
PAO

1
00:00:05,269 --> 00:00:02,710
hi and here with us today i'm here with

2
00:00:07,510 --> 00:00:05,279
the station flight control direct flight

3
00:00:08,710 --> 00:00:07,520
director um royce renfrew welcome royce

4
00:00:11,030 --> 00:00:08,720
thank you for joining us today you're

5
00:00:13,190 --> 00:00:11,040
welcome thanks for having me um roy so

6
00:00:14,950 --> 00:00:13,200
first of all um you you just came off a

7
00:00:16,310 --> 00:00:14,960
shift from last week during this this

8
00:00:17,830 --> 00:00:16,320
particular shift and i know there are a

9
00:00:19,510 --> 00:00:17,840
lot of activities but first i want to

10
00:00:21,590 --> 00:00:19,520
talk go into just talking a little about

11
00:00:23,029 --> 00:00:21,600
you so just um tell me how long have you

12
00:00:25,750 --> 00:00:23,039
been here right now so

13
00:00:27,429 --> 00:00:25,760

i've been here about 15 years i started

14
00:00:29,509 --> 00:00:27,439
here as a

15
00:00:32,229 --> 00:00:29,519
robotics instructor working with the

16
00:00:34,069 --> 00:00:32,239
increment 2 and increment 4 crew so it's

17
00:00:35,910 --> 00:00:34,079
a really long time ago an increment

18
00:00:37,830 --> 00:00:35,920
you're talking about the actual missions

19
00:00:40,229 --> 00:00:37,840
the expedition missions now we're on

20
00:00:41,670 --> 00:00:40,239
expedition 30. so i'll tell you how long

21
00:00:43,830 --> 00:00:41,680
in a long time

22
00:00:45,110 --> 00:00:43,840
so i worked as an instructor

23
00:00:47,029 --> 00:00:45,120
for a number of years and then i

24
00:00:49,830 --> 00:00:47,039
transferred from there into the robotics

25
00:00:52,630 --> 00:00:49,840
operations group for the robos so i sat

26
00:00:54,389 --> 00:00:52,640
on console a number of missions for for

27
00:00:56,950 --> 00:00:54,399
robo and i transferred out of there into

28
00:00:58,389 --> 00:00:56,960
the odin group which is the

29
00:00:59,910 --> 00:00:58,399
the group of folks here in the flight

30
00:01:02,229 --> 00:00:59,920
control team that are responsible for

31
00:01:04,149 --> 00:01:02,239
all the onboard computer system not the

32
00:01:05,030 --> 00:01:04,159
laptops that the crew interfaces with

33
00:01:06,789 --> 00:01:05,040
but

34
00:01:09,030 --> 00:01:06,799
the computers that collect data and

35
00:01:10,550 --> 00:01:09,040
transmit commands and whatnot back and

36
00:01:12,710 --> 00:01:10,560
forth from the ground

37
00:01:14,630 --> 00:01:12,720
i did that for a while and then i

38
00:01:16,310 --> 00:01:14,640

transferred i was selected as the group

39
00:01:17,910 --> 00:01:16,320
lead for that group and worked in that

40
00:01:21,030 --> 00:01:17,920
for about a year and then i was selected

41
00:01:22,630 --> 00:01:21,040
as a flight director in may of 2008 so

42
00:01:23,830 --> 00:01:22,640
i've been a flight director about four

43
00:01:25,270 --> 00:01:23,840
years now

44
00:01:27,190 --> 00:01:25,280
done a lot of really cool stuff as a

45
00:01:28,870 --> 00:01:27,200
flight director and i've enjoyed pretty

46
00:01:30,390 --> 00:01:28,880
much every every day i've been here at

47
00:01:31,990 --> 00:01:30,400
nasa it's a lot of fun to come work out

48
00:01:33,830 --> 00:01:32,000
here great well i can't imagine there

49
00:01:35,030 --> 00:01:33,840
not been any exciting moments but tell

50
00:01:37,190 --> 00:01:35,040
me um

51
00:01:38,469 --> 00:01:37,200
is there any significant moment that you

52
00:01:40,069 --> 00:01:38,479
was

53
00:01:41,830 --> 00:01:40,079
the most exciting for you during your

54
00:01:44,469 --> 00:01:41,840
time here as a flight director

55
00:01:45,990 --> 00:01:44,479
um there are a number uh

56
00:01:47,749 --> 00:01:46,000
the

57
00:01:50,069 --> 00:01:47,759
when i was robotics flight controller

58
00:01:51,270 --> 00:01:50,079
the day we installed the s zero truss

59
00:01:53,270 --> 00:01:51,280
that was my

60
00:01:54,789 --> 00:01:53,280
responsibility and that was the first

61
00:01:57,590 --> 00:01:54,799
trust segment that got installed on

62
00:02:00,469 --> 00:01:57,600
board iss that's a day that stands out

63
00:02:02,069 --> 00:02:00,479

as a very exciting day and a lot of work

64
00:02:04,230 --> 00:02:02,079
uh the day i was selected as a flight

65
00:02:06,310 --> 00:02:04,240
director it's uh it's very competitive

66
00:02:08,309 --> 00:02:06,320
to become a flight director and

67
00:02:10,949 --> 00:02:08,319
a lot of folks apply for that job and a

68
00:02:12,309 --> 00:02:10,959
lot of very high quality well-qualified

69
00:02:13,910 --> 00:02:12,319
people that are that are trying to get

70
00:02:15,910 --> 00:02:13,920
the job at flight director and so the

71
00:02:17,830 --> 00:02:15,920
day i got selected was a very good uh

72
00:02:20,190 --> 00:02:17,840
very good day

73
00:02:23,110 --> 00:02:20,200
the 133 mission i was the lead for

74
00:02:25,510 --> 00:02:23,120
sts-133 on the station side with brian

75
00:02:27,510 --> 00:02:25,520
lunny was my shuttle counterpart so the

76
00:02:28,869 --> 00:02:27,520
entire 133 mission

77
00:02:30,070 --> 00:02:28,879
was uh

78
00:02:33,509 --> 00:02:30,080
was very

79
00:02:34,869 --> 00:02:33,519
mission of the space shuttle discovery

80
00:02:36,790 --> 00:02:34,879
and working with just a really

81
00:02:39,110 --> 00:02:36,800
outstanding crew both from the shuttle

82
00:02:41,030 --> 00:02:39,120
and station programs and and there's a

83
00:02:42,390 --> 00:02:41,040
lot of big memories from 133 we just

84
00:02:43,750 --> 00:02:42,400
actually celebrated our one year

85
00:02:46,790 --> 00:02:43,760
anniversary of

86
00:02:48,229 --> 00:02:46,800
133 landing a couple weeks ago so and

87
00:02:51,990 --> 00:02:48,239
then the increment 29 i was the

88
00:02:54,390 --> 00:02:52,000

increment 29 lead with mike fossum and

89
00:02:55,589 --> 00:02:54,400
sergey volkov and satoshi furukawa on

90
00:02:57,110 --> 00:02:55,599
the vehicle and

91
00:02:59,110 --> 00:02:57,120
that that mission didn't turn out

92
00:03:01,350 --> 00:02:59,120
anything like we planned it but it was

93
00:03:03,350 --> 00:03:01,360
it was still a lot of fun to go work

94
00:03:05,030 --> 00:03:03,360
especially with mike i've known him for

95
00:03:07,190 --> 00:03:05,040
years and having him as the commander on

96
00:03:09,110 --> 00:03:07,200
the vehicle while i was the while i was

97
00:03:11,110 --> 00:03:09,120
the lead flight director was was was

98
00:03:12,790 --> 00:03:11,120
really cool well so you mentioned that

99
00:03:15,350 --> 00:03:12,800
you know that mission didn't go anyway

100
00:03:17,509 --> 00:03:15,360
as we planned it and as i i know that

