:37:04,200

the eclipse program uh commercial Leo

965

00:37:07,910 --> 00:37:06,180

and our commercial

966

00:37:10,790 --> 00:37:07,920

science going to the moon but these are

967

00:37:12,710 --> 00:37:10,800

commercial Landers that uh through space

968

00:37:15,530 --> 00:37:12,720

act agreements it was put out by the

969

00:37:18,770 --> 00:37:15,540

science Mission directorate and uh

970

00:37:20,510 --> 00:37:18,780

hopefully uh this year in within a few

971

00:37:22,250 --> 00:37:20,520

months I don't know who's going to be

972

00:37:25,430 --> 00:37:22,260

first but we have intuitive machines

973

00:37:27,530 --> 00:37:25,440

down in Houston in astrobotics up in

974

00:37:29,870 --> 00:37:27,540

Pittsburgh are both sending commercial

975

00:37:31,970 --> 00:37:29,880

Landers to the moon and NASA didn't pay

976  
00:37:34,550 --> 00:37:31,980  
for this whole mission all right they

977  
00:37:36,770 --> 00:37:34,560  
have skin in the game also and it's

978  
00:37:38,630 --> 00:37:36,780  
establishing this commercial exploration

979  
00:37:41,690 --> 00:37:38,640  
of the Moon also so you don't have to

980  
00:37:42,710 --> 00:37:41,700  
wait till uh you know 2024 for that next

981  
00:37:44,390 --> 00:37:42,720  
flight to the Moon we're going to be

982  
00:37:45,650 --> 00:37:44,400  
sending Landers to the Moon here this

983  
00:37:48,290 --> 00:37:45,660  
year and that's going to be pretty cool

984  
00:37:49,730 --> 00:37:48,300  
too yeah very exciting Bob does anybody

985  
00:37:51,829 --> 00:37:49,740  
want to add to that answer on can you

986  
00:37:55,010 --> 00:37:51,839  
tell me about Artemis hey you're gonna

987  
00:37:56,210 --> 00:37:55,020  
fly it well so I I guess my advice uh to

988  
00:37:57,170 --> 00:37:56,220

the parents is ask your kids about it

989

00:37:58,430 --> 00:37:57,180

was just like the same way you learn

990

00:37:59,750 --> 00:37:58,440

about dinosaurs ask your kids they

991

00:38:01,250 --> 00:37:59,760

probably already know the answers to to

992

00:38:03,170 --> 00:38:01,260

things about Artemis at least from when

993

00:38:05,089 --> 00:38:03,180

I go around to schools they are all over

994

00:38:06,170 --> 00:38:05,099

it um so the way I explain it to the

995

00:38:07,670 --> 00:38:06,180

adults who have to talk to the kids

996

00:38:09,170 --> 00:38:07,680

though is uh there's a few different

997

00:38:11,150 --> 00:38:09,180

parts there's to get to the moon you

998

00:38:12,829 --> 00:38:11,160

need a rocket right we got the SLS so we

999

00:38:14,150 --> 00:38:12,839

got that we need a capsule so people

1000

00:38:16,609 --> 00:38:14,160

have to go and then somewhere that's the

1001

00:38:18,650 --> 00:38:16,619

Orion uh you need somewhere to stay and

1002

00:38:20,810 --> 00:38:18,660

go up and down so that's the Gateway and

1003

00:38:22,310 --> 00:38:20,820

all those three things are being built I

1004

00:38:25,010 --> 00:38:22,320

mean it's not a PowerPoint thing like

1005

00:38:26,930 --> 00:38:25,020

there's heart like metal here at KSC

1006

00:38:28,490 --> 00:38:26,940

that is those things uh and then the

1007

00:38:29,930 --> 00:38:28,500

fourth is the hls the way to get from

1008

00:38:31,550 --> 00:38:29,940

the lunar orbit down to the surface and

1009

00:38:33,349 --> 00:38:31,560

right now we have one contract with

1010

00:38:35,270 --> 00:38:33,359

SpaceX and like criminal command said

1011

00:38:37,069 --> 00:38:35,280

there's other contracts ongoing so that

1012

00:38:39,650 --> 00:38:37,079

is the part so they it's not easy to go

1013

00:38:41,810 --> 00:38:39,660

the Moon by any means it's it's hard but

1014

00:38:43,490 --> 00:38:41,820

the tech is all there it's just the time

1015

00:38:45,650 --> 00:38:43,500

and the money and the national world to

1016

00:38:48,109 --> 00:38:45,660

do it and I mean yeah we're excited

1017

00:38:49,550 --> 00:38:48,119

we're ready to go but and we are going

1018

00:38:52,069 --> 00:38:49,560

um it's pretty cool to see Hardware

1019

00:38:54,050 --> 00:38:52,079

getting built tested the momentum is

1020

00:38:55,370 --> 00:38:54,060

there so yeah if you've got more

1021

00:38:57,050 --> 00:38:55,380

questions ask your kids I bet you they

1022

00:38:58,550 --> 00:38:57,060

know

1023

00:38:59,630 --> 00:38:58,560

the much Raja

1024

00:39:03,230 --> 00:38:59,640

all right we've got some more questions

1025

00:39:08,030 --> 00:39:05,870

hi I'm Mario Puzo coming from Los

1026

00:39:11,089 --> 00:39:08,040

Angeles California

1027

00:39:13,910 --> 00:39:11,099

um I'm really curious how is the Sleep

1028

00:39:15,950 --> 00:39:13,920

experience while you're out in space and

1029

00:39:18,170 --> 00:39:15,960

what are your dreams like is there

1030

00:39:20,270 --> 00:39:18,180

anything special that you can share with

1031

00:39:22,670 --> 00:39:20,280

us

1032

00:39:24,589 --> 00:39:22,680

sure I'll talk about so I think the

1033

00:39:25,730 --> 00:39:24,599

first sensation to kind of work through

1034

00:39:27,230 --> 00:39:25,740

and it's a little bit different for

1035

00:39:28,550 --> 00:39:27,240

everyone everyone sleeps a little bit

1036

00:39:29,990 --> 00:39:28,560

restrains itself a little differently

1037

00:39:31,550 --> 00:39:30,000

but I'm sure you've all had that feeling

1038

00:39:33,410 --> 00:39:31,560

when you start to fall asleep at night

1039

00:39:34,550 --> 00:39:33,420

and if your arm goes off the corner of

1040

00:39:37,250 --> 00:39:34,560

the bed or something like that and you

1041

00:39:38,630 --> 00:39:37,260

like startle up and you probably all had

1042

00:39:40,069 --> 00:39:38,640

the experience of being in a roller

1043

00:39:42,170 --> 00:39:40,079

coaster and the feeling of your stomach

1044

00:39:43,370 --> 00:39:42,180

coming up so you have that I mean you

1045

00:39:44,690 --> 00:39:43,380

are in free fall when you're in space

1046

00:39:46,609 --> 00:39:44,700

and so as soon as you close your eyes

1047

00:39:47,870 --> 00:39:46,619

you snap back awake because your body is

1048

00:39:50,089 --> 00:39:47,880

telling you you're falling so it's

1049

00:39:52,010 --> 00:39:50,099

really hard for your brain to ignore

1050

00:39:53,630 --> 00:39:52,020

that because if you're in if you were to

1051  
00:39:55,490 --> 00:39:53,640  
be falling like walking forward and

1052  
00:39:57,410 --> 00:39:55,500  
falling you couldn't fall asleep while

1053  
00:39:58,790 --> 00:39:57,420  
you're falling it's just your brain

1054  
00:40:00,530 --> 00:39:58,800  
won't allow that to happen you'll wake

1055  
00:40:01,910 --> 00:40:00,540  
up before you hit the ground so if it

1056  
00:40:04,490 --> 00:40:01,920  
takes different people different times

1057  
