1
00:00:17,830 --> 00:00:16,790
why did you want to be an astronaut

2
00:00:18,790 --> 00:00:17,840
well

3
00:00:20,630 --> 00:00:18,800
you know i

4
00:00:22,470 --> 00:00:20,640
have to admit i i grew up

5
00:00:25,109 --> 00:00:22,480
watching a lot of star trek

6
00:00:27,429 --> 00:00:25,119
with my dad and he was a he was a space

7
00:00:28,630 --> 00:00:27,439
fanatic this was in montreal

8
00:00:30,230 --> 00:00:28,640
and uh

9
00:00:31,589 --> 00:00:30,240
you know and on you know space program

10
00:00:33,030 --> 00:00:31,599
was was

11
00:00:34,950 --> 00:00:33,040
budding and

12
00:00:36,870 --> 00:00:34,960
and uh you know he would also you know

13
00:00:38,470 --> 00:00:36,880

uh see the you know pictures of mission

14
00:00:39,590 --> 00:00:38,480
control and say who are those guys how

15
00:00:41,990 --> 00:00:39,600
do they get to work there that's got to

16
00:00:43,110 --> 00:00:42,000
be the most amazing job in the world

17
00:00:45,830 --> 00:00:43,120
and um

18
00:00:48,389 --> 00:00:45,840
and the funny thing was you know for me

19
00:00:50,389 --> 00:00:48,399
my dad said that he knew captain kirk

20
00:00:52,709 --> 00:00:50,399
because he knew him from high school in

21
00:00:55,029 --> 00:00:52,719
montreal and so at that age i was

22
00:00:58,310 --> 00:00:55,039
probably five or six you know and i and

23
00:00:59,990 --> 00:00:58,320
uh and so it was a strange mixture of

24
00:01:01,990 --> 00:01:00,000
fiction and reality like i knew this was

25
00:01:03,590 --> 00:01:02,000
fiction on the other hand that my dad

26
00:01:06,149 --> 00:01:03,600
knows this guy

27
00:01:07,910 --> 00:01:06,159
you know and i somehow that maybe made

28
00:01:10,149 --> 00:01:07,920
things seem more possible to me i don't

29
00:01:11,990 --> 00:01:10,159
know but then we went on a

30
00:01:13,910 --> 00:01:12,000
family vacation to florida it was that

31
00:01:16,550 --> 00:01:13,920
it was the time of apollo 11. so we got

32
00:01:19,510 --> 00:01:16,560
to see the launch of apollo 11 um

33
00:01:21,270 --> 00:01:19,520
uh on a family vacation there i was six

34
00:01:24,070 --> 00:01:21,280
and um

35
00:01:25,270 --> 00:01:24,080
and uh that was it that i told my dad uh

36
00:01:27,350 --> 00:01:25,280
at that point

37
00:01:28,310 --> 00:01:27,360
i wanted to do that and never changed my

38
00:01:30,069 --> 00:01:28,320

mind

39
00:01:31,350 --> 00:01:30,079
i want to get you to take us through

40
00:01:34,469 --> 00:01:31,360
that story i want to start with your

41
00:01:36,069 --> 00:01:34,479
hometown or home towns uh tell me about

42
00:01:37,510 --> 00:01:36,079
where you grew up and and what it was

43
00:01:39,749 --> 00:01:37,520
like there

44
00:01:42,069 --> 00:01:39,759
well i grew up in montreal originally

45
00:01:44,230 --> 00:01:42,079
until about 11 and then moved to

46
00:01:45,270 --> 00:01:44,240
california

47
00:01:46,710 --> 00:01:45,280
my dad

48
00:01:48,389 --> 00:01:46,720
felt that california was the land of

49
00:01:49,510 --> 00:01:48,399
opportunity at the time and he was

50
00:01:50,630 --> 00:01:49,520
probably right

51
00:01:52,870 --> 00:01:50,640
and

52
00:01:54,469 --> 00:01:52,880
in both places we sort of we also had

53
00:01:55,590 --> 00:01:54,479
like a really small country house you

54
00:01:58,230 --> 00:01:55,600
know so i

55
00:02:01,109 --> 00:01:58,240
a lot of my memories are spent you know

56
00:02:03,350 --> 00:02:01,119
uh spending time around a small lake and

57
00:02:04,550 --> 00:02:03,360
and uh swimming and boating and things

58
00:02:05,990 --> 00:02:04,560
like that and playing around in the

59
00:02:08,389 --> 00:02:06,000
woods and

60
00:02:09,669 --> 00:02:08,399
also i was in scouts you know so i think

61
00:02:12,630 --> 00:02:09,679
a lot of my a lot of my childhood

62
00:02:14,150 --> 00:02:12,640
memories are camping and backpacking and

63
00:02:15,670 --> 00:02:14,160

spending time in the mountains and some

64
00:02:17,110 --> 00:02:15,680
of that's with family and some of that's

65
00:02:18,070 --> 00:02:17,120
with friends and

66
00:02:20,390 --> 00:02:18,080
um

67
00:02:21,670 --> 00:02:20,400
but i grew up in san jose uh basically

68
00:02:22,790 --> 00:02:21,680
went to high school in san jose

69
00:02:24,150 --> 00:02:22,800
california

70
00:02:28,790 --> 00:02:24,160
and uh

71
00:02:29,990 --> 00:02:28,800
you know when i was there i think

72
00:02:32,309 --> 00:02:30,000
most of the

73
00:02:34,790 --> 00:02:32,319
you know the inspiration i think for me

74
00:02:38,390 --> 00:02:34,800
was from my my parents and my teachers

75
00:02:41,509 --> 00:02:38,400
you know so you do have a sense that the

76
00:02:43,670 --> 00:02:41,519
people in those places and and

77
00:02:45,670 --> 00:02:43,680
really help make you who you are

78
00:02:47,509 --> 00:02:45,680
yeah my dad was uh my dad was a

79
00:02:49,030 --> 00:02:47,519
mathematician and a quality control

80
00:02:51,030 --> 00:02:49,040
engineer so he was a kind of a

81
00:02:53,110 --> 00:02:51,040
perfectionist so i would i'd come back

82
00:02:53,830 --> 00:02:53,120
you know if i got a 97 on an exam you

83
00:02:57,830 --> 00:02:53,840
know

84
00:02:58,869 --> 00:02:57,840
instead of that's great

85
00:03:00,070 --> 00:02:58,879
and uh

86
00:03:01,190 --> 00:03:00,080
so

87
00:03:03,430 --> 00:03:01,200
you know an interesting thing for i

88
00:03:06,229 --> 00:03:03,440

think for me coming from

89
00:03:08,309 --> 00:03:06,239
montreal to california was that um you

90
00:03:09,509 --> 00:03:08,319
know it's kind of a reflection on our

91
00:03:11,830 --> 00:03:09,519
education system and why it's so

92
00:03:13,589 --> 00:03:11,840
important that we try to improve it and

93
00:03:16,229 --> 00:03:13,599
then i was i was three years ahead in

94
00:03:18,630 --> 00:03:16,239
math coming in fifth sixth grade from

95
00:03:20,070 --> 00:03:18,640
montreal

96
00:03:22,949 --> 00:03:20,080
so much so that they didn't have a book

97
00:03:24,710 --> 00:03:22,959
for me uh at the elementary school and

98
00:03:26,470 --> 00:03:24,720
so i spent the rest of that year

99
00:03:28,309 --> 00:03:26,480
tutoring like the the kids who needed

100
00:03:29,509 --> 00:03:28,319
help in math

101
00:03:31,830 --> 00:03:29,519
which is kind of formative for me

102
00:03:33,509 --> 00:03:31,840
because i kind of tutored the rest of my

103
00:03:35,589 --> 00:03:33,519
time through school in college and and

104
00:03:38,869 --> 00:03:35,599
then you know and then taught later you

105
00:03:40,949 --> 00:03:38,879
know in you know after finish school

106
00:03:44,229 --> 00:03:40,959
so in six months in space did you get a

107
00:03:46,070 --> 00:03:44,239
chance to see montreal in san jose

108
00:03:48,789 --> 00:03:46,080
yeah yeah that was a really there was a

109