101
00:03:19,190 --> 00:03:17,519
that was that is the case explain to us

102
00:03:20,949 --> 00:03:19,200
just a little about um you know no

103
00:03:22,869 --> 00:03:20,959
matter how much planning we go how

104
00:03:25,830 --> 00:03:22,879
things can definitely not follow that

105
00:03:27,990 --> 00:03:25,840
plan and and what is your role in

106
00:03:30,390 --> 00:03:28,000
that sort of um

107
00:03:32,869 --> 00:03:30,400
sure so so really the flight directors

108
00:03:34,789 --> 00:03:32,879
have um a bunch of different hats that

109
00:03:37,110 --> 00:03:34,799
they wear uh courtney sitting over there

110
00:03:39,910 --> 00:03:37,120
the flight director's console today

111
00:03:42,710 --> 00:03:39,920
is uh his day is responsible for today's

112
00:03:44,309 --> 00:03:42,720
activities and she's monitoring all the

113
00:03:46,149 --> 00:03:44,319

all the systems and all the activities

114
00:03:47,670 --> 00:03:46,159
that the crew's doing and is

115
00:03:49,030 --> 00:03:47,680
keeping her keeping her thumb on the

116
00:03:50,630 --> 00:03:49,040
pulse of all the stuff that's going on

117
00:03:52,869 --> 00:03:50,640
on the ground and what the crew's doing

118
00:03:54,470 --> 00:03:52,879
on the vehicle at the same time she's

119
00:03:56,229 --> 00:03:54,480
planning or reviewing plans that are

120
00:03:58,229 --> 00:03:56,239
going to be conducted next day and three

121
00:04:00,470 --> 00:03:58,239
days out and seven days out

122
00:04:02,630 --> 00:04:00,480
so the on console flight director's

123
00:04:04,390 --> 00:04:02,640
responsibility is really

124
00:04:06,710 --> 00:04:04,400
the down and in what exactly are we

125
00:04:08,390 --> 00:04:06,720
doing today monitoring the systems as i

126
00:04:10,229 --> 00:04:08,400
said and always being prepared for when

127
00:04:13,110 --> 00:04:10,239
things go wrong how to triage the

128
00:04:14,710 --> 00:04:13,120
timeline how to how to how to work

129
00:04:17,270 --> 00:04:14,720
problems that come up any caution and

130
00:04:19,670 --> 00:04:17,280
warning you always see the kosh warning

131
00:04:21,349 --> 00:04:19,680
display behind this view and thicker

132
00:04:22,950 --> 00:04:21,359
here whenever that has yellow or red on

133
00:04:24,230 --> 00:04:22,960
it that's somebody in here is doing

134
00:04:26,950 --> 00:04:24,240
something because something went wrong

135
00:04:29,749 --> 00:04:28,310
so that's the on console flight

136
00:04:32,310 --> 00:04:29,759
director's job and then

137
00:04:34,950 --> 00:04:32,320
the increment lead flight director uh in

138
00:04:38,550 --> 00:04:34,960

this case uh franklin 30 is uh scott

139
00:04:41,110 --> 00:04:38,560
stover and he is responsible for um

140
00:04:42,469 --> 00:04:41,120
the longer term plan for this entire

141
00:04:44,230 --> 00:04:42,479
increment so

142
00:04:45,909 --> 00:04:44,240
he's not looking at what we're doing

143
00:04:47,909 --> 00:04:45,919
today other than hoping that we get it

144
00:04:50,230 --> 00:04:47,919
all done today as he planned it but he's

145
00:04:51,749 --> 00:04:50,240
looking two and three weeks out and and

146
00:04:53,350 --> 00:04:51,759
four weeks out and planning the

147
00:04:54,870 --> 00:04:53,360
activities that are going to domino

148
00:04:55,670 --> 00:04:54,880
through the cruise timeline and through

149
00:05:06,070 --> 00:04:55,680
the

150
00:05:07,909 --> 00:05:06,080
increment team is responsible for making

151
00:05:09,830 --> 00:05:07,919
sure that's all potted and ready to go

152
00:05:12,469 --> 00:05:09,840
to hand over to the real time team to go

153
00:05:14,710 --> 00:05:12,479
execute and then the flight directors

154
00:05:16,230 --> 00:05:14,720
also have their have various different

155
00:05:18,550 --> 00:05:16,240
other activities that we're working on

156
00:05:20,070 --> 00:05:18,560
in the office like i'm the generic joint

157
00:05:22,469 --> 00:05:20,080
operations panel

158
00:05:24,150 --> 00:05:22,479
lead so we look at

159
00:05:26,150 --> 00:05:24,160
how we operate the vehicle and what we

160
00:05:27,590 --> 00:05:26,160
should change to make that better there

161
00:05:29,670 --> 00:05:27,600
are folks who are leads for various

162
00:05:32,550 --> 00:05:29,680
software transitions we have leads for

163
00:05:33,990 --> 00:05:32,560

the for the cots vehicles coming up both

164
00:05:35,670 --> 00:05:34,000
the commercial vehicle and the

165
00:05:37,990 --> 00:05:35,680
commercial crew vehicle or the cargo

166
00:05:39,430 --> 00:05:38,000
vehicle in the commercial crew vehicle

167
00:05:40,790 --> 00:05:39,440
we have folks in our office who are

168
00:05:43,270 --> 00:05:40,800
embedded working on all of those

169
00:05:44,790 --> 00:05:43,280
different programs so we stay very busy

170
00:05:46,310 --> 00:05:44,800
even when we're not here on console

171
00:05:48,469 --> 00:05:46,320
doing a lot of stuff

172
00:05:50,550 --> 00:05:48,479
to do future execution of what we're

173
00:05:52,469 --> 00:05:50,560
going to do in here in picker one

174
00:05:54,629 --> 00:05:52,479
steph i like that

175
00:05:56,870 --> 00:05:54,639
lots of stuff so um talk to me a little

176
00:05:58,150 --> 00:05:56,880
about this room because there's like

177
00:05:59,830 --> 00:05:58,160
several pieces i'm not going to put you

178
00:06:01,510 --> 00:05:59,840
on the spot with knowing exactly the

179
00:06:03,430 --> 00:06:01,520
number of console positions unless of

180
00:06:05,430 --> 00:06:03,440
course you know that number not off the

181
00:06:08,150 --> 00:06:05,440
top of my head okay um maybe just

182
00:06:09,430 --> 00:06:08,160
explain to me about a little about how

183
00:06:11,430 --> 00:06:09,440
these um

184
00:06:12,870 --> 00:06:11,440
different folks interact with the flight

185
00:06:14,870 --> 00:06:12,880
director such as yourself if you're on

186
00:06:17,590 --> 00:06:14,880
console sure so

187
00:06:19,510 --> 00:06:17,600
uh in the room here we have

188
00:06:21,909 --> 00:06:19,520

subject matter experts for everything

189
00:06:24,309 --> 00:06:21,919
that's on board the iss so

190
00:06:25,909 --> 00:06:24,319
next to this pao console there's the

191
00:06:27,830 --> 00:06:25,919
thor console the thermal officers

192
00:06:29,670 --> 00:06:27,840
console and sitting next to them

193
00:06:31,110 --> 00:06:29,680
is a council named spartan who is

194
00:06:33,270 --> 00:06:31,120
responsible for

195
00:06:34,629 --> 00:06:33,280
power generation and external thermal

196
00:06:36,390 --> 00:06:34,639
we're actually combining those two

197
00:06:37,909 --> 00:06:36,400
consoles so you rarely ever see a thor

198