00:40:07,250 --> 00:40:04,500  
but for me about two-ish days to

1058  
00:40:09,530 --> 00:40:07,260  
actually get over that feeling and be

1059  
00:40:12,109 --> 00:40:09,540  
able to close my eyes and not have my

1060  
00:40:14,510 --> 00:40:12,119  
brain kick yourself back awake in terms

1061  
00:40:16,250 --> 00:40:14,520  
of dreams I don't honestly remember any

1062  
00:40:17,569 --> 00:40:16,260  
significant changes but I do I do

1063  
00:40:19,430 --> 00:40:17,579

distinctly remember both on the way up

1064

00:40:22,190 --> 00:40:19,440

and the way down the first time on the

1065

00:40:24,290 --> 00:40:22,200

way up uh so on uh on orbit I think it

1066

00:40:25,490 --> 00:40:24,300

was like three or four weeks in was the

1067

00:40:27,530 --> 00:40:25,500

first time I had a dream where I was

1068

00:40:30,290 --> 00:40:27,540

floating in the dream and that next day

1069

00:40:31,970 --> 00:40:30,300

was the first time that as much as as

1070

00:40:33,290 --> 00:40:31,980

much as you know you can use the walls

1071

00:40:36,349 --> 00:40:33,300

in the ceiling in space you'll always

1072

00:40:39,050 --> 00:40:36,359

reorient your body for conversations and

1073

00:40:40,670 --> 00:40:39,060

to talk to work in the way that it looks

1074

00:40:42,170 --> 00:40:40,680

like on the ground because the laptops

1075

00:40:44,089 --> 00:40:42,180

and the equipment is oriented certain

1076

00:40:45,349 --> 00:40:44,099

direction but after that time it didn't

1077

00:40:47,690 --> 00:40:45,359

matter and I could come around the

1078

00:40:49,970 --> 00:40:47,700

corner it didn't matter it was and all

1079

00:40:51,650 --> 00:40:49,980

of a sudden like you notice little

1080

00:40:53,390 --> 00:40:51,660

things like the first few weeks the

1081

00:40:54,950 --> 00:40:53,400

ground is always absolutely uh did you

1082

00:40:56,089 --> 00:40:54,960

you know did you power off that payload

1083

00:40:57,530 --> 00:40:56,099

and that's their gentle way of saying

1084

00:40:59,510 --> 00:40:57,540

hey idiot you like I kicked it with your

1085

00:41:01,310 --> 00:40:59,520

foot because we're just like tearing

1086

00:41:03,829 --> 00:41:01,320

through ethernet cables and bumping into

1087

00:41:05,510 --> 00:41:03,839

things but after that after that three

1088

00:41:07,069 --> 00:41:05,520

weeks once that clicked it was like oh

1089

00:41:08,750 --> 00:41:07,079

everything makes sense and you just

1090

00:41:09,890 --> 00:41:08,760

notice like just floating through you

1091

00:41:10,970 --> 00:41:09,900

just see something just like you can now

1092

00:41:12,349 --> 00:41:10,980

in your house like right away you're

1093

00:41:13,670 --> 00:41:12,359

like that's out of place

1094

00:41:16,010 --> 00:41:13,680

um and that was when I had that dream on

1095

00:41:18,410 --> 00:41:16,020

the way on after I landed the first time

1096

00:41:19,730 --> 00:41:18,420

I was um I got up in the middle of the

1097

00:41:21,109 --> 00:41:19,740

night like that it was like 10 hours

1098

00:41:23,089 --> 00:41:21,119

after we landed and even though the

1099

00:41:24,589 --> 00:41:23,099

chair was on the ground I could not

1100

00:41:25,970 --> 00:41:24,599

convince myself this was dark in the

1101  
00:41:27,770 --> 00:41:25,980  
room wearing crew quarters that I was

1102  
00:41:29,990 --> 00:41:27,780  
not standing on the wall like I actually

1103  
00:41:31,609 --> 00:41:30,000  
had to have my wife like come like like

1104  
00:41:33,890 --> 00:41:31,619  
help me get off the ground because I

1105  
00:41:35,750 --> 00:41:33,900  
couldn't I was convinced I was gonna

1106  
00:41:37,130 --> 00:41:35,760  
fall over because I was on the wall

1107  
00:41:38,270 --> 00:41:37,140  
obviously I was not on the wall I was

1108  
00:41:40,550 --> 00:41:38,280  
the chair I was doing this with a chair

1109  
00:41:42,530 --> 00:41:40,560  
but I couldn't connect and then about

1110  
00:41:45,349 --> 00:41:42,540  
the first good sleep I had that wasn't

1111  
00:41:46,670 --> 00:41:45,359  
ambient induced after landing I had a

1112  
00:41:48,170 --> 00:41:46,680  
dream where I was talking to people in

1113  
00:41:49,609 --> 00:41:48,180

the pmm and they were floating but I was

1114

00:41:51,290 --> 00:41:49,619

standing on the ground in the pmm and

1115

00:41:53,750 --> 00:41:51,300

when I woke up from that everything was

1116

00:41:56,569 --> 00:41:53,760

fine like totally back to normal so it's

1117

00:41:58,190 --> 00:41:56,579

amazing what your brain does and we talk

1118

00:41:59,510 --> 00:41:58,200

about you're like a baby in space you

1119

00:42:00,650 --> 00:41:59,520

can't eat on your own you can't poop or

1120

00:42:01,849 --> 00:42:00,660

pee on your own you really can't do

1121

00:42:03,530 --> 00:42:01,859

anything on your own much like a baby

1122

00:42:05,329 --> 00:42:03,540

and just like a baby all you want to do

1123

00:42:06,770 --> 00:42:05,339

is sleep because your brain is doing a

1124

00:42:07,849 --> 00:42:06,780

whole bunch of rewickering in the

1125

00:42:09,710 --> 00:42:07,859

background which is actually one of the

1126  
00:42:11,329 --> 00:42:09,720  
things we study with some of the grasp

1127  
00:42:13,670 --> 00:42:11,339  
experiments and some stuff for sensory

1128  
00:42:16,550 --> 00:42:13,680  
deprivation so it's pretty cool how your

1129  
00:42:18,829 --> 00:42:16,560  
brain rewires itself and it takes effort

1130  
00:42:20,569 --> 00:42:18,839  
and energy for it to do that but yeah

1131  
00:42:22,430 --> 00:42:20,579  
everyone and then once you do adjust the

1132  
00:42:24,109 --> 00:42:22,440  
sleeping some people like to be bungeed

1133  
00:42:25,130 --> 00:42:24,119  
in some people like to free float I

1134  
00:42:27,530 --> 00:42:25,140  
don't I mean I know on the shuttle

1135  
00:42:28,910 --> 00:42:27,540  
different people did different things so

1136  
00:42:30,410 --> 00:42:28,920  
that's kind of personal preference but

1137  
00:42:32,089 --> 00:42:30,420  
it's the best sleep I've had in my life

1138  
00:42:33,109 --> 00:42:32,099

I have three young kids so no one's

1139

00:42:36,890 --> 00:42:33,119

waking me up in the middle of the night

1140

00:42:41,569 --> 00:42:40,130

I didn't have any problems sleeping but

1141

00:42:44,329 --> 00:42:41,579

but I found out I didn't need to sleep

1142

00:42:47,810 --> 00:42:44,339

as much uh it I don't know maybe it

1143

00:42:49,910 --> 00:42:47,820

wasn't we were really busy but the uh I

1144

00:42:51,410 --> 00:42:49,920

will go along with uh what you're saying

1145

00:42:52,910 --> 00:42:51,420

about you can really tell first-time

1146

00:42:54,829 --> 00:42:52,920

flyers from folks that have flown more

1147

00:42:57,589 --> 00:42:54,839