00:03:50,630 --> 00:03:48,799
really uh neat neat uh moment for me in

110
00:03:52,149 --> 00:03:50,640
uh in on the space station it was one

111
00:03:53,910 --> 00:03:52,159
day and i think was pretty early on in

112
00:03:55,270 --> 00:03:53,920
the mission when i we were flying over

113
00:03:56,149 --> 00:03:55,280

north america

114
00:03:59,910 --> 00:03:56,159
and

115
00:04:02,869 --> 00:03:59,920
up in san jose as a teenager in in

116
00:04:04,869 --> 00:04:02,879
montreal as a young boy um

117
00:04:06,789 --> 00:04:04,879
you know all my memories you know from

118
00:04:09,190 --> 00:04:06,799
you know from childhood took place in

119
00:04:10,949 --> 00:04:09,200
you know basically those places and and

120
00:04:12,470 --> 00:04:10,959
you know and places in between on trips

121
00:04:15,670 --> 00:04:12,480
you know my family took across the

122
00:04:18,150 --> 00:04:15,680
country uh you know camping trips in the

123
00:04:19,749 --> 00:04:18,160
sierras or you know so all the places

124
00:04:21,270 --> 00:04:19,759
that really all the places that i had

125
00:04:23,110 --> 00:04:21,280
had been you know

126
00:04:25,030 --> 00:04:23,120
uh i got to see them in about three

127
00:04:27,350 --> 00:04:25,040
minutes you know so like every place i'd

128
00:04:29,430 --> 00:04:27,360
ever been and everybody i you know i

129
00:04:30,950 --> 00:04:29,440
knew and and all the memories i had i

130
00:04:33,030 --> 00:04:30,960
could just kind of look down and relive

131
00:04:35,030 --> 00:04:33,040
them all in about three minutes and it

132
00:04:36,550 --> 00:04:35,040
was unbelievable that's not the same as

133
00:04:38,230 --> 00:04:36,560
your life flashing before your eyes not

134
00:04:40,790 --> 00:04:38,240
exactly

135
00:04:42,150 --> 00:04:40,800
um yeah let's tell me more of the story

136
00:04:43,830 --> 00:04:42,160
from give me

137
00:04:46,390 --> 00:04:43,840
the sense of your educational your

138
00:04:48,950 --> 00:04:46,400

professional career that ultimately led

139
00:04:51,270 --> 00:04:48,960
you to become an astronaut

140
00:04:53,350 --> 00:04:51,280
well actually after high school

141
00:04:55,510 --> 00:04:53,360
i went to cal poly

142
00:04:58,629 --> 00:04:55,520
san luis obispo in california started

143
00:05:00,469 --> 00:04:58,639
off in physics and uh you know i really

144
00:05:02,710 --> 00:05:00,479
was excited about physics but i but i

145
00:05:04,870 --> 00:05:02,720
really liked um

146
00:05:06,710 --> 00:05:04,880
robots for some reason i think part of

147
00:05:08,390 --> 00:05:06,720
it was the idea of um

148
00:05:10,710 --> 00:05:08,400
it was kind of a new it was it was a new

149
00:05:12,870 --> 00:05:10,720
field at that time really and and i kind

150
00:05:14,710 --> 00:05:12,880
of like the idea of uh you know

151
00:05:16,070 --> 00:05:14,720
programming logic that comes out of your

152
00:05:18,230 --> 00:05:16,080
head into

153
00:05:20,950 --> 00:05:18,240
into a system and then and then watching

154
00:05:22,710 --> 00:05:20,960
it you know live in the sense and act on

155
00:05:23,590 --> 00:05:22,720
logic that you gave it you know in other

156
00:05:25,110 --> 00:05:23,600
words

157
00:05:26,870 --> 00:05:25,120
i suppose it has this this sense of

158
00:05:29,029 --> 00:05:26,880
creating life in a way because it you

159
00:05:30,550 --> 00:05:29,039
know you give it something and then it

160
00:05:32,230 --> 00:05:30,560
uses that and

161
00:05:33,830 --> 00:05:32,240
and operates from there and

162
00:05:37,189 --> 00:05:33,840
and so i change over to electrical

163
00:05:39,830 --> 00:05:37,199

engineering and um and so i you know i

164
00:05:41,430 --> 00:05:39,840
uh and my my senior project there was a

165
00:05:42,710 --> 00:05:41,440
robot um

166
00:05:44,150 --> 00:05:42,720
the first one that i had made and that

167
00:05:45,830 --> 00:05:44,160
was that was really pretty cool did it

168
00:05:47,670 --> 00:05:45,840
with a roommate who was also in

169
00:05:49,909 --> 00:05:47,680
mechanical engineering so he did all the

170
00:05:52,390 --> 00:05:49,919
mechanical engineering part of it

171
00:05:54,070 --> 00:05:52,400
and um but during college there was two

172
00:05:56,150 --> 00:05:54,080
things that happened that really were

173
00:05:58,790 --> 00:05:56,160
meaningful to me uh one was

174
00:06:00,950 --> 00:05:58,800
that it was um during my freshman year

175
00:06:02,790 --> 00:06:00,960
it was the first flight of the shuttle

176
00:06:04,390 --> 00:06:02,800
and i i just remember so vividly being

177
00:06:07,270 --> 00:06:04,400
in the dormitory you know people

178
00:06:08,469 --> 00:06:07,280
gathered to watch this the first flight

179
00:06:10,390 --> 00:06:08,479
and um

180
00:06:12,629 --> 00:06:10,400
and and for me you know i'd i'd want to

181
00:06:14,950 --> 00:06:12,639
do this all my life but there wasn't

182
00:06:17,670 --> 00:06:14,960
either yet wasn't any um

183
00:06:20,150 --> 00:06:17,680
urgency or sense of direction you know

184
00:06:21,110 --> 00:06:20,160
of how to do it

185
00:06:22,550 --> 00:06:21,120
and

186
00:06:24,309 --> 00:06:22,560
as soon as that happened i said i got

187
00:06:26,950 --> 00:06:24,319
called asa and asked him what i have to

188
00:06:28,790 --> 00:06:26,960

do so it's the first time i reached out

189
00:06:31,350 --> 00:06:28,800
and tried to find out like who at nasa

190
00:06:32,950 --> 00:06:31,360
could tell me what to do and

191
00:06:35,590 --> 00:06:32,960
you know found the astronaut selection

192
00:06:37,270 --> 00:06:35,600
office and um and and heard back from

193
00:06:38,790 --> 00:06:37,280
them you know and you know and they kind

194
00:06:40,150 --> 00:06:38,800
of give everybody the same advice you

195
00:06:41,749 --> 00:06:40,160
know which is

196
00:06:43,830 --> 00:06:41,759
do the you know be the best you can be

197
00:06:46,469 --> 00:06:43,840
at whatever you choose to do don't focus

198
00:06:48,230 --> 00:06:46,479
your career on trying to do this but but

199
00:06:50,150 --> 00:06:48,240
just be the best you can be and and

200
00:06:52,150 --> 00:06:50,160
follow what your you know your your

201
00:06:54,070 --> 00:06:52,160
interests and um

202
00:06:55,350 --> 00:06:54,080
so i never got a b again in college

203
00:06:57,270 --> 00:06:55,360
after that

204
00:06:59,189 --> 00:06:57,280
i just i just i couldn't allow that to

205
00:07:02,469 --> 00:06:59,199
happen and uh

206
00:07:04,790 --> 00:07:02,479
and so that worked out well for me

207
00:07:06,710 --> 00:07:04,800
and and in the end um

208
00:07:08,790 --> 00:07:06,720
at graduation at cal poly so now this is

209
00:07:10,550 --> 00:07:08,800
the end of those four years

210
00:07:12,550 --> 00:07:10,560
something another thing happened and so

211
00:07:15,029 --> 00:07:12,560