00:06:40,070 --> 00:06:37,919
setting on console anymore when there's

199
00:06:42,230 --> 00:06:40,080
a spartan on console we have folks in

200
00:06:44,629 --> 00:06:42,240
here who do attitude determination we

201
00:06:46,070 --> 00:06:44,639
have the robotics officer like i used to

202
00:06:47,830 --> 00:06:46,080
do they sit in here but they don't

203
00:06:49,589 --> 00:06:47,840
always sit in here when we're not doing

204
00:06:50,550 --> 00:06:49,599
something for robotics on board the

205
00:06:53,909 --> 00:06:50,560
vehicle

206
00:06:55,830 --> 00:06:53,919
we have the eva officer we have

207
00:06:57,670 --> 00:06:55,840
environmental control officer

208
00:06:59,589 --> 00:06:57,680
and so just generically if you want to

209
00:07:01,589 --> 00:06:59,599
think of it there are subject matter

210
00:07:03,670 --> 00:07:01,599
experts who sit for everything in this

211
00:07:06,629 --> 00:07:03,680
room and who are the point of contact

212
00:07:08,309 --> 00:07:06,639
for that system so pluto for example is

213
00:07:10,870 --> 00:07:08,319

responsible for all of the laptops that

214
00:07:12,629 --> 00:07:10,880
the crew interfaces with all the sscs

215
00:07:13,990 --> 00:07:12,639
and they do they have world map running

216
00:07:16,710 --> 00:07:14,000
and they have email and they have

217
00:07:18,870 --> 00:07:16,720
various applications that they run pluto

218
00:07:20,469 --> 00:07:18,880
is the person in in this room who is

219
00:07:22,790 --> 00:07:20,479
responsible for knowing everything about

220
00:07:24,950 --> 00:07:22,800
that system pluto not the planet right

221
00:07:26,790 --> 00:07:24,960
no not the planet right

222
00:07:28,629 --> 00:07:26,800
uh so if there's a problem if the crew

223
00:07:31,670 --> 00:07:28,639
calls down and says hey world map's not

224
00:07:33,830 --> 00:07:31,680
updating or hey this ssc is locked up

225
00:07:36,309 --> 00:07:33,840
and i can't transfer pictures to it or

226
00:07:37,830 --> 00:07:36,319
whatever i look to the pluto console as

227
00:07:39,350 --> 00:07:37,840
the subject matter expert to explain to

228
00:07:41,350 --> 00:07:39,360
me what the crew needs to do have we

229
00:07:42,550 --> 00:07:41,360
seen this signature before is this

230
00:07:44,390 --> 00:07:42,560
something new

231
00:07:46,150 --> 00:07:44,400
so the flight director is kind of at the

232
00:07:47,670 --> 00:07:46,160
top of that pinnacle up there where i

233
00:07:49,749 --> 00:07:47,680
have all these people in this room who

234
00:07:51,430 --> 00:07:49,759
are working for me who are subject

235
00:07:53,430 --> 00:07:51,440
matter experts in all the various

236
00:07:55,510 --> 00:07:53,440
activities that the crew is doing and

237
00:07:57,430 --> 00:07:55,520
they feed me information

238
00:07:58,950 --> 00:07:57,440

it's my job as flight director to

239
00:08:00,070 --> 00:07:58,960
balance all the stuff that i'm getting

240
00:08:01,909 --> 00:08:00,080
from all of these people because

241
00:08:03,749 --> 00:08:01,919
sometimes they're in conflict a lot of

242
00:08:05,270 --> 00:08:03,759
information coming in one one console

243
00:08:06,550 --> 00:08:05,280
might want to do one thing another

244
00:08:07,830 --> 00:08:06,560
console might want to do another thing

245
00:08:09,909 --> 00:08:07,840
that's that's going in a different

246
00:08:11,350 --> 00:08:09,919
direction it's the responsibility of the

247
00:08:13,589 --> 00:08:11,360
flight director's off uh flight

248
00:08:15,270 --> 00:08:13,599
director's console to sync all those

249
00:08:17,830 --> 00:08:15,280
together and come up with a forward plan

250
00:08:19,029 --> 00:08:17,840
then we can all go execute so a lot of

251
00:08:20,629 --> 00:08:19,039
different consoles in the room there's

252
00:08:21,990 --> 00:08:20,639
actually a console in this room sitting

253
00:08:23,430 --> 00:08:22,000
in the back corner over there called the

254
00:08:25,189 --> 00:08:23,440
ground controller

255
00:08:27,589 --> 00:08:25,199
who is responsible actually for this

256
00:08:28,469 --> 00:08:27,599
building this building is complicated

257
00:08:30,390 --> 00:08:28,479
enough

258
00:08:32,870 --> 00:08:30,400
that we have a flight control position

259
00:08:35,350 --> 00:08:32,880
who has nothing on board the iss his own

260
00:08:37,029 --> 00:08:35,360
his or her only responsibility is making

261
00:08:39,269 --> 00:08:37,039
sure this building is up and running and

262
00:08:41,269 --> 00:08:39,279
that we can command command the vehicle

263
00:08:42,389 --> 00:08:41,279

and receive telemetry etc

264
00:08:44,389 --> 00:08:42,399
well it sounds like you have a really

265
00:08:46,389 --> 00:08:44,399
big job and we definitely uh appreciate

266
00:08:49,110 --> 00:08:46,399
all the work that you do for us here

267
00:08:50,949 --> 00:08:49,120
um so we talked about that uh you were

268
00:08:52,790 --> 00:08:50,959
actually there in the hot seat just last

269
00:08:54,710 --> 00:08:52,800
week and uh there were some activities

270
00:08:56,310 --> 00:08:54,720
that were taking place one of the big

271
00:08:59,269 --> 00:08:56,320
activities i think was the uh the

272
00:09:00,870 --> 00:08:59,279
robonaut glove testing and um there was

273
00:09:03,269 --> 00:09:00,880
a sign language thing can you want to

274
00:09:05,269 --> 00:09:03,279
talk to me about that yeah so so

275
00:09:07,829 --> 00:09:05,279
robonaut last week

276
00:09:10,150 --> 00:09:07,839
so robonaut usually lives folded up and

277
00:09:12,150 --> 00:09:10,160
put away in in one of the

278
00:09:13,750 --> 00:09:12,160
racks on board iss

279
00:09:15,590 --> 00:09:13,760
and when we're going to do work with him

280
00:09:17,670 --> 00:09:15,600
we bring him out and and he lives in the

281
00:09:19,590 --> 00:09:17,680
lab standing on a pedestal right now

282
00:09:21,350 --> 00:09:19,600
because we haven't we haven't got the

283
00:09:23,509 --> 00:09:21,360
lower portion of the robot up there yet

284
00:09:25,190 --> 00:09:23,519
so we're just working with the torso and

285
00:09:26,070 --> 00:09:25,200
the arms and the head

286
00:09:28,230 --> 00:09:26,080
and

287
00:09:30,070 --> 00:09:28,240
we've been working with him sequentially

288
00:09:31,910 --> 00:09:30,080

since he came up actually came up on the

289
00:09:33,670 --> 00:09:31,920
133 mission

290
00:09:35,670 --> 00:09:33,680
about a year ago

291
00:09:38,150 --> 00:09:35,680
and sequentially we've been working with

292
00:09:40,710 --> 00:09:38,160
that particular payload to check it out

293
00:09:42,630 --> 00:09:40,720
on orbit so the very first things that

294
00:09:44,150 --> 00:09:42,640