than once in the experience

1148

00:42:59,450 --> 00:42:57,599

um I remember on you know my last flight

1149

00:43:01,069 --> 00:42:59,460

Sergey krikolov who had been a year for

1150

00:43:02,870 --> 00:43:01,079

a space he was like it was like poetry

1151  
00:43:05,870 --> 00:43:02,880  
in motion watching him move through the

1152  
00:43:07,910 --> 00:43:05,880  
vehicle in a on a previous flight I had

1153  
00:43:09,349 --> 00:43:07,920  
a newbie that flew with us and it was

1154  
00:43:11,270 --> 00:43:09,359  
like they were bouncing off the walls

1155  
00:43:15,290 --> 00:43:11,280  
the whole time even after two weeks they

1156  
00:43:17,630 --> 00:43:15,300  
hadn't adapted to uh to zero g the

1157  
00:43:20,150 --> 00:43:17,640  
interesting thing is the physiological

1158  
00:43:22,849 --> 00:43:20,160  
aspects that Raj was talking about you

1159  
00:43:25,550 --> 00:43:22,859  
know you it takes time to adapt to zero

1160  
00:43:29,030 --> 00:43:25,560  
g and a time to adapt to 1G coming back

1161  
00:43:31,550 --> 00:43:29,040  
but with each flight you learn your

1162  
00:43:32,930 --> 00:43:31,560  
brain remembers and I'll never forget my

1163  
00:43:34,970 --> 00:43:32,940

you know my second plate once we got to

1164

00:43:38,270 --> 00:43:34,980

zero g it was like hey I'm here I'm back

1165

00:43:42,170 --> 00:43:38,280

it's it's amazing so you adapt quicker

1166

00:43:44,690 --> 00:43:42,180

each time to both zero g and 1G with the

1167

00:43:46,790 --> 00:43:44,700

number of flights I I never had any

1168

00:43:48,290 --> 00:43:46,800

weird dreams but uh something that's

1169

00:43:50,030 --> 00:43:48,300

really cool is

1170

00:43:52,250 --> 00:43:50,040

especially on a high inclination flight

1171

00:43:53,210 --> 00:43:52,260

you're it's all dark and you're sleeping

1172

00:43:54,589 --> 00:43:53,220

at night and all of a sudden one of

1173

00:43:56,150 --> 00:43:54,599

these high energy particles hits your

1174

00:43:58,250 --> 00:43:56,160

retina and you get this Flash in your

1175

00:43:59,450 --> 00:43:58,260

eye from uh yeah so that's kind of

1176

00:44:01,130 --> 00:43:59,460

interesting but also depressing it's

1177

00:44:04,849 --> 00:44:01,140

like that's by Cordia getting bombarded

1178

00:44:08,569 --> 00:44:07,250

oh and the Raja Bob thank you so much

1179

00:44:10,670 --> 00:44:08,579

that was those are very entertaining

1180

00:44:12,950 --> 00:44:10,680

answers so we appreciate it um we have

1181

00:44:14,930 --> 00:44:12,960

another one from Twitter for Dana how

1182

00:44:16,910 --> 00:44:14,940

has adding commercial Partners changed

1183

00:44:17,809 --> 00:44:16,920

the way NASA sends crew to the space

1184

00:44:20,690 --> 00:44:17,819

station

1185

00:44:23,270 --> 00:44:20,700

oh that's a really good question so um

1186

00:44:25,309 --> 00:44:23,280

by using these commercial Partners you

1187

00:44:27,170 --> 00:44:25,319

know I I like to step back and think

1188

00:44:30,530 --> 00:44:27,180

about commercial crew program has paved

1189

00:44:32,150 --> 00:44:30,540

the way for NASA we have Partnerships

1190

00:44:35,089 --> 00:44:32,160

um all over the place we work with our

1191

00:44:38,630 --> 00:44:35,099

internet with our partners among NASA we

1192

00:44:41,630 --> 00:44:38,640

work with Partners outside of NASA with

1193

00:44:44,089 --> 00:44:41,640

um specifically Boeing and SpaceX who

1194

00:44:46,250 --> 00:44:44,099

we've selected to provide these crew

1195

00:44:47,750 --> 00:44:46,260

transportation systems for our

1196

00:44:50,329 --> 00:44:47,760

astronauts to be able to fly up to the

1197

00:44:54,230 --> 00:44:50,339

International Space Station and we also

1198

00:44:56,329 --> 00:44:54,240

have Partnerships with DOD and other

1199

00:44:58,250 --> 00:44:56,339

entities FAA as well so we've kind of

1200

00:45:01,190 --> 00:44:58,260

paved the way for NASA to be able to do

1201  
00:45:03,230 --> 00:45:01,200  
a lot of these commercial work with the

1202  
00:45:05,569 --> 00:45:03,240  
commercial industry and what that's

1203  
00:45:06,770 --> 00:45:05,579  
really done for us too is as we talk

1204  
00:45:08,030 --> 00:45:06,780  
about all the science and the

1205  
00:45:09,470 --> 00:45:08,040  
experiments and everything that we've

1206  
00:45:13,010 --> 00:45:09,480  
we're learning on the International

1207  
00:45:14,930 --> 00:45:13,020  
Space Station we're allowing NASA to

1208  
00:45:16,730 --> 00:45:14,940  
also specialize and look at going Beyond

1209  
00:45:18,349 --> 00:45:16,740  
and all of the Artemis program and

1210  
00:45:20,569 --> 00:45:18,359  
everything that Bob talked about out as

1211  
00:45:22,730 --> 00:45:20,579  
well so it's it's really cool that we're

1212  
00:45:25,670 --> 00:45:22,740  
able to partner with these commercial

1213  
00:45:27,890 --> 00:45:25,680

entities providing this this cost

1214

00:45:29,390 --> 00:45:27,900

efficient mechanism for us to be able to

1215

00:45:31,790 --> 00:45:29,400

get our astronauts up to the

1216

00:45:34,970 --> 00:45:31,800

International Space Station it's um it's

1217

00:45:37,910 --> 00:45:34,980

been a a been a fun trial I think for us

1218

00:45:40,730 --> 00:45:37,920

at Nasa I think it's also paved the way

1219

00:45:42,890 --> 00:45:40,740

for other programs that we've also

1220

00:45:44,569 --> 00:45:42,900

mentioned his and some others that are

1221

00:45:47,329 --> 00:45:44,579

also going the commercial route as well

1222

00:45:49,670 --> 00:45:47,339

so it's a different it's a new paradigm

1223

00:45:51,410 --> 00:45:49,680

for NASA to partner with these

1224

00:45:53,870 --> 00:45:51,420

commercial industry but it's allowing

1225

00:45:55,730 --> 00:45:53,880

NASA to use our expertise and go further

1226  
00:45:56,569 --> 00:45:55,740  
and go beyond to go to Moon Mars and

1227  
00:45:58,490 --> 00:45:56,579  
Beyond

1228  
00:46:01,370 --> 00:45:58,500  
so if I could add to that Dana so it

1229  
00:46:02,990 --> 00:46:01,380  
allows NASA to actually focus on

1230  
00:46:04,910 --> 00:46:03,000  
exploration because we're not paying so

1231  
00:46:07,130 --> 00:46:04,920  
much getting back and forth to the space

1232  
00:46:10,130 --> 00:46:07,140  
station something else it's done is it's

1233  
00:46:12,349 --> 00:46:10,140  
opened up commercial space and I think

1234  
00:46:14,690 --> 00:46:12,359  
you're familiar with the commercial Leo

1235  
00:46:15,829 --> 00:46:14,700  
destinations program eventually the ISS

1236  
00:46:18,290 --> 00:46:15,839  
is going to end and we're going until

1237  
00:46:19,790 --> 00:46:18,300  
2030. so we got a lot of time left to

1238  
00:46:22,069 --> 00:46:19,800

keep sending Crews up and doing science