in between you know it was just college

212
00:07:16,950 --> 00:07:15,039
and had a good time and worked hard and

213
00:07:18,309 --> 00:07:16,960

and uh made a lot of great friends

214
00:07:19,670 --> 00:07:18,319
lifelong friends

215
00:07:22,309 --> 00:07:19,680
and at the end

216
00:07:24,390 --> 00:07:22,319
graduation there was uh

217
00:07:26,150 --> 00:07:24,400
our graduation speaker was an astronaut

218
00:07:28,070 --> 00:07:26,160
the first one that i ever met so that

219
00:07:29,350 --> 00:07:28,080
was hoot gibson i didn't know this was

220
00:07:31,430 --> 00:07:29,360
coming it just suddenly there was an

221
00:07:34,390 --> 00:07:31,440
astronaut talking at graduation

222
00:07:36,150 --> 00:07:34,400
and because i did so well i got to go up

223
00:07:38,469 --> 00:07:36,160
to the podium to get an award so i got

224
00:07:40,150 --> 00:07:38,479
to you know and instead of walking back

225
00:07:42,550 --> 00:07:40,160
to my seat i turn around and walk toward

226
00:07:43,350 --> 00:07:42,560
him sitting on the stage to shake his

227
00:07:44,469 --> 00:07:43,360
hand

228
00:07:45,990 --> 00:07:44,479
and um

229
00:07:47,029 --> 00:07:46,000
later on i got to remind him of that he

230
00:07:49,270 --> 00:07:47,039
remembered it because it was kind of out

231
00:07:50,869 --> 00:07:49,280
of out of order to do that

232
00:07:52,309 --> 00:07:50,879
and

233
00:07:53,510 --> 00:07:52,319
so that was a really neat kind of

234
00:07:55,430 --> 00:07:53,520
inspiration

235
00:07:56,710 --> 00:07:55,440
you know that kind of block that kind of

236
00:07:59,350 --> 00:07:56,720
you know

237
00:08:00,550 --> 00:07:59,360
bracketed my college education was you

238
00:08:02,230 --> 00:08:00,560

know

239
00:08:03,749 --> 00:08:02,240
seeing the shuttle first go and then an

240
00:08:06,629 --> 00:08:03,759
astronaut at the end and that that

241
00:08:08,230 --> 00:08:06,639
really focused me um in college then i

242
00:08:10,629 --> 00:08:08,240
went to cal tech after that

243
00:08:12,390 --> 00:08:10,639
uh for a master's went uh kind of turned

244
00:08:13,670 --> 00:08:12,400
to arrow i mean i always

245
00:08:15,589 --> 00:08:13,680
was interested in aero but electrical

246
00:08:17,749 --> 00:08:15,599
engineering was also uh i grew up in

247
00:08:19,110 --> 00:08:17,759
silicon valley you know so this was the

248
00:08:20,390 --> 00:08:19,120
job security

249
00:08:22,869 --> 00:08:20,400
path as well

250
00:08:23,749 --> 00:08:22,879
and field my dad was in essentially and

251
00:08:26,230 --> 00:08:23,759
uh

252
00:08:28,390 --> 00:08:26,240
um but turned toward arrow did a masters

253
00:08:30,469 --> 00:08:28,400
in era with caltech um

254
00:08:32,630 --> 00:08:30,479
and maybe at cal tech i the thing that

255
00:08:33,430 --> 00:08:32,640
you know i kind of learned at caltech is

256
00:08:34,550 --> 00:08:33,440
uh

257
00:08:36,149 --> 00:08:34,560
you know there's a lot of brilliant

258
00:08:38,149 --> 00:08:36,159
people in this world and i wasn't one of

259
00:08:39,589 --> 00:08:38,159
them

260
00:08:41,269 --> 00:08:39,599
it's people who are brilliant and these

261
00:08:42,709 --> 00:08:41,279
people have to really work really hard

262
00:08:43,909 --> 00:08:42,719
to achieve and i'm in the second

263
00:08:46,710 --> 00:08:43,919

category

264
00:08:47,670 --> 00:08:46,720
uh and then i went to mit after that for

265
00:08:49,910 --> 00:08:47,680
uh

266
00:08:50,949 --> 00:08:49,920
the rest of my graduate work for a phd

267
00:08:51,829 --> 00:08:50,959
and um

268
00:08:53,190 --> 00:08:51,839
uh

269
00:08:54,949 --> 00:08:53,200
did a really neat thing about being

270
00:08:56,949 --> 00:08:54,959
there was

271
00:08:59,670 --> 00:08:56,959
i was working at draper laboratory for

272
00:09:01,590 --> 00:08:59,680
as a research assistant while

273
00:09:03,829 --> 00:09:01,600
being a grad student and i got to work

274
00:09:06,470 --> 00:09:03,839
on nasa programs for the first time so

275
00:09:08,310 --> 00:09:06,480
the hubble telescope i got to work on

276
00:09:09,910 --> 00:09:08,320
analysis for that for the release of it

277
00:09:11,670 --> 00:09:09,920
from the shuttle and i got to work on

278
00:09:14,230 --> 00:09:11,680
the shuttle auto pilot and i got to work

279
00:09:15,829 --> 00:09:14,240
on space station later and so i got to

280
00:09:18,470 --> 00:09:15,839
work on real nasa programs which felt

281
00:09:21,430 --> 00:09:18,480
made me feel like i was getting closer

282
00:09:23,430 --> 00:09:21,440
and then i after i finished graduate

283
00:09:26,150 --> 00:09:23,440
school i taught and my wife and i my

284
00:09:29,670 --> 00:09:28,150
was finishing medical school and we

285
00:09:31,350 --> 00:09:29,680
decided to spend a couple years doing

286
00:09:32,550 --> 00:09:31,360
something different so we went to sydney

287
00:09:34,630 --> 00:09:32,560
australia

288
00:09:36,949 --> 00:09:34,640

and i taught in the university there

289
00:09:37,990 --> 00:09:36,959
aeronautics for a couple years

290
00:09:42,150 --> 00:09:38,000
and

291
00:09:44,150 --> 00:09:42,160
nasa you know for like you know 10 years

292
00:09:46,550 --> 00:09:44,160
and finally got interviewed and then

293
00:09:48,949 --> 00:09:46,560
after uh getting disqualified for a

294
00:09:52,070 --> 00:09:48,959
medical condition which was devastating

295
00:09:54,389 --> 00:09:52,080
that cleared up and then i was i got in

296
00:09:56,550 --> 00:09:54,399
you know two years later after already

297
00:09:57,590 --> 00:09:56,560
coming to houston so i worked in houston

298
00:09:58,790 --> 00:09:57,600
for a couple years as a flight

299
00:10:01,190 --> 00:09:58,800
controller

300
00:10:03,190 --> 00:10:01,200
before getting selected so that's the

301
00:10:05,750 --> 00:10:03,200
that was the path

302
00:10:08,470 --> 00:10:05,760
the flying in space part of the job that

303
00:10:10,550 --> 00:10:08,480
you've worked so long and hard to get

304
00:10:12,230 --> 00:10:10,560
is a part that that has its dangers

305
00:10:14,710 --> 00:10:12,240
there's no denying that

306
00:10:17,590 --> 00:10:14,720
but greg what is it that you feel we get

307
00:10:20,949 --> 00:10:17,600
as a result of flying people in space

308
00:10:22,949 --> 00:10:20,959
that makes it worth taking that risk

309
00:10:24,470 --> 00:10:22,959
well there's no there's no you know

310
00:10:27,750 --> 00:10:24,480
there's a saying there's no reward

311
00:10:29,750 --> 00:10:27,760
without risk and you know and also

312
00:10:31,350 --> 00:10:29,760
you know if it's worth doing it's worth

313
00:10:33,590 --> 00:10:31,360

doing well and i think from nasa's

314
00:10:35,990 --> 00:10:33,600
perspective that means doing it safely

315
00:10:37,829 --> 00:10:36,000
you know and so these are we take

316
