



1
00:00:05,430 --> 00:00:02,790
well good afternoon or good morning i

2
00:00:07,829 --> 00:00:05,440
guess for us here in houston and i guess

3
00:00:09,589 --> 00:00:07,839
for you folks up in new york it's

4
00:00:10,870 --> 00:00:09,599
afternoon welcome to mission control

5
00:00:12,230 --> 00:00:10,880
houston you're looking at the

6
00:00:15,190 --> 00:00:12,240
international space station flight

7
00:00:17,590 --> 00:00:15,200
control room and we are very pleased to

8
00:00:18,950 --> 00:00:17,600
have with us here jason barber

9
00:00:20,150 --> 00:00:18,960
he is

10
00:00:28,830 --> 00:00:20,160
a

11
00:00:31,269 --> 00:00:28,840
here on one of the other consoles he

12
00:00:33,110 --> 00:00:31,279
supports the environmental control and

13
00:00:35,430 --> 00:00:33,120

life support system on the station

14

00:00:37,350 --> 00:00:35,440

monitors all of that activity as part of

15

00:00:40,709 --> 00:00:37,360

the environmental and thermal operating

16

00:00:42,549 --> 00:00:40,719

system of the station so jason's

17

00:00:44,389 --> 00:00:42,559

agreed to join us and help

18

00:00:45,110 --> 00:00:44,399

answer some questions for you guys so

19

00:00:48,709 --> 00:00:45,120

we're

20

00:00:53,830 --> 00:00:50,150

good morning it's good to talk to people

21

00:00:57,990 --> 00:00:55,270

yes

22

00:00:59,750 --> 00:00:58,000

i'm the teacher i'll briefly say hello i

23

00:01:01,830 --> 00:00:59,760

went to school in binghamton so i know

24

00:01:03,750 --> 00:01:01,840

you're further north on route 80. brady

25

00:01:08,149 --> 00:01:03,760

won

26

00:01:12,789 --> 00:01:10,149

i think they'd check anybody can i hear

27

00:01:13,510 --> 00:01:12,799

us okay we got it on now sorry about

28

00:01:16,149 --> 00:01:13,520

that

29

00:01:19,030 --> 00:01:16,159

now we hear you loud and clear

30

00:01:21,030 --> 00:01:19,040

welcome okay welcome welcome we uh

31

00:01:22,870 --> 00:01:21,040

understand you're a new yorker i went to

32

00:01:25,429 --> 00:01:22,880

school in binghamton on

33

00:01:27,749 --> 00:01:25,439

route 81 okay so

34

00:01:30,469 --> 00:01:27,759

southern tier and we have a couple of

35

00:01:33,510 --> 00:01:30,479

students with questions we learned this

36

00:01:35,270 --> 00:01:33,520

year because of our work that two of the

37

00:01:37,030 --> 00:01:35,280

family members

38

00:01:38,870 --> 00:01:37,040

worked with nasa

39

00:01:40,069 --> 00:01:38,880

the things you learn when you work with

40

00:01:42,389 --> 00:01:40,079

you

41

00:01:45,429 --> 00:01:42,399

so we have uh we'll have one of those

42

00:01:48,149 --> 00:01:45,439

students tell you what grandpa did and

43

00:01:50,230 --> 00:01:48,159

uh we have lovely questions tell us when

44

00:01:52,550 --> 00:01:50,240

you'd like us to ask our questions we're

45

00:01:56,310 --> 00:01:52,560

ready uh we're really happy to have you

46

00:01:58,469 --> 00:01:56,320

guys here we're going to try

47

00:02:01,109 --> 00:01:58,479

oh thank you julia

48

00:02:02,950 --> 00:02:01,119

um my name is julia my question to

49

00:02:05,670 --> 00:02:02,960

mostly about the gemini missions because

50

00:02:07,350 --> 00:02:05,680

my grandpa richard sandovsky was a

51
00:02:08,389 --> 00:02:07,360
real-time programmer for ibm that

52
00:02:12,869 --> 00:02:08,399
reported to

53
00:02:14,470 --> 00:02:12,879
nasa from 1962 to 1966.