1239

00:46:24,290 --> 00:46:22,079

but we want to be able to transition to

1240

00:46:26,329 --> 00:46:24,300

commercial space stations where we are

1241

00:46:28,250 --> 00:46:26,339

one of many uh customers and we're not

1242

00:46:29,630 --> 00:46:28,260

paying for the whole thing again so we

1243

00:46:33,290 --> 00:46:29,640

can focus that funding on the

1244

00:46:34,730 --> 00:46:33,300

exploration part along with that you've

1245

00:46:36,410 --> 00:46:34,740

probably noticed the private astronaut

1246

00:46:37,930 --> 00:46:36,420

missions we flew one we're getting ready

1247

00:46:40,309 --> 00:46:37,940

to fly another

1248

00:46:44,329 --> 00:46:40,319

SpaceX has flown the inspiration Mission

1249

00:46:46,089 --> 00:46:44,339

separate from a NASA Mission at all not

1250

00:46:48,890 --> 00:46:46,099

going to the International Space Station

1251  
00:46:50,390 --> 00:46:48,900  
and hopefully we'll have you know there

1252  
00:46:53,450 --> 00:46:50,400  
are three companies right now looking at

1253  
00:46:56,089 --> 00:46:53,460  
building a uh a commercial space station

1254  
00:46:57,770 --> 00:46:56,099  
much smaller but we're learning

1255  
00:47:00,109 --> 00:46:57,780  
utilizing in the International Space

1256  
00:47:02,690 --> 00:47:00,119  
Station on how we're going to be able to

1257  
00:47:05,870 --> 00:47:02,700  
transition in having private astronauts

1258  
00:47:07,670 --> 00:47:05,880  
going to a commercial destination also

1259  
00:47:10,490 --> 00:47:07,680  
so hugely important what we're doing

1260  
00:47:12,829 --> 00:47:10,500  
right now on ISS to help enable that

1261  
00:47:14,390 --> 00:47:12,839  
I would add one more thing too is you

1262  
00:47:16,970 --> 00:47:14,400  
know the cool thing about this is

1263  
00:47:19,010 --> 00:47:16,980

because NASA is helping certify these

1264

00:47:20,990 --> 00:47:19,020

Transportation Systems it allows

1265

00:47:22,849 --> 00:47:21,000

opportunities like any of you in the

1266

00:47:25,670 --> 00:47:22,859

room too to be able to go and fly in

1267

00:47:26,990 --> 00:47:25,680

space and these commercial systems that

1268

00:47:28,550 --> 00:47:27,000

are being available or they're available

1269

00:47:30,530 --> 00:47:28,560

could be available for our kids our

1270

00:47:32,150 --> 00:47:30,540

grandkids and any of you in the room

1271

00:47:35,089 --> 00:47:32,160

here too so I think it's a really cool

1272

00:47:36,890 --> 00:47:35,099

opportunity to make space Transportation

1273

00:47:38,870 --> 00:47:36,900

available to everyone

1274

00:47:39,829 --> 00:47:38,880

thank you Dana and and Bob I'm glad that

1275

00:47:41,930 --> 00:47:39,839

you actually mentioned that we're

1276  
00:47:43,670 --> 00:47:41,940  
opening up space for everyone we have

1277  
00:47:45,890 --> 00:47:43,680  
one from Jake on Twitter and I'm not

1278  
00:47:47,630 --> 00:47:45,900  
sure who he's directing this at so feel

1279  
00:47:49,550 --> 00:47:47,640  
free to take that as you will can you

1280  
00:47:51,290 --> 00:47:49,560  
take me with you I need a few days off

1281  
00:47:57,650 --> 00:47:51,300  
the Earth

1282  
00:48:01,670 --> 00:47:59,030  
like Dana since she just said they could

1283  
00:48:02,270 --> 00:48:01,680  
fly on this space right

1284  
00:48:04,250 --> 00:48:02,280  
um

1285  
00:48:07,309 --> 00:48:04,260  
uh yeah I guess uh

1286  
00:48:08,510 --> 00:48:07,319  
take those take him with us um if if the

1287  
00:48:09,890 --> 00:48:08,520  
answer is like try to strap him into

1288  
00:48:11,630 --> 00:48:09,900

crew six that might be tough to get on

1289

00:48:14,270 --> 00:48:11,640

the Manifest but uh just figuratively

1290

00:48:16,250 --> 00:48:14,280

speaking I guess uh it's you know I

1291

00:48:19,010 --> 00:48:16,260

think the the what struck me on the

1292

00:48:21,829 --> 00:48:19,020

first uh like the first few days

1293

00:48:25,430 --> 00:48:21,839

um is just the fun of being in the Space

1294

00:48:27,410 --> 00:48:25,440

Capsule so I I actually enjoyed being in

1295

00:48:28,430 --> 00:48:27,420

the Dragon for I would have loved to be

1296

00:48:30,410 --> 00:48:28,440

in there another day or two because

1297

00:48:33,530 --> 00:48:30,420

you've trained so much in it that it

1298

00:48:34,670 --> 00:48:33,540

really becomes uh like you're like your

1299

00:48:36,109 --> 00:48:34,680

home like your room it's a very

1300

00:48:38,030 --> 00:48:36,119

comfortable place it's kind of cool to

1301  
00:48:39,650 --> 00:48:38,040  
hear the valves like when before there's

1302  
00:48:41,329 --> 00:48:39,660  
a burn you'll hear the prop starting to

1303  
00:48:43,190 --> 00:48:41,339  
flow you can hear the valve cycle you

1304  
00:48:44,990 --> 00:48:43,200  
can see the plasma arcs out the front

1305  
00:48:46,370 --> 00:48:45,000  
window it's a it was a very cool thing I

1306  
00:48:48,470 --> 00:48:46,380  
think the most surreal thing for us as a

1307  
00:48:50,030 --> 00:48:48,480  
crew was we saw uh we picked up a tally

1308  
00:48:52,250 --> 00:48:50,040  
on the space station about 40 kilometers

1309  
00:48:53,630 --> 00:48:52,260  
as we I have we happen to know us in the

1310  
00:48:55,730 --> 00:48:53,640  
in one of the displays that should be

1311  
00:48:57,290 --> 00:48:55,740  
out the window and it was 40 kilometers

1312  
00:48:59,270 --> 00:48:57,300  
away which you normally can't see on the

1313  
00:49:00,890 --> 00:48:59,280

ground but it was backlit by the sun and

1314

00:49:02,750 --> 00:49:00,900

it looked like a like a golden Christmas

1315

00:49:03,890 --> 00:49:02,760

ornament just hanging out that it was so

1316

00:49:05,030 --> 00:49:03,900

cool like that's that's where we're

1317

00:49:06,710 --> 00:49:05,040

gonna go

1318

00:49:08,210 --> 00:49:06,720

um and then I think the next big thing

1319

00:49:11,870 --> 00:49:08,220

is when you get onto the space station

1320

00:49:13,430 --> 00:49:11,880

it is visually overwise it it's not huge

1321

00:49:14,809 --> 00:49:13,440

if you had a house that big you'd

1322

00:49:17,270 --> 00:49:14,819

probably be unimpressed or like that's

1323

00:49:18,650 --> 00:49:17,280

not so cool but in when you're in a

1324

00:49:21,609 --> 00:49:18,660

capsule and then you go from the capsule

1325

00:49:24,190 --> 00:49:21,619

to this house and you can use all four

1326

00:49:26,630 --> 00:49:24,200

walls that's what's really like

1327

00:49:28,849 --> 00:49:26,640

mind-boggling it just is very visually

1328

00:49:30,589 --> 00:49:28,859

and a very visceral emotion like holy

1329

00:49:32,750 --> 00:49:30,599

cowlick this is this is enormous and

1330

00:49:36,530 --> 00:49:32,760

just trying to take that all in but just

1331