00:10:39,430 --> 00:10:37,839
measured risks you know i mean you know

317
00:10:41,030 --> 00:10:39,440
what we're trying what we do we believe

318
00:10:42,710 --> 00:10:41,040
and we think is very important and and

319
00:10:44,470 --> 00:10:42,720
we do everything possible to make sure

320
00:10:45,750 --> 00:10:44,480
that there's backups and redundancies

321
00:10:48,069 --> 00:10:45,760
and checks to make sure that it's as

322
00:10:49,350 --> 00:10:48,079
safe as it possibly can be but having

323
00:10:51,190 --> 00:10:49,360
said that you know yeah there's

324
00:10:52,470 --> 00:10:51,200
certainly an element of risk

325
00:10:54,069 --> 00:10:52,480
and um

326
00:10:55,269 --> 00:10:54,079
but uh

327
00:10:56,790 --> 00:10:55,279
you know it's

328
00:10:58,949 --> 00:10:56,800
it's sort of uh

329
00:11:01,030 --> 00:10:58,959
the sense of um

330
00:11:02,710 --> 00:11:01,040
you know we've we've ex you know it's

331
00:11:04,230 --> 00:11:02,720
part of human nature to explore and be

332
00:11:07,350 --> 00:11:04,240
curious and want to know new things and

333
00:11:09,269 --> 00:11:07,360
i my uh my kids are are five right now

334
00:11:10,630 --> 00:11:09,279
and it's neat because they it must have

335
00:11:13,190 --> 00:11:10,640
been a teacher that told them you know

336
00:11:14,710 --> 00:11:13,200
that uh you know we're so we do science

337
00:11:16,949 --> 00:11:14,720
because we're curious you know so they

338
00:11:18,710 --> 00:11:16,959

say they say i'm curious i'm going to be

339
00:11:21,269 --> 00:11:18,720
a scientist you know which is really

340
00:11:22,790 --> 00:11:21,279
cute and you know and and you know this

341
00:11:24,630 --> 00:11:22,800
the science and exploration i mean

342
00:11:26,710 --> 00:11:24,640
that's what it is it's you know it's

343
00:11:28,630 --> 00:11:26,720
it's we're curious you know species we

344
00:11:30,310 --> 00:11:28,640
want to understand things and and uh

345
00:11:31,030 --> 00:11:30,320
that's what our exploration is all about

346
00:11:33,590 --> 00:11:31,040
and

347
00:11:35,110 --> 00:11:33,600
you know i feel like we're kind of

348
00:11:36,550 --> 00:11:35,120
living you know if once you've been in

349
00:11:38,790 --> 00:11:36,560
space and you can look down on the earth

350
00:11:40,790 --> 00:11:38,800
and see the whole earth floating you

351
00:11:43,350 --> 00:11:40,800
know in emptiness

352
00:11:44,949 --> 00:11:43,360
uh with your own eyes

353
00:11:47,030 --> 00:11:44,959
you really get the sense of

354
00:11:48,949 --> 00:11:47,040
this is a this is a small part of what

355
00:11:50,629 --> 00:11:48,959
there is to know about you know and it's

356
00:11:52,310 --> 00:11:50,639
so important and we've explored it you

357
00:11:54,550 --> 00:11:52,320
know quite thoroughly and there's still

358
00:11:56,870 --> 00:11:54,560
plenty more to you know to learn and

359
00:11:58,389 --> 00:11:56,880
explore on on earth but there's so much

360
00:12:00,230 --> 00:11:58,399
more out there

361
00:12:02,150 --> 00:12:00,240
we just have to be out there you know

362
00:12:03,269 --> 00:12:02,160
exploring it and

363
00:12:04,870 --> 00:12:03,279

and uh

364
00:12:06,949 --> 00:12:04,880
you know i think it's just it's it's

365
00:12:09,430 --> 00:12:06,959
destiny it's our future we have to do it

366
00:12:10,870 --> 00:12:09,440
and and um and this is the beginning of

367
00:12:12,150 --> 00:12:10,880
it and i you know it's very exciting to

368
00:12:17,750 --> 00:12:12,160
be part of it and

369
00:12:23,030 --> 00:12:19,870
greg you're a member of shuttle mission

370
00:12:24,790 --> 00:12:23,040
sts-134s crew just summarize the overall

371
00:12:26,550 --> 00:12:24,800
goals of this mission and tell me what

372
00:12:27,910 --> 00:12:26,560
your major responsibilities on this

373
00:12:29,110 --> 00:12:27,920
flight are going to be

374
00:12:30,710 --> 00:12:29,120
sure

375
00:12:32,629 --> 00:12:30,720
yeah i think the probably the most

376
00:12:35,269 --> 00:12:32,639
significant thing on this flight without

377
00:12:37,509 --> 00:12:35,279
a doubt is the ams the alpha magnetic

378
00:12:39,829 --> 00:12:37,519
spectrometer that we're flying up

379
00:12:42,310 --> 00:12:39,839
this is a physics experiment

380
00:12:44,949 --> 00:12:42,320
it's a two billion dollar

381
00:12:46,310 --> 00:12:44,959
experiment built by 15 countries and

382
00:12:48,389 --> 00:12:46,320
this will be installing this on top of

383
00:12:50,069 --> 00:12:48,399
the space station and there's there's no

384
00:12:51,269 --> 00:12:50,079
doubt this is probably going to be you

385
00:12:52,790 --> 00:12:51,279
know one of the most significant

386
00:12:54,790 --> 00:12:52,800
contributions to the science on the

387
00:12:56,069 --> 00:12:54,800
space station in the years to come so

388
00:12:57,670 --> 00:12:56,079

that that's a that's a very big part of

389
00:13:00,949 --> 00:12:57,680
the mission is getting that installed

390
00:13:02,389 --> 00:13:00,959
safely and correctly and um

391
00:13:05,030 --> 00:13:02,399
in addition to that there's a platform

392
00:13:07,110 --> 00:13:05,040
we have it's called uh elc 3. it's a

393
00:13:08,470 --> 00:13:07,120
logistics platform it goes outside also

394
00:13:10,470 --> 00:13:08,480
it gets installed another part of the

395
00:13:11,509 --> 00:13:10,480
truss and it has spare equipment

396
00:13:13,190 --> 00:13:11,519
basically

397
00:13:14,389 --> 00:13:13,200
uh there's a list of equipment on i

398
00:13:16,389 --> 00:13:14,399
could give you but essentially it's

399
00:13:18,230 --> 00:13:16,399
there to enable us to keep flying the

400
00:13:19,750 --> 00:13:18,240
space station you know for the next 10

401
00:13:21,269 --> 00:13:19,760
years and and have the spare equipment

402
00:13:23,110 --> 00:13:21,279
that we need

403
00:13:24,150 --> 00:13:23,120
and then we have a series of spacewalks

404
00:13:25,509 --> 00:13:24,160
on the mission

405
00:13:26,470 --> 00:13:25,519
i'm excited to be doing a couple of

406
00:13:28,550 --> 00:13:26,480
those

407
00:13:30,870 --> 00:13:28,560
and uh and some of that is maintenance

408
00:13:33,509 --> 00:13:30,880
some of it is uh science related some of

409
00:13:35,030 --> 00:13:33,519
it is um installing some new equipment

410
00:13:36,389 --> 00:13:35,040
and so i think between those four

411
00:13:38,389 --> 00:13:36,399
spacewalks and all the robotics

412
00:13:39,990 --> 00:13:38,399
operations to install the two big

413
00:13:42,230 --> 00:13:40,000

payloads that come up in the payload bay

414
00:13:44,150 --> 00:13:42,240
those are the priorities of the mission

415
00:13:46,389 --> 00:13:44,160
almost everybody on this crew has been

416
00:13:48,310 --> 00:13:46,399
to the space station before in fact you

417
00:13:50,470 --> 00:13:48,320
and mike fink have had long duration