54
00:02:15,750 --> 00:02:14,480
so i was wondering what kind of

55
00:02:17,589 --> 00:02:15,760
information you got from the

56
00:02:20,550 --> 00:02:17,599
spacecraft's radar during the gemini

57
00:02:23,510 --> 00:02:21,990
that helped you with these current

58
00:02:24,630 --> 00:02:23,520
missions

59
00:02:27,430 --> 00:02:24,640
right

60
00:02:29,990 --> 00:02:27,440
um i'll answer that as best i can um but

61
00:02:32,710 --> 00:02:30,000
uh the main thing was um

62
00:02:34,869 --> 00:02:32,720
how the vehicle worked in space um

63
00:02:36,390 --> 00:02:34,879

orbiting the planet um how the life

64

00:02:37,589 --> 00:02:36,400

support equipment was interfacing with

65

00:02:41,589 --> 00:02:37,599

the crew

66

00:02:44,630 --> 00:02:41,599

and taking that and expanding it to

67

00:02:46,070 --> 00:02:44,640

making it to moon i'm sorry yeah mars

68

00:02:47,589 --> 00:02:46,080

making it all the way to the moon and

69

00:02:49,030 --> 00:02:47,599

back and

70

00:02:50,390 --> 00:02:49,040

basically making sure all of that

71

00:02:51,990 --> 00:02:50,400

hardware

72

00:02:53,910 --> 00:02:52,000

worked the way it was supposed to for

73

00:02:56,630 --> 00:02:53,920

long durations

74

00:02:58,949 --> 00:02:56,640

the other thing it figured out was

75

00:03:00,710 --> 00:02:58,959

doing attitude maneuvers while the

76

00:03:02,630 --> 00:03:00,720

vehicle was in space

77

00:03:04,550 --> 00:03:02,640

and being able to align the vehicle to

78

00:03:07,270 --> 00:03:04,560

leave earth's um

79

00:03:08,949 --> 00:03:07,280

atmosphere and go to the moon itself

80

00:03:11,750 --> 00:03:08,959

so it's testing all that

81

00:03:14,309 --> 00:03:11,760

those capabilities so that way

82

00:03:17,509 --> 00:03:14,319

we could land on the moon in apollo like

83

00:03:19,670 --> 00:03:17,519

we did so i guess that julia can be a

84

00:03:22,229 --> 00:03:19,680

legacy and maybe one day work right here

85

00:03:24,149 --> 00:03:22,239

uh where grandpa did that'll be uh it'll

86

00:03:25,750 --> 00:03:24,159

be pretty exciting and that's not

87

00:03:28,149 --> 00:03:25,760

unheard of we've actually in the flight

88

00:03:31,110 --> 00:03:28,159

director office we've had father-son

89

00:03:32,630 --> 00:03:31,120

flight directors before so

90

00:03:35,509 --> 00:03:32,640

it is not unheard of for families to

91

00:03:38,149 --> 00:03:35,519

follow each other into nasa

92

00:03:38,159 --> 00:03:41,030

we encourage it

93

00:03:44,229 --> 00:03:42,949

who's my number one

94

00:03:49,030 --> 00:03:44,239

ryan

95

00:03:51,750 --> 00:03:49,040

was what do members of the mission

96

00:03:54,710 --> 00:03:51,760

control do to prepare for a launch and

97

00:03:56,470 --> 00:03:54,720

the most recent one with expedition 36

98

00:04:00,869 --> 00:03:56,480

thank you

99

00:04:03,429 --> 00:04:00,879

you may have to repeat that can you get

100

00:04:06,070 --> 00:04:03,439

what did mission control have to do to

101
00:04:08,869 --> 00:04:06,080
prepare for this large this most recent

102
00:04:10,710 --> 00:04:08,879
mission when it was going up what was

103
00:04:12,830 --> 00:04:10,720
your role in it

104
00:04:16,550 --> 00:04:12,840
my particular role in that

105
00:04:17,830 --> 00:04:16,560
um well my console's role was to

106
00:04:19,270 --> 00:04:17,840
basically determine that we had all the

107
00:04:21,909 --> 00:04:19,280
consumables that we needed to be able to

108
00:04:24,310 --> 00:04:21,919
support the crew while they're on orbit

109
00:04:27,110 --> 00:04:24,320
and by that uh that we have plenty of

110
00:04:28,710 --> 00:04:27,120
water plenty of food

111
00:04:30,150 --> 00:04:28,720
we have the

112
00:04:33,510 --> 00:04:30,160
necessary equipment to be able to

113
00:04:36,790 --> 00:04:35,510

bathroom facilities into drinking water

114

00:04:38,710 --> 00:04:36,800

the next day

115

00:04:42,629 --> 00:04:38,720

and basically making sure all of that is

116

00:04:44,550 --> 00:04:42,639

ready for them to get there

117

00:04:46,469 --> 00:04:44,560

nimmy this is patricia if the students

118

00:04:47,830 --> 00:04:46,479

could come closer to the microphone that

119

00:04:50,550 --> 00:04:47,840

way we could hear them better that would

120

00:04:53,030 --> 00:04:50,560

be great thank you thank you okay number

121

00:04:56,230 --> 00:04:54,710

number two

122

00:04:57,590 --> 00:04:56,240

quickly

123

00:04:59,270 --> 00:04:57,600

come up

124

00:05:02,390 --> 00:04:59,280

and number three line up behind you go

125

00:05:05,029 --> 00:05:02,400

ahead uh hi i'm rachel and my question

126

00:05:09,189 --> 00:05:05,039

is how and where are new members of the

127

00:05:15,029 --> 00:05:12,469

you may have to help us with that nami

128

00:05:17,909 --> 00:05:15,039

oh yeah say that again um how and where

129

00:05:19,830 --> 00:05:17,919

new members of mission control taught

130

00:05:23,029 --> 00:05:19,840

where are you trained where is your best

131

00:05:25,830 --> 00:05:23,039

way for training but in order to become

132

00:05:27,350 --> 00:05:25,840

uh assigned to mission control

133

00:05:29,350 --> 00:05:27,360

okay um

134

00:05:31,670 --> 00:05:29,360

the i'll just give a general overview of

135

00:05:34,070 --> 00:05:31,680

my path um the first thing is get your

136

00:05:36,870 --> 00:05:34,080

four-year four-year engineering degree

137

00:05:39,110 --> 00:05:36,880

um and that can be aerospace mechanical

138

00:05:41,909 --> 00:05:39,120

um

139

00:05:44,070 --> 00:05:41,919

or anyone of that type

140

00:05:46,390 --> 00:05:44,080

and then you once you get there done

141

00:05:48,230 --> 00:05:46,400

with that you get hired by nasa

142

00:05:49,830 --> 00:05:48,240

and you'll go through a series of

143

00:05:51,350 --> 00:05:49,840

training my training took me about two

144

00:05:53,270 --> 00:05:51,360