00:49:37,910 --> 00:49:36,540

a sense of yeah this pure joy and and

1332

00:49:39,650 --> 00:49:37,920

awe like Kayla wouldn't mind me sharing

1333

00:49:42,230 --> 00:49:39,660

this but she talks about it liftoff just

1334

00:49:45,290 --> 00:49:42,240

like a single tier of Joy like just the

1335

00:49:47,930 --> 00:49:45,300

most unfiltered raw emotion of like this

1336

00:49:49,190 --> 00:49:47,940

is so yeah it's hard to describe but

1337

00:49:50,329 --> 00:49:49,200

such an amazing thing and then I think

1338

00:49:52,130 --> 00:49:50,339

seeing the Earth

1339

00:49:53,150 --> 00:49:52,140

yeah people talk about the overview

1340

00:49:53,990 --> 00:49:53,160

effect or whatever you want to call it

1341

00:49:57,170 --> 00:49:54,000

but there's

1342

00:49:58,490 --> 00:49:57,180

it's yeah I I to Dana's point I I in all

1343

00:49:59,569 --> 00:49:58,500

searches like it'll be great the more

1344

00:50:01,730 --> 00:49:59,579

people that can go up there the better

1345

00:50:03,170 --> 00:50:01,740

because you can whatever you take away

1346

00:50:04,430 --> 00:50:03,180

from that experience it's it's goodness

1347

00:50:05,930 --> 00:50:04,440

whether it's realizing there's no

1348

00:50:07,910 --> 00:50:05,940

borders whether you realize how fragile

1349

00:50:10,609 --> 00:50:07,920

the Earth is there's so many conclusions

1350

00:50:11,809 --> 00:50:10,619

but having seeing that I mean that's why

1351  
00:50:14,390 --> 00:50:11,819  
we do human space flight there's

1352  
00:50:16,430 --> 00:50:14,400  
something you cannot do without your

1353  
00:50:18,589 --> 00:50:16,440  
brain and and seeing it and processing

1354  
00:50:20,510 --> 00:50:18,599  
it so I got to jump on that when you

1355  
00:50:24,349 --> 00:50:20,520  
talked about the joy I wish I could take

1356  
00:50:26,329 --> 00:50:24,359  
a five-year-old with me uh you know time

1357  
00:50:28,730 --> 00:50:26,339  
on orbit is extremely expensive it's

1358  
00:50:30,290 --> 00:50:28,740  
very busy and what I used to tell

1359  
00:50:32,150 --> 00:50:30,300  
first-time Flyers is at some point

1360  
00:50:33,770 --> 00:50:32,160  
during the mission stick your nose up to

1361  
00:50:36,109 --> 00:50:33,780  
the window and make a memory because

1362  
00:50:37,550 --> 00:50:36,119  
it's so much better than anything no

1363  
00:50:39,109 --> 00:50:37,560

picture does it justice it's like going

1364

00:50:40,190 --> 00:50:39,119

to the Grand Canyon it looks awesome and

1365

00:50:42,349 --> 00:50:40,200

you take a picture and say it didn't

1366

00:50:45,050 --> 00:50:42,359

look like that and it's the same with

1367

00:50:46,609 --> 00:50:45,060

space even even an IMAX film is not the

1368

00:50:50,390 --> 00:50:46,619

same as is what you see with the eyes

1369

00:50:52,370 --> 00:50:50,400

God gave you but uh it's it's very

1370

00:50:54,950 --> 00:50:52,380

expensive but then there's time to have

1371

00:50:57,349 --> 00:50:54,960

fun too and do stupid ass not tricks and

1372

00:51:00,230 --> 00:50:57,359

you can be the best gymnast in the world

1373

00:51:02,630 --> 00:51:00,240

in a in a microgravity environment and

1374

00:51:04,609 --> 00:51:02,640

it's just uh there's it's pretty cool

1375

00:51:06,650 --> 00:51:04,619

it's it's a lot of fun it's a lot of

1376

00:51:08,089 --> 00:51:06,660

hard work but it's a lot of fun too it's

1377

00:51:09,650 --> 00:51:08,099

funny you said that so we actually have

1378

00:51:10,849 --> 00:51:09,660

that exact conversation with the Axiom

1379

00:51:12,290 --> 00:51:10,859

one occur so we're talking about private

1380

00:51:13,430 --> 00:51:12,300

Crews because they were taking a lot of

1381

00:51:15,470 --> 00:51:13,440

pictures and we said the exact same

1382

00:51:18,049 --> 00:51:15,480

thing put the camera down and just look

1383

00:51:20,930 --> 00:51:18,059

just look outside just like

1384

00:51:22,970 --> 00:51:20,940

and you're it just because you can't and

1385

00:51:25,609 --> 00:51:22,980

that Kubla I mean these guys had that

1386

00:51:27,230 --> 00:51:25,619

cupola you know uh to be able to just

1387

00:51:28,910 --> 00:51:27,240

sit in there and have all that looking

1388

00:51:30,770 --> 00:51:28,920

out is pretty awesome

1389

00:51:32,690 --> 00:51:30,780

if I could let me let me offer a

1390

00:51:34,849 --> 00:51:32,700

different aspect of answering this

1391

00:51:37,250 --> 00:51:34,859

question too because obviously we can't

1392

00:51:40,970 --> 00:51:37,260

take everybody along with us it's it's a

1393

00:51:43,250 --> 00:51:40,980

very limited resources but NASA is open

1394

00:51:47,150 --> 00:51:43,260

about not only the imagery from flight

1395

00:51:50,230 --> 00:51:47,160

but our science data too so we have uh

1396

00:51:53,150 --> 00:51:50,240

Open Access citizen science initiatives

1397

00:51:56,150 --> 00:51:53,160

that are fueled by space station program

1398

00:51:58,609 --> 00:51:56,160

data Gene lab you may have heard of

1399

00:52:00,829 --> 00:51:58,619

heard about it's a repository of all the

1400

00:52:03,290 --> 00:52:00,839

genetic information from all the NASA

1401  
00:52:05,270 --> 00:52:03,300  
investigations we've done on station we

1402  
00:52:10,010 --> 00:52:05,280  
have a physical science informatics

1403  
00:52:12,950 --> 00:52:10,020  
database and they hold in both Grant

1404  
00:52:15,470 --> 00:52:12,960  
competitions and also open citizen

1405  
00:52:17,690 --> 00:52:15,480  
science applications to go in there and

1406  
00:52:19,430 --> 00:52:17,700  
be part of this question there is so

1407  
00:52:20,990 --> 00:52:19,440  
much data it took home through that

1408  
00:52:23,450 --> 00:52:21,000  
there are always discoveries that are

1409  
00:52:26,390 --> 00:52:23,460  
out there that could be found so if you

1410  
00:52:28,609 --> 00:52:26,400  
don't think you can can participate as a

1411  
00:52:30,890 --> 00:52:28,619  
crew member you can participate as a

1412  
00:52:32,569 --> 00:52:30,900  
citizen scientist

1413  
00:52:34,430 --> 00:52:32,579

thank you all for those answers that was

1414

00:52:35,870 --> 00:52:34,440

those some beautiful remarks there let's

1415

00:52:38,450 --> 00:52:35,880

take it back to the room now we have

1416

00:52:40,309 --> 00:52:38,460

some hands going up again

1417

00:52:43,910 --> 00:52:40,319

right over here

1418

00:52:47,030 --> 00:52:43,920

hi thank you so much I'm masako first of

1419

00:52:49,250 --> 00:52:47,040

all today this is so exciting and

1420

00:52:51,650 --> 00:52:49,260

interesting I'm so happy to be here and

1421

00:52:53,510 --> 00:52:51,660

I'm I have like so many questions so I'm

1422

00:52:55,190 --> 00:52:53,520

I know I'm gonna regret that I'm gonna