robonaut did were just move his hands

295
00:09:45,990 --> 00:09:44,160
and make sure we could do that or move

296
00:09:47,990 --> 00:09:46,000
his arms and make sure we could do that

297
00:09:49,430 --> 00:09:48,000
or move his head and and we learned a

298
00:09:51,670 --> 00:09:49,440
lot about how

299
00:09:53,269 --> 00:09:51,680
this robot actually functions in zero g

300
00:09:55,190 --> 00:09:53,279
because it's not the same as he would be

301
00:09:57,269 --> 00:09:55,200
functioning on on earth

302
00:09:58,949 --> 00:09:57,279
we've tweaked some parameters and and

303
00:10:00,070 --> 00:09:58,959
changed some data that we're getting

304
00:10:02,230 --> 00:10:00,080
from him

305
00:10:04,550 --> 00:10:02,240
and finally last week he actually got to

306
00:10:06,550 --> 00:10:04,560
do some really cool stuff you mentioned

307
00:10:09,190 --> 00:10:06,560
the sign language he signed out hello

308
00:10:11,110 --> 00:10:09,200
world which i thought was really cool

309
00:10:12,710 --> 00:10:11,120
we also set him up in the lab and gave

310
00:10:14,630 --> 00:10:12,720
him a tool

311
00:10:17,030 --> 00:10:14,640
to measure some

312
00:10:19,590 --> 00:10:17,040
it's called a velocicalc tool and what

313
00:10:20,710 --> 00:10:19,600

it does is the the diffusers on board

314
00:10:23,030 --> 00:10:20,720
the station

315
00:10:25,190 --> 00:10:23,040
are put pumping out air that's been

316
00:10:27,269 --> 00:10:25,200
filtered and we always like to measure

317
00:10:29,269 --> 00:10:27,279
how fast the air is getting pumped out

318
00:10:30,550 --> 00:10:29,279
of those filters so we have a crew

319
00:10:32,310 --> 00:10:30,560
member every now and again go through

320
00:10:34,389 --> 00:10:32,320
with this little velocicalc tool which

321
00:10:35,350 --> 00:10:34,399
has a monitor on one hand and a wand in

322
00:10:37,350 --> 00:10:35,360
the other

323
00:10:39,430 --> 00:10:37,360
and hold the little wand in front of the

324
00:10:41,910 --> 00:10:39,440
the vent there and then read the numbers

325
00:10:43,509 --> 00:10:41,920
that it's that it's transmitting

326
00:10:45,110 --> 00:10:43,519
so there happens to be

327
00:10:48,150 --> 00:10:45,120
right near where we

328
00:10:50,870 --> 00:10:48,160
usually install robonaut one of those

329
00:10:53,350 --> 00:10:50,880
outlet vents so we gave robonaut the

330
00:10:54,790 --> 00:10:53,360
the little meter and the wand

331
00:10:57,030 --> 00:10:54,800
and then pretty much just turned him

332
00:10:59,030 --> 00:10:57,040
loose if you were watching the video he

333
00:11:00,949 --> 00:10:59,040
saw dan burbank every now and again came

334
00:11:02,710 --> 00:11:00,959
by to check on him but he was pretty

335
00:11:04,949 --> 00:11:02,720
much doing that all by himself so the

336
00:11:06,949 --> 00:11:04,959
ground uh folks here in houston and over

337
00:11:08,870 --> 00:11:06,959
in huntsville were commanding him to

338
00:11:10,790 --> 00:11:08,880

move that wand around in front of that

339
00:11:12,790 --> 00:11:10,800
vent and then every now and again he'd

340
00:11:15,750 --> 00:11:12,800
swivel his head over to read the monitor

341
00:11:17,990 --> 00:11:15,760
for us and actually did some real no

342
00:11:19,590 --> 00:11:18,000
kidding work which i just that that was

343
00:11:21,269 --> 00:11:19,600
way cool i enjoy i really enjoyed

344
00:11:23,590 --> 00:11:21,279
watching imagine that so robonaut had

345
00:11:25,670 --> 00:11:23,600
its first real day of work while you

346
00:11:27,030 --> 00:11:25,680
were on post here in the international

347
00:11:30,230 --> 00:11:27,040
space station flight control room that

348
00:11:32,150 --> 00:11:30,240
had been exciting for you um i know so

349
00:11:33,829 --> 00:11:32,160
you were talking about this this

350
00:11:36,069 --> 00:11:33,839
particular task and it sounds like a

351
00:11:38,150 --> 00:11:36,079
mundane task that but it's something

352
00:11:39,829 --> 00:11:38,160
that has to be done and uh with

353
00:11:42,470 --> 00:11:39,839
something like robonaut

354
00:11:45,350 --> 00:11:42,480
and its capability that would maybe

355
00:11:47,910 --> 00:11:45,360
uh free up some crew time yes absolutely

356
00:11:49,190 --> 00:11:47,920
anything that we can get the robot to do

357
00:11:50,870 --> 00:11:49,200
for us

358
00:11:51,910 --> 00:11:50,880
allows us not to

359
00:12:00,870 --> 00:11:51,920
the

360
00:12:01,910 --> 00:12:00,880
because you have to maintain that little

361
00:12:03,670 --> 00:12:01,920
wand

362
00:12:05,350 --> 00:12:03,680
at a very specific place while you're

363
00:12:07,110 --> 00:12:05,360

trying to read this reading at the same

364
00:12:09,430 --> 00:12:07,120
time and for a human that's extremely

365
00:12:11,670 --> 00:12:09,440
difficult to do so often we'll actually

366
00:12:13,030 --> 00:12:11,680
put two crew members to do that so one's

367
00:12:14,629 --> 00:12:13,040
reading the readings and writing the

368
00:12:17,350 --> 00:12:14,639
numbers down while the other is holding

369
00:12:19,590 --> 00:12:17,360
the wand as steady as they can

370
00:12:21,190 --> 00:12:19,600
uh for robonaut's case he once we told

371
00:12:23,269 --> 00:12:21,200
him to put the wand in that position he

372
00:12:25,190 --> 00:12:23,279
held it there for two and a half hours

373
00:12:27,190 --> 00:12:25,200
really just making minor movements to

374
00:12:29,030 --> 00:12:27,200
get different readings which is which is

375
00:12:31,430 --> 00:12:29,040
a real advantage because instead of me

376
00:12:33,190 --> 00:12:31,440
having to have two crew members do that

377
00:12:35,190 --> 00:12:33,200
go and there are a lot of vents all over

378
00:12:37,030 --> 00:12:35,200
station so instead of having two crew

379
00:12:39,430 --> 00:12:37,040
members go around literally just to read

380
00:12:41,430 --> 00:12:39,440
the outputs of these vents if we could

381
00:12:42,949 --> 00:12:41,440
get robonaut to do that for us we would

382
00:12:44,710 --> 00:12:42,959
not have to use the crew to do that and

383
00:12:46,949 --> 00:12:44,720
then the crew could go do other things

384
00:12:48,550 --> 00:12:46,959
like science like slice and all the

385
00:12:50,310 --> 00:12:48,560
other activities that the crew's capable

386
00:12:53,269 --> 00:12:50,320
of doing on board so anything the

387
00:12:56,470 --> 00:12:53,279
mundane activities that we can get this

388
00:12:58,069 --> 00:12:56,480

this robonaut payload to do for us is is

389
00:12:59,670 --> 00:12:58,079
is value added

390
00:13:01,910 --> 00:12:59,680
there's a lot of inventory that we

391
00:13:05,030 --> 00:13:01,920