418
00:13:52,550 --> 00:13:50,480
stays on the station before

419
00:13:56,150 --> 00:13:52,560
has that really benefited the group of

420
00:13:57,670 --> 00:13:56,160
you as you prepare to fly sts-134 oh i'm

421
00:14:00,230 --> 00:13:57,680
sure you know

422
00:14:02,550 --> 00:14:00,240
we all we all feel that it has and a lot

423
00:14:03,829 --> 00:14:02,560
of you know in the training

424
00:14:06,230 --> 00:14:03,839
it makes a huge difference because we

425
00:14:07,430 --> 00:14:06,240
know exactly what to expect uh you know

426
00:14:09,750 --> 00:14:07,440
i think you know as you say especially

427
00:14:11,110 --> 00:14:09,760
for mike and i you know we were up there

428
00:14:12,470 --> 00:14:11,120
actually overlap for about six weeks

429
00:14:14,389 --> 00:14:12,480
we're there together

430
00:14:15,829 --> 00:14:14,399
and uh

431
00:14:17,189 --> 00:14:15,839
during the time that i was there in the

432
00:14:18,870 --> 00:14:17,199
time he was there there were multiple

433
00:14:20,870 --> 00:14:18,880
shuttle missions coming and going so the

434
00:14:23,030 --> 00:14:20,880
whole the whole dynamic of a shuttle

435
00:14:25,509 --> 00:14:23,040
coming up to the space station uh the

436
00:14:27,110 --> 00:14:25,519
two teams working together um you know

437
00:14:29,189 --> 00:14:27,120
how the space station prepares for us

438
00:14:30,629 --> 00:14:29,199

you know which i did for another shuttle

439
00:14:32,069 --> 00:14:30,639
how we work together when we're up there

440
00:14:33,509 --> 00:14:32,079
and then of course using all the systems

441
00:14:35,269 --> 00:14:33,519
on the space station

442
00:14:37,030 --> 00:14:35,279
in our case especially the airlock on

443
00:14:38,389 --> 00:14:37,040
the space station you know for the space

444
00:14:40,470 --> 00:14:38,399
walks

445
00:14:41,509 --> 00:14:40,480
so all that is so familiar to to mike

446
00:14:42,790 --> 00:14:41,519
and i

447
00:14:44,870 --> 00:14:42,800
it helps throughout the training because

448
00:14:46,310 --> 00:14:44,880
we can bring up you know these these

449
00:14:47,430 --> 00:14:46,320
points that are relevant you know as

450
00:14:49,509 --> 00:14:47,440
they come up for the shuttle crew that

451
00:14:51,590 --> 00:14:49,519
hasn't necessarily uh

452
00:14:54,069 --> 00:14:51,600
seen all these things and roberto too

453
00:14:56,230 --> 00:14:54,079
roberto you know has been there on the

454
00:14:57,750 --> 00:14:56,240
soyuz twice so he's also got that same

455
00:14:58,949 --> 00:14:57,760
familiarity with it with the space

456
00:15:00,310 --> 00:14:58,959
station so

457
00:15:01,189 --> 00:15:00,320
it helps a lot of the training i know

458
00:15:03,350 --> 00:15:01,199
during the mission it's gonna make

459
00:15:04,870 --> 00:15:03,360
things go a lot smoother

460
00:15:06,069 --> 00:15:04,880
and uh we'll know how to treat the space

461
00:15:06,790 --> 00:15:06,079
station guys because we know how we

462
00:15:08,550 --> 00:15:06,800
would

463
00:15:10,949 --> 00:15:08,560

like to be treated when shuttle crew

464
00:15:12,790 --> 00:15:10,959
came up and we were helping them and uh

465
00:15:14,150 --> 00:15:12,800
so it's a really helpful thing i think

466
00:15:15,110 --> 00:15:14,160
it's it's uh it's great and we're

467
00:15:16,230 --> 00:15:15,120
looking forward to seeing the space

468
00:15:18,310 --> 00:15:16,240
station again i can't wait to see it

469
00:15:20,069 --> 00:15:18,320
again well yeah you've done six months

470
00:15:21,990 --> 00:15:20,079
on the station so now you're looking at

471
00:15:23,269 --> 00:15:22,000
going for just a shorter period of time

472
00:15:25,030 --> 00:15:23,279
but you're also going to a station

473
00:15:26,790 --> 00:15:25,040
that's changed since you were there so

474
00:15:29,110 --> 00:15:26,800
so what are your expectations about what

475
00:15:30,949 --> 00:15:29,120
you're going to see when you arrive

476
00:15:32,870 --> 00:15:30,959
yeah i can't wait to to get there again

477
00:15:34,710 --> 00:15:32,880
you know it like say was it was home for

478
00:15:36,150 --> 00:15:34,720
me for six months you know and i and i

479
00:15:38,710 --> 00:15:36,160
feel that way about it it's you know

480
00:15:41,110 --> 00:15:38,720
it's a place i've lived in my life for a

481
00:15:42,230 --> 00:15:41,120
significant chunk of my life

482
00:15:45,670 --> 00:15:42,240
and

483
00:15:47,430 --> 00:15:45,680
has changed the one one big change i

484
00:15:48,629 --> 00:15:47,440
think that i'll notice is the cupola

485
00:15:59,269 --> 00:15:48,639
window

486
00:16:00,470 --> 00:15:59,279
side the japanese modular or spectacular

487
00:16:02,230 --> 00:16:00,480
windows

488
00:16:03,910 --> 00:16:02,240

but the cupola you know you can move

489
00:16:06,949 --> 00:16:03,920
into it and have windows all around it's

490
00:16:08,389 --> 00:16:06,959
a you know 360 degree panoramic view

491
00:16:09,829 --> 00:16:08,399
that's going to be spectacular to see

492
00:16:11,430 --> 00:16:09,839
that and there'll be additional modules

493
00:16:13,350 --> 00:16:11,440
it'll be even bigger you know even

494
00:16:15,189 --> 00:16:13,360
harder to find somebody than it was when

495
00:16:18,949 --> 00:16:15,199
i was up there

496
00:16:21,829 --> 00:16:18,959
before i had you know we were ready to

497
00:16:23,910 --> 00:16:21,839
do spacewalk if we needed to and

498
00:16:25,910 --> 00:16:23,920
i had a suit ready you know for me there

499
00:16:28,150 --> 00:16:25,920
that i bumped into as i flew past it

500
00:16:29,509 --> 00:16:28,160
every day and uh did a lot of work in

501
00:16:31,110 --> 00:16:29,519
the in the airlock but never had a

502
00:16:32,629 --> 00:16:31,120
chance to go outside nothing broke you

503
00:16:34,069 --> 00:16:32,639
know we're kind of you know in a funny

504
00:16:35,590 --> 00:16:34,079
way hoping for something really small

505
00:16:37,509 --> 00:16:35,600
and simple to break so we could go out

506
00:16:39,749 --> 00:16:37,519
and fix it but so i'm very excited this

507
00:16:40,949 --> 00:16:39,759
time to get a chance to actually go out

508
00:16:43,670 --> 00:16:40,959
the hatch and see the outside of the

509
00:16:45,030 --> 00:16:43,680
space station so i can't wait for that

510
00:16:46,629 --> 00:16:45,040
let me get you to tell us a little bit

511
00:16:47,590 --> 00:16:46,639
more about the the stuff that you're

512
00:16:49,990 --> 00:16:47,600
bringing

513
00:16:52,069 --> 00:16:50,000

express logistics carrier three you

514
00:16:54,550 --> 00:16:52,079
referred to before tell me what its

515
00:16:56,470 --> 00:16:54,560
function is on orbit so this is a

516
00:16:58,310 --> 00:16:56,480
basically a platform

517
00:16:59,509 --> 00:16:58,320
that sits in the shuttle cargo bay and

518