1423

00:52:57,950 --> 00:52:55,200

be able to I'm not gonna be able to ask

1424

00:53:00,470 --> 00:52:57,960

all of them but I come from space

1425

00:53:03,049 --> 00:53:00,480

taymund it's a company that combines the

1426  
00:53:05,809 --> 00:53:03,059  
word space and entertainment we actually

1427  
00:53:08,870 --> 00:53:05,819  
have an artwork that's going into ISS

1428  
00:53:10,670 --> 00:53:08,880  
next month on a commercial flight we're

1429  
00:53:13,549 --> 00:53:10,680  
working with a space logistics company

1430  
00:53:16,870 --> 00:53:13,559  
so I appreciate your explaining how

1431  
00:53:19,910 --> 00:53:16,880  
you're collaborating with new commercial

1432  
00:53:22,450 --> 00:53:19,920  
elements to bring new things into space

1433  
00:53:25,549 --> 00:53:22,460  
that wasn't conventionally done before

1434  
00:53:27,170 --> 00:53:25,559  
because all of us at space payment we

1435  
00:53:29,990 --> 00:53:27,180  
all want to go to space and that's why

1436  
00:53:31,490 --> 00:53:30,000  
we're doing this but and our artists of

1437  
00:53:33,829 --> 00:53:31,500  
course want to go to space but we're

1438  
00:53:36,470 --> 00:53:33,839

sending in an artwork it's a flat small

1439

00:53:39,710 --> 00:53:36,480

artwork as a symbolism to go into space

1440

00:53:42,170 --> 00:53:39,720

instead of us so um we're really excited

1441

00:53:45,770 --> 00:53:42,180

about bringing hanging symbolism of

1442

00:53:49,069 --> 00:53:45,780

exploring Humanity by bringing it into

1443

00:53:51,950 --> 00:53:49,079

space and looking at Earth and in a

1444

00:53:55,190 --> 00:53:51,960

condition that's not you know expected

1445

00:53:57,049 --> 00:53:55,200

on Earth so the story about how your

1446

00:53:59,089 --> 00:53:57,059

dreams are different and everything that

1447

00:54:01,069 --> 00:53:59,099

was like really exciting because I feel

1448

00:54:03,890 --> 00:54:01,079

like you learned so much about the human

1449

00:54:06,230 --> 00:54:03,900

perspective by being in a very different

1450

00:54:09,230 --> 00:54:06,240

condition and I was curious if you had

1451  
00:54:11,990 --> 00:54:09,240  
more um things that you could tell us

1452  
00:54:14,450 --> 00:54:12,000  
about how perspectives have changed like

1453  
00:54:16,490 --> 00:54:14,460  
you talked about spatial perception

1454  
00:54:19,430 --> 00:54:16,500  
changes obviously because you're in

1455  
00:54:21,770 --> 00:54:19,440  
microgravity how about like time or how

1456  
00:54:24,650 --> 00:54:21,780  
you feel about things or like without

1457  
00:54:26,930 --> 00:54:24,660  
smell and being able to eat the food

1458  
00:54:28,790 --> 00:54:26,940  
that you're used to even little things

1459  
00:54:32,210 --> 00:54:28,800  
like that I I'm sure it changes

1460  
00:54:34,130 --> 00:54:32,220  
perspective or even like how Jim has

1461  
00:54:37,670 --> 00:54:34,140  
this amazing program with amateur radio

1462  
00:54:38,930 --> 00:54:37,680  
that provides connection to Earth that

1463  
00:54:41,450 --> 00:54:38,940

makes you keep

1464

00:54:43,309 --> 00:54:41,460

um being in touch but I know you also

1465

00:54:45,170 --> 00:54:43,319

have Twitter nowadays that you could

1466

00:54:46,609 --> 00:54:45,180

tweet from space that's really exciting

1467

00:54:48,890 --> 00:54:46,619

too do you I don't know if you do

1468

00:54:51,530 --> 00:54:48,900

Twitter space from space but is there

1469

00:54:53,390 --> 00:54:51,540

new experiments to stay connected and

1470

00:54:56,809 --> 00:54:53,400

giving more information about The Human

1471

00:54:58,609 --> 00:54:56,819

Condition in space to earth like maybe

1472

00:55:01,370 --> 00:54:58,619

you're developing Holograms or something

1473

00:55:03,349 --> 00:55:01,380

being you know super star warsy and

1474

00:55:04,970 --> 00:55:03,359

stuff like that but I want I wanted to

1475

00:55:07,130 --> 00:55:04,980

know if there's like new developments

1476  
00:55:08,990 --> 00:55:07,140  
about that kind of aspects of humanity

1477  
00:55:11,630 --> 00:55:09,000  
that you're developing that you could

1478  
00:55:15,049 --> 00:55:13,250  
an example that's been probably kick it

1479  
00:55:16,670 --> 00:55:15,059  
to Kurt and Patrick was I bet you they

1480  
00:55:18,589 --> 00:55:16,680  
there are definitely New Balance like

1481  
00:55:20,329 --> 00:55:18,599  
one we worked on was to you the

1482  
00:55:21,710 --> 00:55:20,339  
holographic thing you mentioned is what

1483  
00:55:23,870 --> 00:55:21,720  
made me think of it what by like a

1484  
00:55:25,309 --> 00:55:23,880  
virtual reality interface and we were

1485  
00:55:27,170 --> 00:55:25,319  
doing it from this perspective of like

1486  
00:55:29,390 --> 00:55:27,180  
remote medicine and so like talking to

1487  
00:55:31,849 --> 00:55:29,400  
like a flight surgeon remotely but it

1488  
00:55:34,430 --> 00:55:31,859

the secondary use was like you could

1489

00:55:36,950 --> 00:55:34,440

have a virtual interface instead of like

1490

00:55:38,569 --> 00:55:36,960

a zoom call with your family which they

1491

00:55:40,309 --> 00:55:38,579

we set up you know once a week you could

1492

00:55:42,049 --> 00:55:40,319

do that maybe virtually so that that

1493

00:55:44,450 --> 00:55:42,059

kind of connectedness is at better or

1494

00:55:46,309 --> 00:55:44,460

worse or freaky or good

1495

00:55:48,410 --> 00:55:46,319

um uh I think the the other just general

1496

00:55:49,670 --> 00:55:48,420

perspective is uh and the reason it

1497

00:55:52,030 --> 00:55:49,680

takes so long to select the astronauts

1498

00:55:54,950 --> 00:55:52,040

is we spend a lot of time trying to find

1499

00:55:56,150 --> 00:55:54,960

the right mix of people who can work

1500

00:55:57,349 --> 00:55:56,160

together as a team that's probably the

1501  
00:55:58,609 --> 00:55:57,359  
biggest perspective changes you're

1502  
00:56:00,589 --> 00:55:58,619  
you're in this together it's no

1503  
00:56:02,030 --> 00:56:00,599  
different than you know small units in

1504  
00:56:04,130 --> 00:56:02,040  
the military or deployed units or small

1505  
00:56:05,569 --> 00:56:04,140  
teams where you really come to count on

1506  
00:56:07,970 --> 00:56:05,579  
one another and you're so your

1507  
00:56:09,170 --> 00:56:07,980  
perspective uh you have to rely on a

1508  
00:56:12,470 --> 00:56:09,180  
good connection with the ground and with

1509  
00:56:16,130 --> 00:56:12,480  
each other so I think it's just good uh

1510  
00:56:19,309 --> 00:56:16,140  
you know it's it's a different uh world

1511  
00:56:20,510 --> 00:56:19,319  
and not no pun intended was you only are

1512  
00:56:22,010 --> 00:56:20,520  
sharing that experience with the people

1513  
00:56:23,270 --> 00:56:22,020