always have the crew do we have them

392
00:13:07,110 --> 00:13:05,040
consolidating inventory from one ctb to

393
00:13:08,870 --> 00:13:07,120
another if we could get the robot to do

394
00:13:11,110 --> 00:13:08,880
that for us that's that's something

395
00:13:12,069 --> 00:13:11,120
anyone can do but it has to be done as

396
00:13:14,310 --> 00:13:12,079
you said

397
00:13:16,150 --> 00:13:14,320
uh so if we get the robot to do that for

398
00:13:18,069 --> 00:13:16,160
us and free up that time for the crew to

399
00:13:20,310 --> 00:13:18,079
do the stuff that we really want them

400
00:13:22,389 --> 00:13:20,320
doing on board that these are these are

401
00:13:23,990 --> 00:13:22,399
great advantages i'm going to love

402
00:13:26,470 --> 00:13:24,000
seeing this robot fully up and running

403
00:13:28,230 --> 00:13:26,480
you know and and i suppose potentially

404
00:13:29,750 --> 00:13:28,240
one day you know we could have a robot

405
00:13:31,350 --> 00:13:29,760
actually not only do the mundane

406
00:13:33,110 --> 00:13:31,360
activities but also those activities

407
00:13:34,870 --> 00:13:33,120
that may be dangerous consider dangerous

408
00:13:36,310 --> 00:13:34,880
for a crew member

409
00:13:37,269 --> 00:13:36,320
absolutely so

410
00:13:39,509 --> 00:13:37,279
um

411
00:13:41,189 --> 00:13:39,519
we could con one of the

412
00:13:42,870 --> 00:13:41,199
one of the ops concepts i've seen for

413
00:13:44,389 --> 00:13:42,880

robonaut eventually is to be able to go

414
00:13:47,030 --> 00:13:44,399
do an eva

415
00:13:50,230 --> 00:13:47,040
which is uh which is really cool to go

416
00:13:52,629 --> 00:13:50,240
to a spacewalk extra vehicular activity

417
00:13:55,350 --> 00:13:52,639
to go outside and and fix some hardware

418
00:13:57,829 --> 00:13:55,360
that that we have going outside or to go

419
00:14:00,150 --> 00:13:57,839
outside with a crew member or to

420
00:14:01,350 --> 00:14:00,160
to assist in an eva would be would be

421
00:14:02,389 --> 00:14:01,360
very useful

422
00:14:05,590 --> 00:14:02,399
um

423
00:14:07,430 --> 00:14:05,600
being able to send the robot in if uh

424
00:14:09,350 --> 00:14:07,440
heaven forbid we ever had a fire on the

425
00:14:11,910 --> 00:14:09,360
vehicle like we had on mir

426
00:14:13,750 --> 00:14:11,920
uh if we hadn't if we had that situation

427
00:14:15,829 --> 00:14:13,760
and we were we didn't want to send the

428
00:14:17,990 --> 00:14:15,839
crew in there to try to put out this

429
00:14:19,910 --> 00:14:18,000
fire take measurements for us we could

430
00:14:21,990 --> 00:14:19,920
conceivably send this robot in there in

431
00:14:24,069 --> 00:14:22,000
dangerous situations

432
00:14:25,750 --> 00:14:24,079
that he could he's well suited for

433
00:14:27,350 --> 00:14:25,760
working in that that we can see we

434
00:14:29,990 --> 00:14:27,360
wouldn't want to send the crew in these

435
00:14:31,910 --> 00:14:30,000
are all way down the road but you saw

436
00:14:34,069 --> 00:14:31,920
the first step of that just last week

437
00:14:35,910 --> 00:14:34,079
when he actually did some real work on

438
00:14:38,629 --> 00:14:35,920

orbit for us and took some glasgow

439
00:14:40,629 --> 00:14:38,639
greetings for us yeah very good and so

440
00:14:42,829 --> 00:14:40,639
um that was very exciting um activity

441
00:14:45,750 --> 00:14:42,839
that took place last week but also

442
00:14:47,030 --> 00:14:45,760
um other activities i understand the way

443
00:14:48,870 --> 00:14:47,040
the timeline works i mean everything

444
00:14:49,910 --> 00:14:48,880
that we do is is kind of a building

445
00:14:51,829 --> 00:14:49,920
block for the next thing that we're

446
00:14:53,750 --> 00:14:51,839
going to do so were there any activities

447
00:14:55,189 --> 00:14:53,760
last week that you know of that

448
00:14:58,710 --> 00:14:55,199
basically set us up for activities are

449
00:15:01,189 --> 00:14:58,720
going to take place this week sure so um

450
00:15:04,550 --> 00:15:01,199
we have this combustions interface rack

451
00:15:06,230 --> 00:15:04,560
i think the is interface see a serve

452
00:15:07,829 --> 00:15:06,240
a combustion rack on the vehicle we do a

453
00:15:11,189 --> 00:15:07,839
lot of stuff with fire on the vehicle as

454
00:15:14,310 --> 00:15:11,199
you've seen don working with slice today

455
00:15:16,550 --> 00:15:14,320
it has inside it has little bottles of

456
00:15:18,790 --> 00:15:16,560
various different kinds of gas

457
00:15:20,629 --> 00:15:18,800
that we remotely from the ground in

458
00:15:22,230 --> 00:15:20,639
particular out at huntsville at poic

459
00:15:24,470 --> 00:15:22,240
where this is operated

460
00:15:26,470 --> 00:15:24,480
they'll take a little droplet of the gas

461
00:15:28,790 --> 00:15:26,480
and put it on a put it in this little

462
00:15:30,230 --> 00:15:28,800
chamber and ignite it and then they look

463
00:15:32,710 --> 00:15:30,240

to see what it looks like when it

464
00:15:34,150 --> 00:15:32,720
ignites in zero g so what we're looking

465
00:15:36,470 --> 00:15:34,160
at there's the different properties of

466
00:15:38,230 --> 00:15:36,480
the ignition of this gas in zero g with

467
00:15:40,949 --> 00:15:38,240
different types of gases

468
00:15:42,790 --> 00:15:40,959
so as we go we obviously use up the gas

469
00:15:44,710 --> 00:15:42,800
that's in this uh

470
00:15:45,990 --> 00:15:44,720
in this experiment and then every now

471
00:15:47,430 --> 00:15:46,000
and again we have to have the crew go in

472
00:15:49,670 --> 00:15:47,440
and take it apart and replace those

473
00:15:52,069 --> 00:15:49,680
bottles for us so commander burbank did

474
00:15:53,430 --> 00:15:52,079
that for us last night and i saw the

475
00:15:55,829 --> 00:15:53,440
timeline i think tomorrow they're going

476
00:15:57,670 --> 00:15:55,839
to do some some more sheer runs with the

477
00:15:59,269 --> 00:15:57,680
models that he changed out

478
00:16:00,629 --> 00:15:59,279
some more long-term stuff that we're

479
00:16:01,910 --> 00:16:00,639
doing

480
00:16:04,870 --> 00:16:01,920
we're eventually going to get an

481
00:16:07,990 --> 00:16:04,880
upgraded communication system for iss a

482
00:16:09,509 --> 00:16:08,000
high rate com system or hrcs

483
00:16:11,590 --> 00:16:09,519
and that's actually been a very

484
00:16:13,990 --> 00:16:11,600
long-term project in increment 29 we did

485
00:16:16,230 --> 00:16:14,000
some work in 28 we did some work

486
00:16:17,670 --> 00:16:16,240
so last week dan rotated down a couple

487
00:16:19,189 --> 00:16:17,680
of racks for us and installed some

488
00:16:20,710 --> 00:16:19,199

additional cabling

489