and a half years

145

00:05:55,909 --> 00:05:53,280

to get the current cert i have to do the

146

00:05:58,150 --> 00:05:55,919

to work on life support

147

00:05:59,590 --> 00:05:58,160

and basically nasa teaches you to become

148

00:06:01,029 --> 00:05:59,600

a flight controller

149

00:06:02,870 --> 00:06:01,039

and

150

00:06:04,629 --> 00:06:02,880

that's through a series of simulations

151
00:06:08,070 --> 00:06:04,639
book reading

152
00:06:09,590 --> 00:06:08,080
testing um to take on the job that i

153
00:06:11,270 --> 00:06:09,600
have and then there's

154
00:06:12,710 --> 00:06:11,280
after that once i do

155
00:06:14,710 --> 00:06:12,720
um

156
00:06:16,309 --> 00:06:14,720
a year or so of working console that's

157
00:06:18,629 --> 00:06:16,319
when i get assigned

158
00:06:20,469 --> 00:06:18,639
um to be a mission lead for various

159
00:06:21,909 --> 00:06:20,479
missions like um for me it was shuttle

160
00:06:23,990 --> 00:06:21,919
missions and increment leads with the

161
00:06:25,350 --> 00:06:24,000
crew that's on orbit now

162
00:06:26,710 --> 00:06:25,360
and

163
00:06:28,150 --> 00:06:26,720

various other

164

00:06:30,150 --> 00:06:28,160

system leads that

165

00:06:33,110 --> 00:06:30,160

pop up for different hardwares and stuff

166

00:06:37,350 --> 00:06:34,550

so that's the general

167

00:06:39,430 --> 00:06:37,360

path to the training and that's

168

00:06:41,990 --> 00:06:39,440

that's essentially the path that a lot

169

00:06:44,309 --> 00:06:42,000

of the people you see in this room take

170

00:06:46,309 --> 00:06:44,319

um as jason said there's different

171

00:06:47,749 --> 00:06:46,319

engineering backgrounds and and

172

00:06:49,670 --> 00:06:47,759

depending on what position you're

173

00:06:50,790 --> 00:06:49,680

sitting at in this room

174

00:06:52,710 --> 00:06:50,800

um

175

00:06:54,309 --> 00:06:52,720

you oversee a specific area of that

176

00:06:56,469 --> 00:06:54,319

space station to make sure that it's

177

00:06:57,909 --> 00:06:56,479

safe and operating uh for the crew

178

00:06:59,189 --> 00:06:57,919

that's on board

179

00:07:00,830 --> 00:06:59,199

correct

180

00:07:03,909 --> 00:07:00,840

okay

181

00:07:04,710 --> 00:07:03,919

um hi my name is ali and my question is

182

00:07:06,390 --> 00:07:04,720

um

183

00:07:08,629 --> 00:07:06,400

what have been some of the most

184

00:07:11,589 --> 00:07:08,639

important measures you normally take to

185

00:07:13,430 --> 00:07:11,599

ensure safety is there anything in you

186

00:07:15,990 --> 00:07:13,440

you are doing to improve safety

187

00:07:18,469 --> 00:07:16,000

awareness on the iss

188

00:07:21,110 --> 00:07:18,479

um well three of the items that my

189

00:07:23,029 --> 00:07:21,120

console is specif specifically involved

190

00:07:24,710 --> 00:07:23,039

in is emergencies

191

00:07:27,270 --> 00:07:24,720

so any one of those emergencies can be a

192

00:07:29,029 --> 00:07:27,280

rapid depress a hole in the

193

00:07:30,469 --> 00:07:29,039

shell of the vehicle a fire on board the

194

00:07:32,390 --> 00:07:30,479

vehicle or

195

00:07:33,670 --> 00:07:32,400

some sort of toxic fluid gets spilled on

196

00:07:36,469 --> 00:07:33,680

iss

197

00:07:38,629 --> 00:07:36,479

and my console is constantly

198

00:07:40,070 --> 00:07:38,639

revamping procedures and making making

199

00:07:42,070 --> 00:07:40,080

improvements that way if any of those

200

00:07:47,510 --> 00:07:42,080

emergencies work to occur

201

00:07:52,469 --> 00:07:50,469

thank you good question

202

00:07:55,110 --> 00:07:52,479

my name is pamela and my question is

203

00:07:56,710 --> 00:07:55,120

what type of technology is most commonly

204

00:07:59,350 --> 00:07:56,720

used that we would understand for

205

00:08:00,150 --> 00:07:59,360

mission control

206

00:08:03,350 --> 00:08:00,160

um

207

00:08:04,869 --> 00:08:03,360

well i probably computers

208

00:08:07,189 --> 00:08:04,879

everything that we do is all on

209

00:08:10,309 --> 00:08:07,199

computers all of our telemetry we get

210

00:08:11,990 --> 00:08:10,319

from the vehicle is we view on computers

211

00:08:14,150 --> 00:08:12,000

um

212

00:08:16,390 --> 00:08:14,160

and all that is processed on the ground

213

00:08:18,790 --> 00:08:16,400

and sent to our particular consoles

214

00:08:22,150 --> 00:08:18,800

where our computers are at and we can

215

00:08:23,749 --> 00:08:22,160

view all the telemetry that we have

216

00:08:26,070 --> 00:08:23,759

yeah there's

217

00:08:27,990 --> 00:08:26,080

my producer karen's showing jason's

218

00:08:29,430 --> 00:08:28,000

console right there so you guys can see

219

00:08:32,550 --> 00:08:29,440

that's where he

220

00:08:33,670 --> 00:08:32,560

he normally sits if he's on duty of

221

00:08:36,070 --> 00:08:33,680

course he's

222

00:08:37,110 --> 00:08:36,080

doing helping me today talk to you guys

223

00:08:40,310 --> 00:08:37,120

but

224

00:08:41,829 --> 00:08:40,320

that is a live view just about what 15

225

00:08:43,029 --> 00:08:41,839

or 20 feet away

226

00:08:47,190 --> 00:08:43,039

and

227

00:08:48,870 --> 00:08:47,200

you don't see is all of their computer

228

00:08:50,550 --> 00:08:48,880

screens that

229

00:08:52,070 --> 00:08:50,560

that stream the data that jason's

230

00:08:53,110 --> 00:08:52,080

talking to you about so they can

231

00:08:56,230 --> 00:08:53,120

maintain

232

00:08:57,750 --> 00:08:56,240

a real good watch over all of

233

00:08:59,350 --> 00:08:57,760

the things that are going on with their

234

00:09:00,470 --> 00:08:59,360

systems aboard the international space

235

00:09:01,750 --> 00:09:00,480

station

236

00:09:03,670 --> 00:09:01,760

in fact if you look behind us we have

237

00:09:05,509 --> 00:09:03,680

computers right here that are similar to

238

00:09:07,829 --> 00:09:05,519