there and so you have to spend a lot of

1514

00:56:24,890 --> 00:56:23,280

active time communicating with the

1515

00:56:27,049 --> 00:56:24,900

ground both professionally during the

1516

00:56:28,490 --> 00:56:27,059

day but also outside of the workday to

1517

00:56:30,170 --> 00:56:28,500

make sure you're staying staying

1518

00:56:32,870 --> 00:56:30,180

connected and I know there's there's

1519

00:56:35,270 --> 00:56:32,880

that the virtual uh piece but there's uh

1520

00:56:36,589 --> 00:56:35,280

I know other other research of like and

1521

00:56:38,690 --> 00:56:36,599

as Kurt mentioned all of it's open

1522

00:56:40,190 --> 00:56:38,700

source right you can you can go see all

1523

00:56:41,690 --> 00:56:40,200

the experiments that have been done on

1524

00:56:43,370 --> 00:56:41,700

that on that connect to this are already

1525

00:56:45,770 --> 00:56:43,380

out there and it's actually there's so

1526

00:56:47,150 --> 00:56:45,780

much I think that's that it would take a

1527

00:56:48,290 --> 00:56:47,160

long time to actually comb through to

1528

00:56:49,790 --> 00:56:48,300

find what you're looking for but it

1529

00:56:50,870 --> 00:56:49,800

probably has already been done as my

1530

00:56:53,450 --> 00:56:50,880

guess

1531

00:56:55,370 --> 00:56:53,460

so you make a great Point we've got a

1532

00:56:56,690 --> 00:56:55,380

great searchable database out there it's

1533

00:56:58,790 --> 00:56:56,700

called the space station research

1534

00:57:00,530 --> 00:56:58,800

Explorer you can go to it and you can

1535

00:57:02,510 --> 00:57:00,540

search by keywords you can search by the

1536

00:57:04,730 --> 00:57:02,520

type of investigation you want to learn

1537

00:57:07,670 --> 00:57:04,740

about but you're right Roger that there

1538

00:57:10,190 --> 00:57:07,680

has been a number of Investigations in

1539

00:57:11,809 --> 00:57:10,200

the field of Behavioral Science and one

1540

00:57:15,530 --> 00:57:11,819

of the results that came out recently

1541

00:57:17,990 --> 00:57:15,540

was on astronaut time perception so that

1542

00:57:21,470 --> 00:57:18,000

study actually showed that the the time

1543

00:57:25,370 --> 00:57:21,480

perception of crew members uh

1544

00:57:28,309 --> 00:57:25,380

they think a minute is a little longer

1545

00:57:31,510 --> 00:57:28,319

than a minute actually is and in

1546

00:57:34,250 --> 00:57:31,520

retrospective when they look back at

1547

00:57:36,650 --> 00:57:34,260

how long in the past something happened

1548

00:57:39,290 --> 00:57:36,660

it seems shorter to them at least that's

1549

00:57:41,870 --> 00:57:39,300

the reported results that we've seen but

1550

00:57:44,210 --> 00:57:41,880

uh there is this entire field of

1551  
00:57:46,250 --> 00:57:44,220  
Behavioral Science that we're looking at

1552  
00:57:49,609 --> 00:57:46,260  
because we need to understand not only

1553  
00:57:51,650 --> 00:57:49,619  
our crew cohesion for six-month missions

1554  
00:57:53,990 --> 00:57:51,660  
but eventually how do we get to that

1555  
00:57:56,349 --> 00:57:54,000  
Mars mission where it could be you know

1556  
00:58:00,770 --> 00:57:56,359  
almost three years round trip

1557  
00:58:02,690 --> 00:58:00,780  
it could be a big big part of that

1558  
00:58:05,390 --> 00:58:02,700  
mission just keeping the the team

1559  
00:58:08,390 --> 00:58:05,400  
together other things that I that I know

1560  
00:58:11,750 --> 00:58:08,400  
we've looked into are communication

1561  
00:58:14,210 --> 00:58:11,760  
techniques guiding operations for

1562  
00:58:16,730 --> 00:58:14,220  
ultrasound or other medical procedures

1563  
00:58:18,829 --> 00:58:16,740

and that has bearing not only for our

1564

00:58:20,630 --> 00:58:18,839

crews in remote locations but if you

1565

00:58:22,430 --> 00:58:20,640

think about it for remotely isolated

1566

00:58:25,010 --> 00:58:22,440

communities as well well where you don't

1567

00:58:27,650 --> 00:58:25,020

have a specialist on call or the ability

1568

00:58:30,770 --> 00:58:27,660

necessary to necessarily to even get to

1569

00:58:33,410 --> 00:58:30,780

a hospital quickly so our Canadian

1570

00:58:35,510 --> 00:58:33,420

partners are very interested in this for

1571

00:58:37,730 --> 00:58:35,520

a lot of their Northern Communities

1572

00:58:40,250 --> 00:58:37,740

I have a different perspective on your

1573

00:58:41,329 --> 00:58:40,260

question on perspective so earlier this

1574

00:58:43,490 --> 00:58:41,339

week I was actually I was lucky enough

1575

00:58:44,510 --> 00:58:43,500

to go to Atlanta there's a research team

1576

00:58:46,970 --> 00:58:44,520

that's going to be launching an

1577

00:58:49,010 --> 00:58:46,980

investigation from Emory University on

1578

00:58:51,410 --> 00:58:49,020

Northrop Grumman CRS 19 a little bit

1579

00:58:53,450 --> 00:58:51,420

later on but it was interesting because

1580

00:58:55,910 --> 00:58:53,460

I had the chance to meet with this

1581

00:58:58,069 --> 00:58:55,920

investigator the lead Pi for this about

1582

00:59:00,410 --> 00:58:58,079

nine years ago an Outreach event over at

1583

00:59:02,329 --> 00:59:00,420

Emory University where NASA and National

1584

00:59:03,829 --> 00:59:02,339

Lab we kind of go and we educate people

1585

00:59:06,230 --> 00:59:03,839

on the opportunities that are available

1586

00:59:08,210 --> 00:59:06,240

to leverage the space station and she

1587

00:59:10,490 --> 00:59:08,220

was one of maybe 10 people that was in

1588

00:59:12,049 --> 00:59:10,500

the audience that day and she came up to

1589

00:59:13,190 --> 00:59:12,059

me afterwards and she said hey is there

1590

00:59:15,069 --> 00:59:13,200

are there like any research

1591

00:59:17,329 --> 00:59:15,079

announcements that are geared towards

1592

00:59:19,010 --> 00:59:17,339

biological sciences or stem cell

1593

00:59:20,630 --> 00:59:19,020

research and I said as a matter of fact

1594

00:59:22,430 --> 00:59:20,640

yeah we have a research announcement

1595

00:59:24,470 --> 00:59:22,440

available right now focused on stem

1596

00:59:25,970 --> 00:59:24,480

cells she applied and then she was

1597

00:59:27,890 --> 00:59:25,980

awarded and she's flown multiple

1598

00:59:29,870 --> 00:59:27,900

investigations and so when I was meeting

1599

00:59:32,870 --> 00:59:29,880

with her team this week it was a great

1600

00:59:35,150 --> 00:59:32,880

conversation because that nine years ago

1601  
00:59:37,910 --> 00:59:35,160  
her perspective changed on how it is

1602  
00:59:39,829 --> 00:59:37,920  
that she could do science she

1603  
00:59:40,970 --> 00:59:39,839  
didn't realize they didn't realize that

1604  
00:59:43,069 --> 00:59:40,980  
they could leverage the space station