00:17:01,670 --> 00:16:59,519
it'll move and it'll be installed

519
00:17:03,350 --> 00:17:01,680
outside on the truss on the station

520
00:17:05,350 --> 00:17:03,360
what's on it is things that have to be

521
00:17:07,429 --> 00:17:05,360
outside or will be used outside the

522
00:17:09,350 --> 00:17:07,439
spare equipment one thing is a is a tank

523
00:17:11,110 --> 00:17:09,360
a high pressure tank for the airlock

524
00:17:13,029 --> 00:17:11,120
another thing is a spare

525
00:17:15,270 --> 00:17:13,039
part of one of the robotic arms it's

526
00:17:17,750 --> 00:17:15,280
called spdm special purpose dexterous

527
00:17:19,669 --> 00:17:17,760
manipulator part of the canadian robotic

528
00:17:21,350 --> 00:17:19,679
arm system and it's a spare

529
00:17:25,110 --> 00:17:21,360
manipulator for that

530
00:17:26,710 --> 00:17:25,120
um there's some extra antennas on it for

531
00:17:29,190 --> 00:17:26,720
our s-band radio

532
00:17:31,510 --> 00:17:29,200
and so there's spare equipment on this

533
00:17:33,270 --> 00:17:31,520
platform that we'll be installing and

534
00:17:35,430 --> 00:17:33,280
setting up one of the spacewalks will

535
00:17:38,070 --> 00:17:35,440
involve um making sure some of that

536
00:17:40,470 --> 00:17:38,080
equipment is ready to be used when when

537
00:17:42,470 --> 00:17:40,480
needed and it'll it'll be out there you

538
00:17:44,390 --> 00:17:42,480

know over the next 10 years you know and

539
00:17:46,150 --> 00:17:44,400
hope and you know as needed equipment

540
00:17:48,390 --> 00:17:46,160
will come off of that that platform to

541
00:17:49,510 --> 00:17:48,400
be used to replace things as they as

542
00:17:51,270 --> 00:17:49,520
they wear out

543
00:17:54,230 --> 00:17:51,280
so it's not anything that we have to

544
00:17:56,549 --> 00:17:54,240
have right now that's right prepping for

545
00:17:58,710 --> 00:17:56,559
stocking the pantry that's right exactly

546
00:18:00,710 --> 00:17:58,720
how does it go from getting in the

547
00:18:01,990 --> 00:18:00,720
payload bay out onto the trust what's

548
00:18:04,310 --> 00:18:02,000
the procedure for getting it out well

549
00:18:06,150 --> 00:18:04,320
the procedure's all robotic and and a

550
00:18:08,630 --> 00:18:06,160
lot of us on this crew are involved to

551
00:18:10,950 --> 00:18:08,640
make this all happen uh two guys uh in

552
00:18:12,150 --> 00:18:10,960
that case uh i believe it's mike and

553
00:18:14,390 --> 00:18:12,160
roberto

554
00:18:15,990 --> 00:18:14,400
they'll be doing the uh shuttle robotic

555
00:18:17,190 --> 00:18:16,000
work so they'll take the they'll take it

556
00:18:18,549 --> 00:18:17,200
out of the payload bay with the shuttle

557
00:18:20,470 --> 00:18:18,559
robotic arm

558
00:18:21,909 --> 00:18:20,480
and they'll basically bring it out and

559
00:18:23,909 --> 00:18:21,919
put it in a position where we can reach

560
00:18:26,230 --> 00:18:23,919
it with the station robotic arm

561
00:18:28,549 --> 00:18:26,240
box and i will be on the station side

562
00:18:30,549 --> 00:18:28,559
and we'll move the space station

563
00:18:32,310 --> 00:18:30,559

robotic arm into position to grapple it

564
00:18:33,510 --> 00:18:32,320
once we grapple it then they can release

565
00:18:42,230 --> 00:18:33,520
it

566
00:18:44,310 --> 00:18:42,240
on the trust we have these mechanisms uh

567
00:18:45,990 --> 00:18:44,320
for attaching external payloads and they

568
00:18:47,110 --> 00:18:46,000
basically have they have guide veins so

569
00:18:48,870 --> 00:18:47,120
you can bring it in you know and they

570
00:18:51,590 --> 00:18:48,880
have targets and camera systems so you

571
00:18:53,350 --> 00:18:51,600
could uh steer it in you know perfectly

572
00:18:55,430 --> 00:18:53,360
and uh so we'll be doing all of that and

573
00:18:56,470 --> 00:18:55,440
then and then there's a basically a big

574
00:18:57,990 --> 00:18:56,480
claw

575
00:18:59,750 --> 00:18:58,000
that you know once and once the

576
00:19:01,510 --> 00:18:59,760
mechanism for the claw is in operation

577
00:19:02,789 --> 00:19:01,520
the claw grabs the capture bar and then

578
00:19:05,270 --> 00:19:02,799
pulls it down and pulls it tight and

579
00:19:06,870 --> 00:19:05,280
holds it in place so um

580
00:19:08,549 --> 00:19:06,880
if everything works right you know it'll

581
00:19:10,630 --> 00:19:08,559
be that claw will stay closed and it'll

582
00:19:12,950 --> 00:19:10,640
be solidly attached you know forever at

583
00:19:14,390 --> 00:19:12,960
that point and there's also

584
00:19:16,390 --> 00:19:14,400
some electrical umbilicals that have to

585
00:19:18,549 --> 00:19:16,400
connect to it and uh so another motor

586
00:19:20,789 --> 00:19:18,559
mechanism has to move into place and

587
00:19:23,430 --> 00:19:20,799
provide power data communication to

588
00:19:25,830 --> 00:19:23,440

everything that's on the platform and so

589
00:19:27,909 --> 00:19:25,840
box and i are taking turns uh in that

590
00:19:29,430 --> 00:19:27,919
case i'll be flying the robotic arm and

591
00:19:31,590 --> 00:19:29,440
he'll be doing the mechanisms on the

592
00:19:33,510 --> 00:19:31,600
attachment system and then the next day

593
00:19:35,350 --> 00:19:33,520
we'll do a similar thing for ams where

594
00:19:38,470 --> 00:19:35,360
we'll swap roles

595
00:19:40,470 --> 00:19:38,480
so for ams installation you'll be on the

596
00:19:42,950 --> 00:19:40,480
station arm side as well yeah so it's

597
00:19:44,630 --> 00:19:42,960
for ams installation uh

598
00:19:47,830 --> 00:19:44,640
again on the shuttle side and this time

599
00:19:49,909 --> 00:19:47,840
i believe it's drew with roberto

600
00:19:51,430 --> 00:19:49,919
flying the shuttle arm moving ams new

601
00:19:53,110 --> 00:19:51,440
position with very similar thing

602
00:19:54,630 --> 00:19:53,120
different position uh different side of

603
00:19:57,830 --> 00:19:54,640
the space station

604
00:19:59,270 --> 00:19:57,840
uh so the you know from the robotic

605
00:20:00,710 --> 00:19:59,280
team's point of view everything's

606
00:20:03,029 --> 00:20:00,720
different but from our point of view you

607
00:20:04,149 --> 00:20:03,039
know it's it's a similar you know or

608
00:20:06,310 --> 00:20:04,159
from a general point of view it's quite

609
00:20:09,110 --> 00:20:06,320
similar and that station arm grabs it

610
00:20:10,789 --> 00:20:09,120
puts it into place mechanisms grapple it

611
00:20:13,110 --> 00:20:10,799
pull it down and

612
00:20:14,870 --> 00:20:13,120
so you know it takes quite a few hours

613
00:20:16,950 --> 00:20:14,880

you know it's it's it's a tricky

614
00:20:18,950 --> 00:20:16,960
operation the tolerances are really

615
00:20:21,110 --> 00:20:18,960
tight you don't have camera views that

616
00:20:22,950 --> 00:20:21,120
show you you know clearances between you