what all the other consoles have

239

00:09:09,910 --> 00:09:07,839

so that way you can get an idea of what

240

00:09:11,509 --> 00:09:09,920

it is we're looking at right most

241

00:09:12,790 --> 00:09:11,519

consoles have about five monitors that

242

00:09:15,910 --> 00:09:12,800

we're using to

243

00:09:20,150 --> 00:09:17,590

thank you

244

00:09:22,150 --> 00:09:20,160

um hello my name is arielle and this is

245

00:09:24,310 --> 00:09:22,160

my question what have you learned about

246

00:09:26,150 --> 00:09:24,320

the spider's web in space how is it

247

00:09:27,910 --> 00:09:26,160

different on earth

248

00:09:29,430 --> 00:09:27,920

he's interested in the creatures that

249

00:09:31,350 --> 00:09:29,440

you have and what you've learned from

250

00:09:32,710 --> 00:09:31,360

them

251
00:09:34,949 --> 00:09:32,720
thank you

252
00:09:36,470 --> 00:09:34,959
um i'll answer that the best i can

253
00:09:39,030 --> 00:09:36,480
that's a taffy

254
00:09:42,550 --> 00:09:40,870
and i'm gonna answer it just based on

255
00:09:45,350 --> 00:09:42,560
based on my views from the video that we

256
00:09:47,910 --> 00:09:45,360
got downlinked it looked like the um

257
00:09:49,190 --> 00:09:47,920
spiderwebs were more perfectly formed

258
00:09:50,630 --> 00:09:49,200
so um

259
00:09:53,350 --> 00:09:50,640
where they didn't have gravity pulling

260
00:09:56,630 --> 00:09:53,360
them down it looked like a more pure

261
00:09:59,670 --> 00:09:58,470
as far as the exact details of what we

262
00:10:01,110 --> 00:09:59,680
learned from that

263
00:10:04,470 --> 00:10:01,120

i can get more information for you and

264

00:10:12,230 --> 00:10:04,480

pass it on to you guys if you like

265

00:10:15,750 --> 00:10:14,310

yeah i think that

266

00:10:20,630 --> 00:10:15,760

some of them did

267

00:10:23,829 --> 00:10:22,389

we have one method right now you know we

268

00:10:25,910 --> 00:10:23,839

had the space shuttle program that

269

00:10:27,829 --> 00:10:25,920

brought was able to bring cargo down

270

00:10:30,710 --> 00:10:27,839

from the station

271

00:10:32,949 --> 00:10:30,720

and now we have other partners that are

272

00:10:36,310 --> 00:10:32,959

providing cargo capability one of which

273

00:10:39,590 --> 00:10:36,320

can provide a return capability so

274

00:10:43,750 --> 00:10:39,600

so yes when we do have um insect or

275

00:10:45,670 --> 00:10:43,760

animal type experiments on the station

276

00:10:49,670 --> 00:10:45,680

they do they are able to be brought back

277

00:10:54,069 --> 00:10:52,230

my name is christy and my question is

278

00:10:56,550 --> 00:10:54,079

how many flight controllers have become

279

00:10:57,670 --> 00:10:56,560

flight directors

280

00:10:59,190 --> 00:10:57,680

um

281

00:11:00,550 --> 00:10:59,200

i tried to get an answer to that

282

00:11:01,990 --> 00:11:00,560

question and

283

00:11:03,110 --> 00:11:02,000

most flight directors are flight

284

00:11:05,030 --> 00:11:03,120

controllers

285

00:11:06,310 --> 00:11:05,040

from one discipline or another generally

286

00:11:07,509 --> 00:11:06,320

that's the path you take if you want to

287

00:11:09,190 --> 00:11:07,519

be a flight director as you become a

288

00:11:11,269 --> 00:11:09,200

flight controller there's a few

289

00:11:13,190 --> 00:11:11,279

exceptions here and there but i'd say

290

00:11:14,470 --> 00:11:13,200

probably 95 of the flight directors were

291

00:11:16,150 --> 00:11:14,480

flight controllers

292

00:11:17,509 --> 00:11:16,160

yeah i think almost every one of them

293

00:11:20,069 --> 00:11:17,519

worked their way through just like

294

00:11:21,350 --> 00:11:20,079

jason's doing you know

295

00:11:23,509 --> 00:11:21,360

training to

296

00:11:25,670 --> 00:11:23,519

to be a specialist in one specific area

297

00:11:27,590 --> 00:11:25,680

the flight director obviously

298

00:11:29,590 --> 00:11:27,600

is the person that oversees everything

299

00:11:31,430 --> 00:11:29,600

that goes on on that shift

300

00:11:32,310 --> 00:11:31,440

as you know a flight director is in this

301
00:11:34,870 --> 00:11:32,320
room

302
00:11:36,470 --> 00:11:34,880
24 hours a day around the clock on three

303
00:11:38,949 --> 00:11:36,480
shifts and so

304
00:11:41,509 --> 00:11:38,959
so we have flight directors that

305
00:11:43,350 --> 00:11:41,519
have to know everything about all of the

306
00:11:45,509 --> 00:11:43,360
systems on the station but they do rely

307
00:11:47,910 --> 00:11:45,519
heavily on jason and the rest of the

308
00:11:49,269 --> 00:11:47,920
flight controllers to provide

309
00:11:51,590 --> 00:11:49,279
the uh

310
00:11:53,750 --> 00:11:51,600
very quickly information to him to help

311
00:11:55,910 --> 00:11:53,760
make decisions especially in the case

312
00:11:57,829 --> 00:11:55,920
where there may be a problem yes that

313
00:12:00,069 --> 00:11:57,839

you have to work so

314

00:12:01,430 --> 00:12:00,079

flight director is a critical position

315

00:12:02,629 --> 00:12:01,440

in the room and

316

00:12:03,350 --> 00:12:02,639

and um

317

00:12:05,190 --> 00:12:03,360

and

318

00:12:07,509 --> 00:12:05,200

as jason said that almost all of them

319

00:12:10,790 --> 00:12:07,519

have come from the background that jason

320

00:12:13,269 --> 00:12:10,800

has in in flight control

321

00:12:15,269 --> 00:12:13,279

good question

322

00:12:17,269 --> 00:12:15,279

my name is emily and my question is what

323

00:12:19,750 --> 00:12:17,279

other experiments with animals insects

324

00:12:21,509 --> 00:12:19,760

or other creatures do you have plants

325

00:12:24,069 --> 00:12:21,519

fish more spiders

326

00:12:26,310 --> 00:12:24,079

more spider experiments more bees and

327

00:12:31,030 --> 00:12:26,320

what are some of the changes that have

328

00:12:31,040 --> 00:12:33,750

i'm not sure

329

00:12:39,030 --> 00:12:37,990