1605  
00:59:45,289 --> 00:59:43,079  
and they could be part of something that

1606  
00:59:46,910 --> 00:59:45,299  
is now uh going to be forever etched in

1607  
00:59:48,710 --> 00:59:46,920  
what it is that they do from a research

1608  
00:59:50,089 --> 00:59:48,720  
perspective moving forward so it was

1609  
00:59:51,770 --> 00:59:50,099  
also a lot of fun just to kind of you

1610  
00:59:54,049 --> 00:59:51,780  
know reminisce and be like gosh that was

1611  
00:59:56,329 --> 00:59:54,059  
a long time ago in a galaxy far far away

1612  
00:59:57,950 --> 00:59:56,339  
but look at us now and again it's

1613  
01:00:00,170 --> 00:59:57,960

exciting to go out there and share those

1614

01:00:01,430 --> 01:00:00,180

types of Stories on how uh you know we

1615

01:00:03,530 --> 01:00:01,440

all were able to kind of change that

1616

01:00:06,109 --> 01:00:03,540

perspective of of what's possible in

1617

01:00:07,789 --> 01:00:06,119

space and and who can access it

1618

01:00:09,410 --> 01:00:07,799

thank you all for answering that

1619

01:00:11,809 --> 01:00:09,420

question together we have time for one

1620

01:00:13,730 --> 01:00:11,819

more question here in the room

1621

01:00:16,490 --> 01:00:13,740

we've got a few hands up so maybe we can

1622

01:00:18,349 --> 01:00:16,500

take one I sorry hard Choice maybe we'll

1623

01:00:20,089 --> 01:00:18,359

take one here in the front that we

1624

01:00:21,890 --> 01:00:20,099

haven't gotten to yet

1625

01:00:22,849 --> 01:00:21,900

oh one here in the front sorry we don't

1626  
01:00:26,510 --> 01:00:22,859  
want to make you the bad guy you're not

1627  
01:00:28,789 --> 01:00:26,520  
choosing there you go perfect hi she

1628  
01:00:30,470 --> 01:00:28,799  
sold Anna here um question for you can

1629  
01:00:32,150 --> 01:00:30,480  
you go over the importance of

1630  
01:00:34,309 --> 01:00:32,160  
plant-based research currently being

1631  
01:00:37,490 --> 01:00:34,319  
conducted in space using systems such as

1632  
01:00:40,250 --> 01:00:37,500  
veggie and x-roots

1633  
01:00:42,589 --> 01:00:40,260  
that is a great question so I'm going to

1634  
01:00:44,510 --> 01:00:42,599  
try and do a really quick overview of

1635  
01:00:46,849 --> 01:00:44,520  
all the different plant growing systems

1636  
01:00:48,289 --> 01:00:46,859  
that we have on board right now I

1637  
01:00:50,390 --> 01:00:48,299  
mentioned the bricks those are

1638  
01:00:52,069 --> 01:00:50,400

biological research and canisters we we

1639

01:00:56,569 --> 01:00:52,079

put small plants in Petri dishes

1640

01:01:00,609 --> 01:00:56,579

sometimes we have a system called veggie

1641

01:01:03,589 --> 01:01:00,619

veggie is an expandable collapsible

1642

01:01:05,690 --> 01:01:03,599

container with lights to grow plants in

1643

01:01:08,870 --> 01:01:05,700

and we're doing a lot of our crop

1644

01:01:12,770 --> 01:01:08,880

production research in Veggie to start

1645

01:01:14,930 --> 01:01:12,780

off we're trying to understand our they

1646

01:01:18,289 --> 01:01:14,940

are the fruits and vegetables as

1647

01:01:20,329 --> 01:01:18,299

nutritional as Earth grown varieties and

1648

01:01:21,829 --> 01:01:20,339

we're allowing the the astronauts to

1649

01:01:25,130 --> 01:01:21,839

sample those now which is a great

1650

01:01:28,490 --> 01:01:25,140

addition to their to their diet

1651

01:01:31,549 --> 01:01:28,500

but we also have X Roots X roots or

1652

01:01:34,130 --> 01:01:31,559

sorry I should go back to uh veggie in

1653

01:01:35,569 --> 01:01:34,140

Veggie we grow the seeds or the

1654

01:01:38,809 --> 01:01:35,579

seedlings of the plants and little

1655

01:01:41,870 --> 01:01:38,819

pillows so you can think of it as being

1656

01:01:44,210 --> 01:01:41,880

typical growth medium in X Roots which

1657

01:01:47,390 --> 01:01:44,220

is also another plant growth chamber

1658

01:01:50,270 --> 01:01:47,400

that is specific specifically for

1659

01:01:52,370 --> 01:01:50,280

aeroponics and hydroponics so there the

1660

01:01:55,150 --> 01:01:52,380

root systems are growing in in clear

1661

01:01:59,030 --> 01:01:55,160

Chambers and they're given food medium

1662

01:02:01,250 --> 01:01:59,040

to grow we're also looking at that for

1663

01:02:04,130 --> 01:02:01,260

many different vegetable varieties and

1664

01:02:07,010 --> 01:02:04,140

of course the the nutritional value in

1665

01:02:09,410 --> 01:02:07,020

those and then lastly we've got a plant

1666

01:02:11,990 --> 01:02:09,420

growth chamber on orbit called the plant

1667

01:02:15,470 --> 01:02:12,000

habitat and the plant Advanced plant

1668

01:02:18,770 --> 01:02:15,480

habitat is really the the motherload of

1669

01:02:20,990 --> 01:02:18,780

plant research on ISS in that chamber

1670

01:02:23,510 --> 01:02:21,000

you can control the atmosphere qualities

1671

01:02:26,210 --> 01:02:23,520

the carbon carbon dioxide concentration

1672

01:02:29,630 --> 01:02:26,220

the light exactly how much light it's

1673

01:02:31,970 --> 01:02:29,640

getting exactly how much wind is on the

1674

01:02:35,150 --> 01:02:31,980

crops and really what we're getting at

1675

01:02:37,970 --> 01:02:35,160

in that research facility is how are

1676

01:02:40,910 --> 01:02:37,980

crops going to grow in maybe different

1677

01:02:43,609 --> 01:02:40,920

environments on the moon or on Mars

1678

01:02:46,970 --> 01:02:43,619

we're really trying to understand the

1679

01:02:48,470 --> 01:02:46,980

basis of those crop systems in

1680

01:02:50,750 --> 01:02:48,480

different areas

1681

01:02:52,670 --> 01:02:50,760

thank you so much Kurt well that will

1682

01:02:54,230 --> 01:02:52,680

wrap up the question and answer portion

1683

01:02:55,849 --> 01:02:54,240

we have for today's panel I want to

1684

01:02:57,410 --> 01:02:55,859

thank our panelists for being here today

1685

01:02:59,210 --> 01:02:57,420

and thank all of our social media

1686

01:03:00,890 --> 01:02:59,220

content creators and influencers here in

1687

01:03:02,770 --> 01:03:00,900

the room it's always great to have the

1688

01:03:05,690 --> 01:03:02,780

NASA social here at Kennedy Space Center

1689

01:03:07,910 --> 01:03:05,700

again the liftoff of cruise 6 is

1690

01:03:11,210 --> 01:03:07,920

targeting very early Monday morning that

1691

01:03:13,190 --> 01:03:11,220

will be 1 45 a.m eastern time we'll want

1692

01:03:15,109 --> 01:03:13,200

you to turn and tune into the live

1693

01:03:19,190 --> 01:03:15,119

coverage that will begin on Sunday Night

1694

01:03:22,130 --> 01:03:19,200

February 27th at 10 15 p.m eastern time

1695

01:03:24,950 --> 01:03:22,140

you can watch that on nasa.gov forward

1696

01:03:27,410 --> 01:03:24,960

slash live or on our YouTube or any of