617
00:20:24,870 --> 00:20:22,960
know things that you would like to to

618
00:20:26,310 --> 00:20:24,880
know for sure that you're not hitting so

619
00:20:27,510 --> 00:20:26,320
it takes some training to make sure you

620
00:20:29,110 --> 00:20:27,520
know what we know we know we know

621
00:20:30,149 --> 00:20:29,120
exactly what we're expecting and get it

622
00:20:31,669 --> 00:20:30,159
in there right

623
00:20:33,270 --> 00:20:31,679
and but

624
00:20:34,310 --> 00:20:33,280
if all goes well you know it should be

625
00:20:36,710 --> 00:20:34,320
no problem

626
00:20:38,390 --> 00:20:36,720
i have to say on the on the for the ams

627
00:20:40,310 --> 00:20:38,400
which is the very expensive payload you

628
00:20:41,669 --> 00:20:40,320
know the one that's most important um

629
00:20:43,029 --> 00:20:41,679
the attachment mechanism we're putting

630
00:20:44,390 --> 00:20:43,039
it on doesn't have the same level of

631
00:20:46,149 --> 00:20:44,400
redundancy as some of the other

632
00:20:48,390 --> 00:20:46,159
attachment mechanisms in other words

633
00:20:51,510 --> 00:20:48,400
there's not two motors if one fails

634
00:20:54,230 --> 00:20:51,520
for attaching it for example so i'll be

635
00:20:56,070 --> 00:20:54,240
breathing a little better after we've

636
00:20:57,510 --> 00:20:56,080
that's been completed and i know that

637
00:20:59,110 --> 00:20:57,520
it's attached

638
00:21:01,350 --> 00:20:59,120

successfully just because i don't we

639
00:21:03,190 --> 00:21:01,360
don't have the redundancy there

640
00:21:06,950 --> 00:21:03,200
you know if something does go wrong is

641
00:21:08,149 --> 00:21:06,960
that a possible contingency eva task did

642
00:21:10,070 --> 00:21:08,159
you guys have prepared there's some

643
00:21:12,630 --> 00:21:10,080
potential tasks we could do you know

644
00:21:14,549 --> 00:21:12,640
there's but there's a couple of fallback

645
00:21:16,230 --> 00:21:14,559
uh things we can do and it's possible to

646
00:21:19,029 --> 00:21:16,240
keep the ams on the robotic arm

647
00:21:21,270 --> 00:21:19,039
overnight if we have to do that it has

648
00:21:24,230 --> 00:21:21,280
it can provide build power to it through

649
00:21:25,990 --> 00:21:24,240
the robotic arm so yeah we have we have

650
00:21:28,390 --> 00:21:26,000
some backup plans hopefully we don't

651
00:21:30,230 --> 00:21:28,400
need them right

652
00:21:33,110 --> 00:21:30,240
fill me in on the alpha magnetic

653
00:21:34,950 --> 00:21:33,120
spectrometer what does it do once it's

654
00:21:37,190 --> 00:21:34,960
in that position out on the station's

655
00:21:39,029 --> 00:21:37,200
truss well this is an amazing instrument

656
00:21:41,270 --> 00:21:39,039
you know the ams

657
00:21:42,149 --> 00:21:41,280
as you said alpha magnetic spectrometer

658
00:21:43,909 --> 00:21:42,159
uh

659
00:21:46,070 --> 00:21:43,919
in my mind this is like the hubble space

660
00:21:49,590 --> 00:21:46,080
telescope i mean it has the same type of

661
00:21:51,270 --> 00:21:49,600
potential for revolutionizing uh revolu

662
00:21:53,669 --> 00:21:51,280
revolutionizing our understanding of the

663
00:21:55,270 --> 00:21:53,679

of the universe um it's looking at

664
00:21:57,029 --> 00:21:55,280
cosmic rays

665
00:21:58,789 --> 00:21:57,039
so it's different than a normal

666
00:22:01,190 --> 00:21:58,799
telescope

667
00:22:02,789 --> 00:22:01,200
and as it's collecting cosmic rays you

668
00:22:04,390 --> 00:22:02,799
know it's basically able to measure mass

669
00:22:06,310 --> 00:22:04,400
the direction they came from the energy

670
00:22:08,230 --> 00:22:06,320
they have and and and whether they're

671
00:22:10,630 --> 00:22:08,240
also matter or anti-matter

672
00:22:12,549 --> 00:22:10,640
and um so i think you know fundamentally

673
00:22:16,070 --> 00:22:12,559
you know it's designed to look look for

674
00:22:17,590 --> 00:22:16,080
antimatter and dark energy dark matter

675
00:22:18,870 --> 00:22:17,600
but it's looking at all cosmic ray

676
00:22:20,950 --> 00:22:18,880
particles and the thing is that on the

677
00:22:22,149 --> 00:22:20,960
ground they've been trying to simulate

678
00:22:24,470 --> 00:22:22,159
uh

679
00:22:26,870 --> 00:22:24,480
or create you know nuclear different

680
00:22:28,230 --> 00:22:26,880
nuclear particles with these acceler

681
00:22:33,510 --> 00:22:28,240
accelera

682
00:22:34,950 --> 00:22:33,520
and um

683
00:22:36,470 --> 00:22:34,960
and the energy levels they've reached on

684
00:22:38,630 --> 00:22:36,480
the ground are still in order of

685
00:22:40,789 --> 00:22:38,640
magnitude or more or less than what's in

686
00:22:42,630 --> 00:22:40,799
free space so it's possible that they're

687
00:22:43,590 --> 00:22:42,640
going to see things that you know first

688
00:22:45,510 --> 00:22:43,600

of all they'll see the natural

689
00:22:47,909 --> 00:22:45,520
background distribution of these kind of

690
00:22:49,510 --> 00:22:47,919
particles and they'll see possibly some

691
00:22:50,870 --> 00:22:49,520
ones that have not been able to create

692
00:22:52,630 --> 00:22:50,880
in the laboratory

693
00:22:54,630 --> 00:22:52,640
so there's a lot of potential for

694
00:22:55,430 --> 00:22:54,640
discovery and the other thing is that

695
00:22:56,870 --> 00:22:55,440
um

696
00:22:58,230 --> 00:22:56,880
you know it knows where the particle is

697
00:22:59,909 --> 00:22:58,240
coming from because if it could be

698
00:23:01,750 --> 00:22:59,919
pointing at a galaxy and if if

699
00:23:03,909 --> 00:23:01,760
anti-matter particles start showing up

700
00:23:05,430 --> 00:23:03,919
in the detector you know it could be

701
00:23:07,430 --> 00:23:05,440
telling us that that galaxy is an

702
00:23:09,909 --> 00:23:07,440
antimatter galaxy and you know the whole

703
00:23:12,549 --> 00:23:09,919
universe was supposedly uh in the big

704
00:23:14,789 --> 00:23:12,559
bang theory made you know in equal parts

705
00:23:17,190 --> 00:23:14,799
anti-matter and matter but now what we

706
00:23:18,870 --> 00:23:17,200
see is essentially all matter

707
00:23:20,149 --> 00:23:18,880
as far as we know

708
00:23:22,390 --> 00:23:20,159
and it turns out that this thing can

709
00:23:24,149 --> 00:23:22,400
detect you know uh anti-matter

710
00:23:26,470 --> 00:23:24,159
uh particles in a you know at a certain

711
00:23:28,230 --> 00:23:26,480
level it'll help understand help us

712
00:23:30,230 --> 00:23:28,240
understand you know the the nature of

713
00:23:31,830 --> 00:23:30,240

the evolution of the universe so it's

714
00:23:33,430 --> 00:23:31,840
some pretty interesting things and also

715
00:23:34,789 --> 00:23:33,440
i think the

716
00:23:36,470 --> 00:23:34,799
the um

717
00:23:38,230 --> 00:23:36,480
you know the thing that hubble did for

718
00:23:40,310 --> 00:23:38,240