i can find out for you if you'd like

330

00:12:40,230 --> 00:12:39,040

and actually i'm gonna have to do that

331

00:12:42,230 --> 00:12:40,240

i'm gonna have to find out for you i'm

332

00:12:44,550 --> 00:12:42,240

sorry yeah we've had uh we've had all

333

00:12:46,550 --> 00:12:44,560

different types of um

334

00:12:47,750 --> 00:12:46,560

some insects and some and we've had the

335

00:12:50,150 --> 00:12:47,760

fish

336

00:12:52,069 --> 00:12:50,160

experiments on board as well

337

00:12:54,230 --> 00:12:52,079

we have investigators on the ground that

338

00:12:55,590 --> 00:12:54,240

plan those experiments the crew

339

00:12:58,629 --> 00:12:55,600

checks on those

340

00:13:00,790 --> 00:12:58,639

uh types of living animal or insect

341

00:13:02,310 --> 00:13:00,800

experiments uh throughout the

342

00:13:04,389 --> 00:13:02,320

the flight and then and then when

343

00:13:06,949 --> 00:13:04,399

they're brought back the investigators

344

00:13:08,069 --> 00:13:06,959

um look at those to see what changes

345

00:13:10,470 --> 00:13:08,079

occurred

346

00:13:11,829 --> 00:13:10,480

we don't hear the direct feedback from

347

00:13:14,150 --> 00:13:11,839

those

348

00:13:15,110 --> 00:13:14,160

you know here in the room

349

00:13:17,030 --> 00:13:15,120

but

350

00:13:18,389 --> 00:13:17,040

you know learning about animals and

351

00:13:21,030 --> 00:13:18,399

insects

352

00:13:23,670 --> 00:13:21,040

will it sounds strange but it will help

353

00:13:25,829 --> 00:13:23,680

in the long term when we try to send

354

00:13:28,870 --> 00:13:25,839

humans further out into space as well

355

00:13:30,870 --> 00:13:28,880

because anything that happens uh to

356

00:13:32,389 --> 00:13:30,880

insects over short periods of times or

357

00:13:34,230 --> 00:13:32,399

small animals

358

00:13:36,550 --> 00:13:34,240

could happen to human beings and so we

359

00:13:38,470 --> 00:13:36,560

need to learn all of that before we send

360

00:13:40,069 --> 00:13:38,480

humans further than the altitude that

361

00:13:42,470 --> 00:13:40,079

the space station's at right now which

362

00:13:44,550 --> 00:13:42,480

is you know about only only 250 miles

363

00:13:46,069 --> 00:13:44,560

away from us but

364

00:13:48,629 --> 00:13:46,079

if we go further out into space

365

00:13:51,509 --> 00:13:48,639

obviously we need to be able to protect

366

00:13:53,269 --> 00:13:51,519

a crew for those long periods of time

367

00:13:55,189 --> 00:13:53,279

and to give you an example of a an

368

00:13:56,790 --> 00:13:55,199

experiment that will have direct impact

369

00:13:58,550 --> 00:13:56,800

to people on the ground

370

00:14:00,870 --> 00:13:58,560

it's not necessarily

371

00:14:02,470 --> 00:14:00,880

using insects but it's a

372

00:14:04,949 --> 00:14:02,480

lung experiment that'll be launching the

373

00:14:06,550 --> 00:14:04,959

next year or so and that'll give us more

374

00:14:09,269 --> 00:14:06,560

insight on

375

00:14:10,470 --> 00:14:09,279

asthma and help us to be able to come up

376

00:14:12,150 --> 00:14:10,480

with better treatments for people with

377

00:14:17,030 --> 00:14:12,160

asthma

378

00:14:20,150 --> 00:14:19,350

uh hi my name is brendan and my question

379

00:14:22,150 --> 00:14:20,160

is

380

00:14:24,710 --> 00:14:22,160

what does mr control have to do when

381

00:14:26,949 --> 00:14:24,720

there's a problem to be solved such as

382

00:14:29,590 --> 00:14:26,959

the ammonia leak on the international

383

00:14:31,430 --> 00:14:29,600

space station great question

384

00:14:32,790 --> 00:14:31,440

um well

385

00:14:34,710 --> 00:14:32,800

actually it was mission control that

386

00:14:35,910 --> 00:14:34,720

found the leak in the first place um

387

00:14:38,150 --> 00:14:35,920

through

388

00:14:40,790 --> 00:14:38,160

monitoring our data and

389

00:14:41,910 --> 00:14:40,800

basically once we observed that we had

390

00:14:44,710 --> 00:14:41,920

the leak

391

00:14:46,310 --> 00:14:44,720

we um at that stage

392

00:14:47,269 --> 00:14:46,320

pulled the team together and figured out

393

00:14:48,550 --> 00:14:47,279

okay

394

00:14:50,230 --> 00:14:48,560

is this something we can solve from

395

00:14:51,750 --> 00:14:50,240

commanding on the ground are we gonna

396

00:14:53,350 --> 00:14:51,760

have to send the crew out eva which is

397

00:14:56,230 --> 00:14:53,360

what we ended up doing

398

00:14:58,230 --> 00:14:56,240

so once we made that decision to go eva

399

00:15:00,069 --> 00:14:58,240

the ground here in mission control

400

00:15:02,870 --> 00:15:00,079

figured out okay what do we need to do

401
00:15:04,230 --> 00:15:02,880
during this eva do we replace the pump

402
00:15:06,870 --> 00:15:04,240
do we

403
00:15:08,470 --> 00:15:06,880
do tests along the way or

404
00:15:09,509 --> 00:15:08,480
what do we need to do so is the team

405
00:15:11,110 --> 00:15:09,519
here

406
00:15:12,629 --> 00:15:11,120
working together to figure out how to

407
00:15:13,750 --> 00:15:12,639
solve that problem

408
00:15:16,069 --> 00:15:13,760
i think it

409
00:15:17,430 --> 00:15:16,079
that's a perfect example of

410
00:15:18,949 --> 00:15:17,440
of teamwork

411
00:15:20,710 --> 00:15:18,959
because you know

412
00:15:23,030 --> 00:15:20,720
mission control is critical to what

413
00:15:25,110 --> 00:15:23,040

happens on the space station in terms of

414

00:15:26,470 --> 00:15:25,120

seeing all the data

415

00:15:28,310 --> 00:15:26,480

and being able to

416

00:15:29,670 --> 00:15:28,320

you know tell the crew what's going on

417

00:15:31,910 --> 00:15:29,680

and not only tell the crew what's going

418

00:15:34,069 --> 00:15:31,920

on but have the crew help if there is a

419

00:15:35,509 --> 00:15:34,079

troubleshooting procedure like what we

420

00:15:37,829 --> 00:15:35,519

ended up having to do with what you just