00:16:22,710 --> 00:16:20,720
and eventually in a couple of years here

490
00:16:24,550 --> 00:16:22,720
we'll or not i think later this year

491
00:16:27,269 --> 00:16:24,560
actually we'll activate that system

492
00:16:29,749 --> 00:16:27,279
which uses the new epic cards that we

493
00:16:32,470 --> 00:16:29,759
installed in the cnc's and it allows us

494
00:16:34,870 --> 00:16:32,480
to get much more data off the vehicle

495
00:16:37,910 --> 00:16:34,880
than we do right now and at a higher

496
00:16:39,189 --> 00:16:37,920
rate so dan worked on doing some of that

497
00:16:41,030 --> 00:16:39,199
uh

498
00:16:43,030 --> 00:16:41,040
don's been working with the folks out in

499
00:16:44,470 --> 00:16:43,040
cleveland doing slice experiments for a

500
00:16:45,990 --> 00:16:44,480
while now

501
00:16:47,350 --> 00:16:46,000
they did a couple of those runs last

502
00:16:48,870 --> 00:16:47,360
week and it's kind of an iterative

503
00:16:51,430 --> 00:16:48,880
process

504
00:16:53,430 --> 00:16:51,440
as we and it's kind of really like

505
00:16:55,350 --> 00:16:53,440
working in a laboratory at least i think

506
00:16:56,710 --> 00:16:55,360
it is i've never worked in a lab but i i

507
00:16:59,269 --> 00:16:56,720
think it has to be

508
00:17:01,269 --> 00:16:59,279
the the results of the experiments that

509
00:17:02,949 --> 00:17:01,279
don got last week

510
00:17:04,390 --> 00:17:02,959
the the folks in cleveland who are

511
00:17:05,909 --> 00:17:04,400
running this experiment

512
00:17:07,510 --> 00:17:05,919
are looking at those results and they're

513
00:17:09,189 --> 00:17:07,520

tweaking you know what are we going to

514
00:17:11,110 --> 00:17:09,199
do what did we see

515
00:17:12,630 --> 00:17:11,120
in the experiment this run and we're

516
00:17:14,630 --> 00:17:12,640
going to go change a couple parameters

517
00:17:16,710 --> 00:17:14,640
and look at it in this next run and they

518
00:17:18,789 --> 00:17:16,720
really have a great rhythm going between

519
00:17:21,350 --> 00:17:18,799
the folks out in cleveland and

520
00:17:23,669 --> 00:17:21,360
and mr pettit there as far as

521
00:17:25,270 --> 00:17:23,679
understanding each other very well

522
00:17:27,189 --> 00:17:25,280
you if you listen to the space to ground

523
00:17:29,110 --> 00:17:27,199
you'll hear him talking to cleveland we

524
00:17:31,110 --> 00:17:29,120
don't actually have a nasa center in

525
00:17:33,430 --> 00:17:31,120
cleveland that's the actual payload

526
00:17:35,190 --> 00:17:33,440
developer for this slice payload who's

527
00:17:36,710 --> 00:17:35,200
talking directly to the vehicle and

528
00:17:38,789 --> 00:17:36,720
that's pretty neat to watch them

529
00:17:41,029 --> 00:17:38,799
interface with each other and really get

530
00:17:42,870 --> 00:17:41,039
some some quality science out of the

531
00:17:45,430 --> 00:17:42,880
runs that we're doing because we're able

532
00:17:47,270 --> 00:17:45,440
to talk back and forth okay great well

533
00:17:48,950 --> 00:17:47,280
um i don't think there's

534
00:17:51,029 --> 00:17:48,960
ever a week where there's not something

535
00:17:53,190 --> 00:17:51,039
big going on and this week the big event

536
00:17:54,870 --> 00:17:53,200
is going to be the automated transfer

537
00:17:56,870 --> 00:17:54,880
vehicle the european cargo ship that

538
00:17:59,350 --> 00:17:56,880

will be coming up it'll be carrying um

539
00:18:00,710 --> 00:17:59,360
seven tons of cargo um so we're not

540
00:18:02,070 --> 00:18:00,720
going to go into all of that because

541
00:18:03,990 --> 00:18:02,080
we're actually in the next couple of

542
00:18:06,630 --> 00:18:04,000
days leading up to that launch on a

543
00:18:07,750 --> 00:18:06,640
thursday we will

544
00:18:08,950 --> 00:18:07,760
we will uh

545
00:18:10,150 --> 00:18:08,960
talk about some of those things but i

546
00:18:11,990 --> 00:18:10,160
want to go ahead and talk to you about

547
00:18:14,310 --> 00:18:12,000
any i believe there is a radiation

548
00:18:16,789 --> 00:18:14,320
monitor and and ask if you if there's

549
00:18:18,070 --> 00:18:16,799
any kind of significance of its arrival

550
00:18:20,310 --> 00:18:18,080
so the uh

551
00:18:22,070 --> 00:18:20,320
the atv is going to launch thursday into

552
00:18:23,590 --> 00:18:22,080
docs this weekend

553
00:18:25,270 --> 00:18:23,600
it's kind of interesting when you think

554
00:18:26,950 --> 00:18:25,280
about what we're doing with the iss in

555
00:18:29,190 --> 00:18:26,960
particular

556
00:18:31,029 --> 00:18:29,200
um as far as being able to do long

557
00:18:33,430 --> 00:18:31,039
duration missions so if you look at all

558
00:18:35,110 --> 00:18:33,440
the cargo ships that launch and then you

559
00:18:36,950 --> 00:18:35,120
try to figure out if you were going to

560
00:18:38,710 --> 00:18:36,960
go do a long duration mission to an

561
00:18:40,710 --> 00:18:38,720
asteroid or long-duration mission to

562
00:18:42,470 --> 00:18:40,720
mars how much cargo we would actually

563
00:18:44,470 --> 00:18:42,480

have to take with us to be able to do

564
00:18:45,830 --> 00:18:44,480
that you get some understanding of what

565
00:18:47,190 --> 00:18:45,840
it's like to do space flight where you

566
00:18:48,710 --> 00:18:47,200
can't just run down to the corner store

567
00:18:50,789 --> 00:18:48,720
and buy another quart of milk when you

568
00:18:52,630 --> 00:18:50,799
run out

569
00:18:55,590 --> 00:18:52,640
one of the things that the atv number

570
00:18:58,630 --> 00:18:55,600
three is bringing up is called a an iv

571
00:19:01,830 --> 00:18:58,640
t-pack stands for tissue equivalent

572
00:19:03,830 --> 00:19:01,840
um a proportional counter which is a

573
00:19:06,549 --> 00:19:03,840
radiation monitor

574
00:19:08,070 --> 00:19:06,559
uh we we set it up in the lab it's bread

575
00:19:09,750 --> 00:19:08,080
box eyes

576
00:19:11,430 --> 00:19:09,760
we set it up in different places in the

577
00:19:14,870 --> 00:19:11,440
in the lab or in the other modules on

578
00:19:17,510 --> 00:19:14,880
board iss and what its real job is to do

579
00:19:18,470 --> 00:19:17,520
is to measure the radiation that it is

580
00:19:20,630 --> 00:19:18,480
taking

581
00:19:23,750 --> 00:19:20,640
and it's a tissue equivalent system

582
00:19:26,390 --> 00:19:23,760
which means it essentially monitors

583
00:19:28,150 --> 00:19:26,400
mimics a human being right

584
00:19:30,549 --> 00:19:28,160
so we get real-time data off of this

585
00:19:32,390 --> 00:19:30,559
little device and we can tell

586
00:19:34,630 --> 00:19:32,400
if we're getting

587
00:19:36,470 --> 00:19:34,640
excess dosage of radiation because of a