421

00:15:39,350 --> 00:15:37,839

mentioned um you know with that with

422

00:15:41,990 --> 00:15:39,360

that ammonia leak we ended up sending a

423

00:15:44,069 --> 00:15:42,000

crew out to to track it down and

424

00:15:46,069 --> 00:15:44,079

actually fix it physically and we

425

00:15:48,790 --> 00:15:46,079

obviously couldn't do that from here but

426

00:15:49,590 --> 00:15:48,800

it was a great uh example of teamwork

427

00:15:53,189 --> 00:15:49,600

and

428

00:15:55,430 --> 00:15:53,199

short period of time to to make that

429

00:15:56,710 --> 00:15:55,440

happen and and keep the vehicle and the

430

00:15:58,949 --> 00:15:56,720

crew safe

431

00:16:01,990 --> 00:15:58,959

great question um another example of the

432

00:16:04,230 --> 00:16:02,000

team working together um we had a

433

00:16:06,310 --> 00:16:04,240

this is about three years ago now but um

434

00:16:08,629 --> 00:16:06,320

our co2 removal device

435

00:16:10,230 --> 00:16:08,639

it um suffered a software failure the

436

00:16:12,389 --> 00:16:10,240

hardware itself was fine but the

437

00:16:14,949 --> 00:16:12,399

software wasn't working properly

438

00:16:17,189 --> 00:16:14,959

so we ended up having to do

439

00:16:18,870 --> 00:16:17,199

manual commanding from the ground to

440

00:16:20,629 --> 00:16:18,880

basically manipulate it to do everything

441

00:16:23,110 --> 00:16:20,639

it needed to do that software would

442

00:16:25,829 --> 00:16:23,120

normally do for us so the ground

443

00:16:27,189 --> 00:16:25,839

basically that's an example the ground

444

00:16:30,310 --> 00:16:27,199

doing for the crew

445

00:16:32,230 --> 00:16:30,320

um what the crew didn't have to do so

446

00:16:36,310 --> 00:16:32,240

we did all the commanding everything

447

00:16:41,749 --> 00:16:38,790

wow that's really something thank you

448

00:16:47,670 --> 00:16:44,069

my name is akshay and answers my

449

00:16:51,509 --> 00:16:50,150

what is the outdoor the algorithm for

450

00:16:53,749 --> 00:16:51,519

solving an

451
00:16:55,910 --> 00:16:53,759
issue on the international space station

452
00:16:58,949 --> 00:16:55,920
do you have a specific procedure

453
00:17:00,870 --> 00:16:58,959
and who's in charge

454
00:17:02,710 --> 00:17:00,880
thank you

455
00:17:05,510 --> 00:17:02,720
i didn't quite get all that question

456
00:17:06,710 --> 00:17:05,520
actually you may have to repeat that

457
00:17:07,909 --> 00:17:06,720
okay

458
00:17:09,590 --> 00:17:07,919
um

459
00:17:11,590 --> 00:17:09,600
uh what is the algo

460
00:17:14,069 --> 00:17:11,600
what is the algorithm for solving an

461
00:17:16,309 --> 00:17:14,079
issue on the international space station

462
00:17:19,669 --> 00:17:16,319
do you have a specific procedure and

463
00:17:22,710 --> 00:17:19,679

who's in charge um ultimately the flight

464

00:17:24,390 --> 00:17:22,720

director is in charge for approving our

465

00:17:27,590 --> 00:17:24,400

troubleshooting methods

466

00:17:29,350 --> 00:17:27,600

but typically what happens is say like

467

00:17:33,190 --> 00:17:29,360

with the cdr example or excuse me the

468

00:17:35,110 --> 00:17:33,200

co2 example that was used earlier

469

00:17:37,750 --> 00:17:35,120

when the failure occurs my team was

470

00:17:39,830 --> 00:17:37,760

looking at okay how do we

471

00:17:42,150 --> 00:17:39,840

keep co2 removal going

472

00:17:44,870 --> 00:17:42,160

and not impact the mission

473

00:17:47,270 --> 00:17:44,880

so we sat down figured out okay how do

474

00:17:49,029 --> 00:17:47,280

we make this work

475

00:17:50,950 --> 00:17:49,039

once we had the plan we presented that

476
00:17:54,230 --> 00:17:50,960
to the flight director

477
00:17:55,669 --> 00:17:54,240
and they said yep sounds good go ahead

478
00:17:57,430 --> 00:17:55,679
and do what you need to do

479
00:17:59,029 --> 00:17:57,440
we documented that

480
00:18:00,870 --> 00:17:59,039
in a procedure

481
00:18:05,990 --> 00:18:00,880
flight approved it and then we started

482
00:18:06,000 --> 00:18:10,230
thank you thank you daniel

483
00:18:14,710 --> 00:18:12,470
hello my name is daniel and my question

484
00:18:16,230 --> 00:18:14,720
is can you communicate with the iss

485
00:18:18,630 --> 00:18:16,240
directly or do you have to use a

486
00:18:21,350 --> 00:18:18,640
satellite to connect to communications

487
00:18:24,070 --> 00:18:21,360
and what type of signal do you use

488
00:18:26,230 --> 00:18:24,080

exactly a cell phone signal radio or

489

00:18:28,070 --> 00:18:26,240

what's your primary type of signal

490

00:18:29,669 --> 00:18:28,080

thank you um we do have to use

491

00:18:31,110 --> 00:18:29,679

satellites to talk to the space station

492

00:18:32,470 --> 00:18:31,120

there is no direct line-of-sight

493

00:18:33,750 --> 00:18:32,480

communication

494

00:18:35,510 --> 00:18:33,760

um

495

00:18:37,430 --> 00:18:35,520

we use two types of signals to talk to

496

00:18:39,590 --> 00:18:37,440

the um space station

497

00:18:41,830 --> 00:18:39,600

one is called s-band which is similar to

498

00:18:43,830 --> 00:18:41,840

what you would think of as a cell phone

499

00:18:45,350 --> 00:18:43,840

which gives us our telemetry that we

500

00:18:47,430 --> 00:18:45,360

look at for all of our troubleshooting

501
00:18:49,909 --> 00:18:47,440
our day-to-day monitoring and our voice

502
00:18:52,870 --> 00:18:49,919
communication with the crew

503
00:18:54,950 --> 00:18:52,880
the second set is ku band which think of

504
00:18:56,549 --> 00:18:54,960
that like the internet that's what gives

505
00:18:58,789 --> 00:18:56,559
us all of our

506
00:19:00,070 --> 00:18:58,799
payload information that we get and all

507
00:19:03,430 --> 00:19:00,080
of our video

508
00:19:04,710 --> 00:19:03,440
that we see coming from space

509
00:19:06,549 --> 00:19:04,720
so

510
00:19:08,310 --> 00:19:06,559