588
00:19:38,950 --> 00:19:36,480

coronal mass ejection i know there's

589
00:19:40,549 --> 00:19:38,960
been a lot of stuff on nasa tv recently

590
00:19:42,870 --> 00:19:40,559
with the coronal mass ejections that

591
00:19:43,590 --> 00:19:42,880
we've seen and some some

592
00:19:45,350 --> 00:19:43,600
uh

593
00:19:48,230 --> 00:19:45,360
airline traffic that got rerouted and

594
00:19:50,390 --> 00:19:48,240
whatnot so the iss is flying outside of

595
00:19:52,150 --> 00:19:50,400
all the atmosphere that you and i are in

596
00:19:54,470 --> 00:19:52,160
we're always very

597
00:19:56,310 --> 00:19:54,480
very cautious and always watching what

598
00:19:58,710 --> 00:19:56,320
the radiation environment looks like on

599
00:20:01,350 --> 00:19:58,720
board iss so this little device that's

600
00:20:03,909 --> 00:20:01,360
coming up to replace us a different tpec

601
00:20:06,070 --> 00:20:03,919
that's already on board that's that's

602
00:20:07,669 --> 00:20:06,080
run out of life we'll replace that and

603
00:20:09,830 --> 00:20:07,679
we'll be able to monitor

604
00:20:12,390 --> 00:20:09,840
in real time what kind of radiation the

605
00:20:14,310 --> 00:20:12,400
crew is being exposed to with these new

606
00:20:16,870 --> 00:20:14,320
coronal mass ejections and you know

607
00:20:18,310 --> 00:20:16,880
we've been doing this for 10 years the

608
00:20:20,390 --> 00:20:18,320
the sun has gone through a couple of

609
00:20:24,230 --> 00:20:20,400
cycles now so we we have a really good

610
00:20:26,950 --> 00:20:24,240
handle on it the iss itself is shielded

611
00:20:28,950 --> 00:20:26,960
for specifically for radiation there are

612
00:20:30,630 --> 00:20:28,960
specific places on board the iss that

613
00:20:32,549 --> 00:20:30,640

are more shielded than others like the

614
00:20:35,110 --> 00:20:32,559
crew quarters that the crew sleeps in

615
00:20:36,390 --> 00:20:35,120
are shielded more so and we've never as

616
00:20:38,070 --> 00:20:36,400
far as i remember and i've been doing

617
00:20:40,310 --> 00:20:38,080
this for a long time i don't think we've

618
00:20:42,230 --> 00:20:40,320
ever asked the crew to go to a specific

619
00:20:44,549 --> 00:20:42,240
place on iss but it's just like

620
00:20:46,230 --> 00:20:44,559
everything else we monitor that at all

621
00:20:47,510 --> 00:20:46,240
times just make sure the crew is safe

622
00:20:49,510 --> 00:20:47,520
and happy and healthy and just like

623
00:20:51,190 --> 00:20:49,520
we're monitoring the

624
00:20:53,510 --> 00:20:51,200
the the air that they're breathing to

625
00:20:56,149 --> 00:20:53,520
make sure the ppco2 is not getting too

626
00:20:57,830 --> 00:20:56,159
high or the temperature or humidity this

627
00:20:59,909 --> 00:20:57,840
is just another item that we monitor

628
00:21:01,270 --> 00:20:59,919
here from houston and from various other

629
00:21:03,669 --> 00:21:01,280
control centers around the world to make

630
00:21:06,230 --> 00:21:03,679
sure the crew is in a good convict

631
00:21:08,230 --> 00:21:06,240
great so uh again just borrowing a word

632
00:21:09,750 --> 00:21:08,240
from you lots of stuff going on aboard

633
00:21:11,190 --> 00:21:09,760
the international space station so now

634
00:21:13,510 --> 00:21:11,200
i'm going to put you on the spot and

635
00:21:14,789 --> 00:21:13,520
it's not me it's actually public we we

636
00:21:16,549 --> 00:21:14,799
pulled the public for a couple of their

637
00:21:17,669 --> 00:21:16,559
questions and we have a couple here that

638
00:21:20,149 --> 00:21:17,679

came to us

639
00:21:22,470 --> 00:21:20,159
on twitter the first one comes from

640
00:21:24,470 --> 00:21:22,480
arthur hartman he asked what is the

641
00:21:27,350 --> 00:21:24,480
duration of a mission

642
00:21:28,710 --> 00:21:27,360
so the crew usually spends six months on

643
00:21:32,390 --> 00:21:28,720
orbit

644
00:21:34,390 --> 00:21:32,400
so they launch and then uh it that six

645
00:21:36,390 --> 00:21:34,400
month on orbit is usually divided up

646
00:21:38,070 --> 00:21:36,400
into two month increments and four

647
00:21:40,310 --> 00:21:38,080
months there are two month pieces and

648
00:21:43,750 --> 00:21:40,320
four month pieces the way the crews

649
00:21:45,190 --> 00:21:43,760
rotate out so they launch on soyuz

650
00:21:46,230 --> 00:21:45,200
for example

651
00:21:48,549 --> 00:21:46,240
commander

652
00:21:51,190 --> 00:21:48,559
burbank launched and he's his undock

653
00:21:53,110 --> 00:21:51,200
date is the end of april april 30th and

654
00:21:54,630 --> 00:21:53,120
that'll be right at five and a half six

655
00:21:57,430 --> 00:21:54,640
months for him

656
00:21:59,190 --> 00:21:57,440
he actually launched a little bit late

657
00:22:00,549 --> 00:21:59,200
and then he's going to undock a little

658
00:22:01,830 --> 00:22:00,559
bit late because of some problems that

659
00:22:04,310 --> 00:22:01,840
we've been having with some russian

660
00:22:05,750 --> 00:22:04,320
rockets but generically it's a six-month

661
00:22:07,909 --> 00:22:05,760
increment

662
00:22:09,750 --> 00:22:07,919
for a given crew but they'll usually

663
00:22:11,750 --> 00:22:09,760

launch and then spend

664
00:22:13,830 --> 00:22:11,760
two months with the three folks and then

665
00:22:15,029 --> 00:22:13,840
those three folks on dock another three

666
00:22:16,549 --> 00:22:15,039
folks will come up and then they'll

667
00:22:18,390 --> 00:22:16,559
spend four months with a different

668
00:22:21,029 --> 00:22:18,400
different set of folks and then they'll

669
00:22:23,270 --> 00:22:21,039
undock so it's a six month overall

670
00:22:25,029 --> 00:22:23,280
increment uh the flight directors for

671
00:22:27,669 --> 00:22:25,039
example divide that up into two

672
00:22:29,830 --> 00:22:27,679
different shifts so i had increment 29

673
00:22:32,230 --> 00:22:29,840
which was the two month piece

674
00:22:34,070 --> 00:22:32,240
and then mr stover has increment 30

675
00:22:36,789 --> 00:22:34,080
which is the four month piece of this

676
00:22:38,870 --> 00:22:36,799
increment okay great thank you

677
00:22:41,669 --> 00:22:38,880
we have another question the second

678
00:22:42,950 --> 00:22:41,679
question from uh that we have from uh

679
00:22:45,669 --> 00:22:42,960
twitter is

680
00:22:47,350 --> 00:22:45,679
comes from frazzledjazz he asked do you

681
00:22:49,830 --> 00:22:47,360
think it would be better with or without

682
00:22:53,750 --> 00:22:49,840
gravity up there

683
00:22:56,549 --> 00:22:53,760
i think sometimes i wish we had gravity

684
00:22:58,549 --> 00:22:56,559
one of the things the crews always

685