just to add to that the the

511
00:19:10,470 --> 00:19:08,320
communications that we get from this

512
00:19:12,710 --> 00:19:10,480
station they have a big dish on the

513
00:19:15,510 --> 00:19:12,720

station just like a satellite dish and

514

00:19:17,990 --> 00:19:15,520

and that can communicate directly with

515

00:19:19,669 --> 00:19:18,000

communication satellites and then that

516

00:19:22,230 --> 00:19:19,679

transmission is bounced to the ground

517

00:19:24,230 --> 00:19:22,240

and bounced here to mission control so

518

00:19:25,990 --> 00:19:24,240

we we can stay in pretty constant

519

00:19:27,590 --> 00:19:26,000

contact with the crew we have short

520

00:19:29,830 --> 00:19:27,600

periods of time here and there where we

521

00:19:32,710 --> 00:19:29,840

lose the signal right and yes and that

522

00:19:35,029 --> 00:19:32,720

and um um but for the most part we can

523

00:19:36,630 --> 00:19:35,039

stay in pretty close contact with them

524

00:19:38,070 --> 00:19:36,640

now way way back

525

00:19:39,750 --> 00:19:38,080

in the

526

00:19:41,830 --> 00:19:39,760

gemini days you know we were talking

527

00:19:43,750 --> 00:19:41,840

about gemini earlier that

528

00:19:45,430 --> 00:19:43,760

we didn't have the communication

529

00:19:47,190 --> 00:19:45,440

satellite capability so we did have

530

00:19:49,190 --> 00:19:47,200

ground stations

531

00:19:50,789 --> 00:19:49,200

and the spacecraft could talk directly

532

00:19:53,350 --> 00:19:50,799

to the ground but only during short

533

00:19:56,710 --> 00:19:53,360

periods of time yes so the the the

534

00:19:59,430 --> 00:19:56,720

ability to talk to the space station um

535

00:20:00,630 --> 00:19:59,440

has changed so dramatically over the the

536

00:20:02,710 --> 00:20:00,640

last 40

537

00:20:04,950 --> 00:20:02,720

50 years

538

00:20:07,110 --> 00:20:04,960

and that allows us and not only do we

539

00:20:09,350 --> 00:20:07,120

can communicate on one channel but we

540

00:20:11,669 --> 00:20:09,360

actually have four different voice

541

00:20:13,590 --> 00:20:11,679

channels now right so the crews can

542

00:20:15,990 --> 00:20:13,600

actually be talking on different

543

00:20:18,549 --> 00:20:16,000

channels about different experiments uh

544

00:20:21,110 --> 00:20:18,559

just like we would on the ground in in

545

00:20:23,750 --> 00:20:21,120

offices to get work done it's uh that's

546

00:20:26,950 --> 00:20:23,760

a great question

547

00:20:32,549 --> 00:20:29,430

i'm nicole and we were watching the

548

00:20:36,149 --> 00:20:32,559

launch replay of the soyuz spacecraft

549

00:20:37,909 --> 00:20:36,159

and um i'm wondering uh why were there

550

00:20:41,830 --> 00:20:37,919

stuffed animals hanging from the

551
00:20:43,909 --> 00:20:42,630
um

552
00:20:45,590 --> 00:20:43,919
well it gave us something entertaining

553
00:20:46,870 --> 00:20:45,600
to watch didn't it

554
00:20:48,870 --> 00:20:46,880
um

555
00:20:51,350 --> 00:20:48,880
it uh

556
00:20:52,870 --> 00:20:51,360
that varies from crew to crew um some

557
00:20:55,510 --> 00:20:52,880
crew like having stuffed animals to play

558
00:20:57,909 --> 00:20:55,520
with on orbit um

559
00:21:00,470 --> 00:20:57,919
and it gave you a pretty good view of

560
00:21:02,549 --> 00:21:00,480
okay how much rocking is the soyuz going

561
00:21:04,390 --> 00:21:02,559
through is on its way up

562
00:21:05,830 --> 00:21:04,400
um

563
00:21:08,230 --> 00:21:05,840

but generally the stuffed animals that's

564

00:21:10,070 --> 00:21:08,240

a crew preference item yeah it's it's

565

00:21:12,070 --> 00:21:10,080

it's interesting it's um

566

00:21:13,750 --> 00:21:12,080

it is it is a scientific approach like

567

00:21:15,909 --> 00:21:13,760

jason says

568

00:21:17,669 --> 00:21:15,919

it shows the crew when they actually you

569

00:21:20,230 --> 00:21:17,679

know they can obviously feel the gravity

570

00:21:21,990 --> 00:21:20,240

building up on them or the g-forces

571

00:21:23,990 --> 00:21:22,000

excuse me building up on them as they

572

00:21:26,149 --> 00:21:24,000

climb into space once they get into

573

00:21:26,870 --> 00:21:26,159

space and the engines shut down it's

574

00:21:28,950 --> 00:21:26,880

like

575

00:21:29,990 --> 00:21:28,960

it's instant and now you see a view

576
00:21:32,710 --> 00:21:30,000
inside

577
00:21:35,750 --> 00:21:32,720
the vehicle for the launch the other day

578
00:21:40,470 --> 00:21:37,990
when that engine shuts off it's instant

579
00:21:41,669 --> 00:21:40,480
micro gravity or zero g

580
00:21:45,510 --> 00:21:41,679
and

581
00:21:48,149 --> 00:21:45,520
that you saw there

582
00:21:50,710 --> 00:21:48,159
his children actually pick the small toy

583
00:21:52,470 --> 00:21:50,720
that they and each crew member is each

584
00:21:54,310 --> 00:21:52,480
each flight is different but that's

585
00:21:56,950 --> 00:21:54,320
that's what that's all about and it's

586
00:21:59,190 --> 00:21:56,960
it's obviously a sentimental

587
00:22:02,070 --> 00:21:59,200
item but it's also has a scientific

588
00:22:05,110 --> 00:22:02,080

purpose as well

589

00:22:08,149 --> 00:22:05,120

hey amara hi i'm amara and my question

590

00:22:11,350 --> 00:22:08,159

is what new materials or information

591

00:22:14,870 --> 00:22:11,360

do does the new crew and iss hope to

592

00:22:17,750 --> 00:22:15,909

um

593

00:22:20,710 --> 00:22:17,760

the main thing is basically the crew

594

00:22:23,590 --> 00:22:20,720

themselves the experiments um

595

00:22:24,870 --> 00:22:23,600

on them as we determine how is space

596

00:22:26,870 --> 00:22:24,880

affecting them

597

00:22:27,990 --> 00:22:26,880

so that helps us determine more data for

598

00:22:29,909 --> 00:22:28,000

when we go to

599

00:22:32,149 --> 00:22:29,919

moon and mars

600

00:22:38,310 --> 00:22:32,159

how is long-term exposure to