00:22:59,270 --> 00:22:58,559
try to hammer home for us

686
00:23:00,950 --> 00:22:59,280
is

687
00:23:02,470 --> 00:23:00,960
whenever we develop a procedure that

688
00:23:04,789 --> 00:23:02,480

they're going to go execute we always

689
00:23:05,990 --> 00:23:04,799
have gravity there to help us so we've

690
00:23:08,710 --> 00:23:06,000
got a

691
00:23:10,870 --> 00:23:08,720
bag and in that bag it's got 15 pieces

692
00:23:13,029 --> 00:23:10,880
with that we need to do this activity we

693
00:23:14,950 --> 00:23:13,039
can go take that bag and set all 15 of

694
00:23:16,310 --> 00:23:14,960
those pieces out on a table

695
00:23:17,830 --> 00:23:16,320
and they're all nice and pretty and we

696
00:23:19,110 --> 00:23:17,840
can start in the top row and work our

697
00:23:20,870 --> 00:23:19,120
way down

698
00:23:22,549 --> 00:23:20,880
when you try to do that in space as soon

699
00:23:24,710 --> 00:23:22,559
as you open that bag unless they're all

700
00:23:26,549 --> 00:23:24,720
tied down you get 15 pieces of hardware

701
00:23:28,630 --> 00:23:26,559
floating everywhere and you're trying to

702
00:23:31,029 --> 00:23:28,640
go keep track of all those

703
00:23:31,909 --> 00:23:31,039
so having gravity to help you

704
00:23:34,149 --> 00:23:31,919
on the

705
00:23:36,149 --> 00:23:34,159
is actually a nice thing and sometimes i

706
00:23:38,230 --> 00:23:36,159
think it would be advantageous if we had

707
00:23:39,669 --> 00:23:38,240
gravity on the vehicle but in reality

708
00:23:41,990 --> 00:23:39,679
the reason we have the vehicle is

709
00:23:44,149 --> 00:23:42,000
because there isn't any gravity uh the

710
00:23:45,909 --> 00:23:44,159
slice experiment that don's

711
00:23:47,590 --> 00:23:45,919
working with here what we're really

712
00:23:50,950 --> 00:23:47,600
looking at is something that's as in

713
00:23:51,909 --> 00:23:50,960

fundamental to human nature as fire

714
00:23:54,230 --> 00:23:51,919
right

715
00:23:56,950 --> 00:23:54,240
fire that we all know and love and use

716
00:23:59,669 --> 00:23:56,960
for warmth and illumination and and to

717
00:24:01,590 --> 00:23:59,679
drive our cars and whatnot is it's it's

718
00:24:03,110 --> 00:24:01,600
absolutely everybody you talk to anybody

719
00:24:05,510 --> 00:24:03,120
asking what fire is and they can explain

720
00:24:07,590 --> 00:24:05,520
it to you what we're doing with fire on

721
00:24:09,510 --> 00:24:07,600
board iss though is taking that one

722
00:24:12,230 --> 00:24:09,520
critical piece out of the equation that

723
00:24:15,269 --> 00:24:12,240
is gravity and seeing how fire responds

724
00:24:17,510 --> 00:24:15,279
in a zero gravity environment

725
00:24:19,669 --> 00:24:17,520
and it's conceivable hopefully that what

726
00:24:21,190 --> 00:24:19,679
we'll be able to do then

727
00:24:23,830 --> 00:24:21,200
is understand

728
00:24:26,070 --> 00:24:23,840
fire that we've all known for hundreds

729
00:24:28,390 --> 00:24:26,080
of you know thousands of years

730
00:24:30,549 --> 00:24:28,400
and learned something new about it and

731
00:24:32,230 --> 00:24:30,559
how it actually behaves and how we can

732
00:24:34,230 --> 00:24:32,240
change how it behaves on earth because

733
00:24:35,990 --> 00:24:34,240
we're taking that one

734
00:24:37,510 --> 00:24:36,000
variable out of the equation which is

735
00:24:39,190 --> 00:24:37,520
gravity

736
00:24:41,510 --> 00:24:39,200
a lot of the stuff that we do on board

737
00:24:43,190 --> 00:24:41,520
iss counts on the fact that we don't

738
00:24:43,909 --> 00:24:43,200

have gravity in the environment there

739
00:24:46,390 --> 00:24:43,919
are

740
00:24:48,950 --> 00:24:46,400
a number of metallurgical

741
00:24:50,950 --> 00:24:48,960
studies that we've done where you heat a

742
00:24:53,510 --> 00:24:50,960
special piece of metal up and different

743
00:24:55,350 --> 00:24:53,520
alloys in it and then you cool it down

744
00:24:56,230 --> 00:24:55,360
really fast and look at the crystal

745
00:24:58,630 --> 00:24:56,240
growth

746
00:25:00,950 --> 00:24:58,640
the crystalline structure of the metal

747
00:25:02,950 --> 00:25:00,960
as it cools down when you do that on

748
00:25:05,190 --> 00:25:02,960
earth the gravity will pull on the

749
00:25:07,350 --> 00:25:05,200
molten metal and and force it to form

750
00:25:09,269 --> 00:25:07,360
specific crystalline structures when you

751
00:25:11,510 --> 00:25:09,279
do that in a zero-g environment like on

752
00:25:13,190 --> 00:25:11,520
board the iss you can actually see the

753
00:25:14,789 --> 00:25:13,200
crystalline structures that are trying

754
00:25:16,789 --> 00:25:14,799
to grow

755
00:25:19,350 --> 00:25:16,799
and and are conceivably better than what

756
00:25:21,269 --> 00:25:19,360
we can do on in a 1g environment

757
00:25:23,990 --> 00:25:21,279
you know and so someday there may be

758
00:25:26,549 --> 00:25:24,000
factories in space that are producing

759
00:25:28,630 --> 00:25:26,559
super high quality steels because we can

760
00:25:30,149 --> 00:25:28,640
take advantage of the fact that gravity

761
00:25:32,549 --> 00:25:30,159
is not trying to force the crystalline

762
00:25:34,630 --> 00:25:32,559
structures into a into a particular

763
00:25:35,830 --> 00:25:34,640

lattice as it cools down

764
00:25:37,990 --> 00:25:35,840
um so

765
00:25:40,230 --> 00:25:38,000
and to answer the question

766
00:25:41,750 --> 00:25:40,240
sometimes yes i think it would be good

767
00:25:44,870 --> 00:25:41,760
if we had gravity but that would really

768
00:25:47,269 --> 00:25:44,880
defeat the purpose of of iss and

769
00:25:49,750 --> 00:25:47,279
and our ability to study all kinds of

770
00:25:51,909 --> 00:25:49,760
interesting things without gravity

771
00:25:53,830 --> 00:25:51,919
or removing the the variable of gravity

772
00:25:56,070 --> 00:25:53,840
from that equation great thank you so it

773
00:25:58,549 --> 00:25:56,080
sounds like gravity is helpful for

774
00:26:00,470 --> 00:25:58,559
logistics but there is are definitely

775
00:26:02,230 --> 00:26:00,480
some advantages of having that

776
00:26:03,909 --> 00:26:02,240
microgravity environment which is one of

777
00:26:06,470 --> 00:26:03,919
the reasons we're up there

778
00:26:07,669 --> 00:26:06,480
um thanks again for joining us today um

779
00:26:09,750 --> 00:26:07,679
i think that's about all the time we

780
00:26:11,029 --> 00:26:09,760
have and i really do appreciate you

781
00:26:12,789 --> 00:26:11,039
coming over and talking with us and

782
00:26:14,310 --> 00:26:12,799
we'll get back to the space station and

783
00:26:16,630 --> 00:26:14,320
find out listen in and find out what's