601
00:22:44,070 --> 00:22:42,149
my name is and my question is um what is

602
00:22:47,350 --> 00:22:44,080
your favorite mission that you're

603
00:22:48,789 --> 00:22:47,360
working on in mission control

604
00:22:52,830 --> 00:22:48,799
do you have a favorite

605
00:23:00,789 --> 00:22:56,310
yes um

606
00:23:04,870 --> 00:23:03,669
i'd have to say my favorite mission uh

607
00:23:08,630 --> 00:23:04,880
was

608
00:23:11,029 --> 00:23:08,640
the lead for that when we launched the

609
00:23:12,070 --> 00:23:11,039
columbus module

610
00:23:14,549 --> 00:23:12,080
it was fun working with the

611
00:23:16,070 --> 00:23:14,559
international partners and

612
00:23:18,549 --> 00:23:16,080
attaching a brand new module to the

613
00:23:19,990 --> 00:23:18,559

space station so i have to say that was

614

00:23:24,789 --> 00:23:20,000

probably holds a special place in my

615

00:23:29,669 --> 00:23:27,270

hi my name is benjamin and hammond and

616

00:23:33,270 --> 00:23:29,679

my dad was tyler and hammond and he

617

00:23:34,549 --> 00:23:33,280

worked in the canadian space agency on a

618

00:23:36,789 --> 00:23:34,559

satellite

619

00:23:38,230 --> 00:23:36,799

and my i'm wondering

620

00:23:41,750 --> 00:23:38,240

what was the

621

00:23:45,029 --> 00:23:41,760

second most important um

622

00:23:46,390 --> 00:23:45,039

contribution to the iss other than the

623

00:23:48,630 --> 00:23:46,400

canadar

624

00:23:51,430 --> 00:23:48,640

notice canada became number one from a

625

00:23:54,149 --> 00:23:51,440

canadian point of view

626

00:23:56,630 --> 00:23:54,159

well obviously it's it's and it is a

627

00:23:59,590 --> 00:23:56,640

very important component of the of the

628

00:24:02,070 --> 00:23:59,600

international space station for sure

629

00:24:03,510 --> 00:24:02,080

um jason's gonna say columbus again

630

00:24:05,590 --> 00:24:03,520

because he worked the shuttle flight

631

00:24:07,909 --> 00:24:05,600

that delivered the european laboratory

632

00:24:09,909 --> 00:24:07,919

right but

633

00:24:11,269 --> 00:24:09,919

um well you know canada holds a special

634

00:24:12,149 --> 00:24:11,279

place in my heart since i grew up on the

635

00:24:13,350 --> 00:24:12,159

border

636

00:24:15,110 --> 00:24:13,360

um

637

00:24:16,470 --> 00:24:15,120

but i'd say the canadian crew probably

638

00:24:19,510 --> 00:24:16,480

is

639

00:24:20,470 --> 00:24:19,520

probably the next best thing to the arm

640

00:24:22,310 --> 00:24:20,480

uh

641

00:24:23,830 --> 00:24:22,320

and that the cane crew that goes up

642

00:24:25,830 --> 00:24:23,840

there like chris hatfield that was just

643

00:24:28,390 --> 00:24:25,840

there um he did a lot of

644

00:24:30,070 --> 00:24:28,400

good uh interaction with the

645

00:24:32,710 --> 00:24:30,080

a lot of children on the ground and

646

00:24:36,950 --> 00:24:32,720

bringing them more closer to the

647

00:24:40,950 --> 00:24:38,870

last one i think

648

00:24:42,789 --> 00:24:40,960

do the different mission controls

649

00:24:43,990 --> 00:24:42,799

connect to each other and if they do how

650

00:24:45,350 --> 00:24:44,000

do they

651
00:24:46,630 --> 00:24:45,360
do that

652
00:24:49,110 --> 00:24:46,640
could you say the

653
00:24:53,029 --> 00:24:49,120
the mission controls for

654
00:24:56,070 --> 00:24:54,390
um

655
00:24:57,909 --> 00:24:56,080
we all we all are connected to each

656
00:25:00,870 --> 00:24:57,919
other and that's through uh basically to

657
00:25:04,390 --> 00:25:02,470
that we

658
00:25:06,149 --> 00:25:04,400
have interfaces so we can talk to each

659
00:25:08,070 --> 00:25:06,159
other

660
00:25:11,029 --> 00:25:08,080
share telemetry

661
00:25:12,789 --> 00:25:11,039
share experimental information

662
00:25:15,750 --> 00:25:12,799
but all that is

663
00:25:17,990 --> 00:25:15,760

all connected through the internet

664

00:25:20,310 --> 00:25:18,000

well that was a great uh great bunch of

665

00:25:21,990 --> 00:25:20,320

questions we if we had time we'd sit

666

00:25:24,630 --> 00:25:22,000

here with you guys all day but you all

667

00:25:25,350 --> 00:25:24,640

have school work probably to get back to

668

00:25:28,390 --> 00:25:25,360

and

669

00:25:31,110 --> 00:25:28,400

jason's got to get back to work as well

670

00:25:33,510 --> 00:25:31,120

but we really enjoyed y'all coming

671

00:25:35,190 --> 00:25:33,520

inside mission control with us and

672

00:25:37,110 --> 00:25:35,200

and talking with us today and we loved

673

00:25:40,070 --> 00:25:37,120

all the questions we really appreciate

674

00:25:41,029 --> 00:25:40,080

it do i have time to say yeah

675

00:25:42,230 --> 00:25:41,039

um

676

00:25:44,390 --> 00:25:42,240

the one thing i wanted to say to you

677

00:25:45,590 --> 00:25:44,400

guys is if you can dream it you can do

678

00:25:47,590 --> 00:25:45,600

it

679

00:25:49,669 --> 00:25:47,600

don't let yourself be put into a box of

680

00:25:52,789 --> 00:25:49,679

what you can and can't do

681

00:25:56,950 --> 00:25:54,070

work hard

682

00:25:59,110 --> 00:25:56,960

get that education

683

00:26:00,630 --> 00:25:59,120

and just follow your hearts

684

00:26:01,990 --> 00:26:00,640

and you'll do anything that you want to

685

00:26:04,310 --> 00:26:02,000

do

686

00:26:06,710 --> 00:26:04,320

great advice you guys have a great day

687

00:26:08,310 --> 00:26:06,720

and we really enjoyed it thank you

688

00:26:11,110 --> 00:26:08,320

inspirational

689

00:26:12,950 --> 00:26:11,120

uh and the answers and all the work that

690

00:26:14,549 --> 00:26:12,960

you that you took time out of your day

691

00:26:17,029 --> 00:26:14,559

and left your seat empty on mission

692

00:26:18,630 --> 00:26:17,039

control so that you could be with us we

693

00:26:20,710 --> 00:26:18,640

thank you for that

694

00:26:23,750 --> 00:26:20,720

i'm happy to be here it was very fun