us that was very one one major thing

719
00:23:41,510 --> 00:23:40,320
hubble did for us was very interesting

720
00:23:42,549 --> 00:23:41,520
was uh

721
00:23:44,950 --> 00:23:42,559
you know

722
00:23:46,230 --> 00:23:44,960
we knew that the universe was expanding

723
00:23:48,070 --> 00:23:46,240
and we wondered whether or not there's

724
00:23:49,510 --> 00:23:48,080
enough gravity for it to stop expanding

725
00:23:51,590 --> 00:23:49,520
and recollapse or whether or not it

726
00:23:53,110 --> 00:23:51,600
would expand forever or you know and

727
00:23:55,029 --> 00:23:53,120
hubble figured out that not only is it

728
00:23:56,230 --> 00:23:55,039
expanding but the rate of expansion is

729
00:23:58,390 --> 00:23:56,240
increasing

730
00:23:59,669 --> 00:23:58,400
and how how does that happen with normal

731
00:24:01,269 --> 00:23:59,679
gravity you know so there's something

732
00:24:03,669 --> 00:24:01,279
else we don't understand

733
00:24:06,149 --> 00:24:03,679
and uh you know and that has to do

734
00:24:09,269 --> 00:24:06,159
potentially with with dark matter and

735
00:24:11,110 --> 00:24:09,279
and dark energy and so if if ams helps

736
00:24:13,350 --> 00:24:11,120
us understand these things i think the

737
00:24:16,230 --> 00:24:13,360
you know the concepts of anti-matter uh

738
00:24:18,149 --> 00:24:16,240

how anti-matter and matter um you know

739
00:24:19,510 --> 00:24:18,159
work and and how gravity works these are

740
00:24:21,269 --> 00:24:19,520
fundamental concepts we still don't

741
00:24:23,190 --> 00:24:21,279
really understand doesn't fit into the

742
00:24:24,870 --> 00:24:23,200
grand unified theory yet

743
00:24:26,549 --> 00:24:24,880
and uh you know just like when we

744
00:24:28,070 --> 00:24:26,559
figured out electromagnetism we have

745
00:24:30,310 --> 00:24:28,080
things like you know tvs and

746
00:24:32,630 --> 00:24:30,320
communications and satellites and

747
00:24:34,070 --> 00:24:32,640
and uh and all this technology based on

748
00:24:35,510 --> 00:24:34,080
our understanding of electromagnetism

749
00:24:36,789 --> 00:24:35,520
and so i think you know this is the

750
00:24:38,789 --> 00:24:36,799
beginning of the next phase of

751
00:24:41,110 --> 00:24:38,799
understanding physics that could really

752
00:24:42,470 --> 00:24:41,120
um be important for the future so it's

753
00:24:43,510 --> 00:24:42,480
pretty pretty interesting stuff that

754
00:24:45,510 --> 00:24:43,520
they're looking at it's fundamental

755
00:24:47,750 --> 00:24:45,520
physics but in the long run i think it

756
00:24:50,070 --> 00:24:47,760
has you know great potential for

757
00:24:51,909 --> 00:24:50,080
uh pushing us to the future so very

758
00:24:53,909 --> 00:24:51,919
interesting stuff and in this case as i

759
00:24:56,549 --> 00:24:53,919
understand it correctly the station is

760
00:24:58,390 --> 00:24:56,559
used as a platform for ams but the crew

761
00:25:01,110 --> 00:24:58,400
members on board don't really have any

762
00:25:02,630 --> 00:25:01,120
anything to do with it helping it take

763
00:25:04,549 --> 00:25:02,640

its readings or measurements right it

764
00:25:07,269 --> 00:25:04,559
collects an incredible amount of data

765
00:25:08,390 --> 00:25:07,279
and uh you know it's looking at um you

766
00:25:09,990 --> 00:25:08,400
know all the particles coming through

767
00:25:12,310 --> 00:25:10,000
the detector and we're talking you know

768
00:25:14,230 --> 00:25:12,320
you know many particles per you know

769
00:25:16,710 --> 00:25:14,240
let's say let's say nanosecond or

770
00:25:18,070 --> 00:25:16,720
whatever and uh and it's figuring out

771
00:25:19,430 --> 00:25:18,080
which you know which ones came in the

772
00:25:21,430 --> 00:25:19,440
right way and left the right way so they

773
00:25:23,669 --> 00:25:21,440
can match up you know that the one that

774
00:25:25,029 --> 00:25:23,679
left through this surface was the one

775
00:25:26,950 --> 00:25:25,039
that came into this surface so it has a

776
00:25:29,029 --> 00:25:26,960
lot of there's a lot of analysis to do

777
00:25:30,789 --> 00:25:29,039
to figure out to match up you know

778
00:25:33,110 --> 00:25:30,799
accident entry points and

779
00:25:34,710 --> 00:25:33,120
and um and uh and you know figure out

780
00:25:36,630 --> 00:25:34,720
the curvature of particles in there and

781
00:25:38,310 --> 00:25:36,640
figure out the mass and so a lot of that

782
00:25:40,149 --> 00:25:38,320
raw data goes down to the ground there's

783
00:25:41,669 --> 00:25:40,159
some onboard computation and data

784
00:25:43,669 --> 00:25:41,679
compression and then it all goes down to

785
00:25:45,350 --> 00:25:43,679
the ground and and there'll be terabytes

786
00:25:47,830 --> 00:25:45,360
and terabytes and terabytes of data for

787
00:25:50,549 --> 00:25:47,840
physicist analytes for the next 10 years

788
00:25:52,070 --> 00:25:50,559

keep them busy no doubt no doubt

789
00:25:53,430 --> 00:25:52,080
you mentioned a few minutes ago that the

790
00:25:55,430 --> 00:25:53,440
plan for this

791
00:25:57,669 --> 00:25:55,440
mission also calls for four spacewalks

792
00:25:59,750 --> 00:25:57,679
by three different teams of spacewalkers

793
00:26:01,430 --> 00:25:59,760
tell me what your role as

794
00:26:04,149 --> 00:26:01,440
as a member of this team is going to be

795
00:26:05,750 --> 00:26:04,159
on this flight sure uh you know this is

796
00:26:07,350 --> 00:26:05,760
a really exciting uh part of the

797
00:26:09,110 --> 00:26:07,360
training in preparation to just being

798
00:26:11,590 --> 00:26:09,120
part of this team as you said there's

799
00:26:14,149 --> 00:26:11,600
three of us so uh drew feustel he's

800
00:26:16,310 --> 00:26:14,159
gonna be the lead space walker um and

801
00:26:17,990 --> 00:26:16,320
mike fink and i mike fink's done several

802
00:26:20,070 --> 00:26:18,000
spacewalks on the russian segment before

803
00:26:22,149 --> 00:26:20,080
for me this is this is the first time

804
00:26:24,549 --> 00:26:22,159
and the three of us work in it working a

805
00:26:26,230 --> 00:26:24,559
team for all the spacewalks so

806
00:26:28,549 --> 00:26:26,240
two of them on any particular spacewalk

807
00:26:30,549 --> 00:26:28,559
two go out the door the other one is uh

808
00:26:33,510 --> 00:26:30,559
works inside we call them iv and those

809
00:26:35,510 --> 00:26:33,520
guys evie and uh and the iv is the sort

810
00:26:37,590 --> 00:26:35,520
of task master the one who's got keeper

811
00:26:39,110 --> 00:26:37,600
of the master plan you know okay next

812
00:26:40,789 --> 00:26:39,120
we're doing this next you're doing this

813
00:26:41,909 --> 00:26:40,799

and you know and as things evolve you

814
00:26:43,269 --> 00:26:41,919
know if they change a little bit is the

815
00:26:44,870 --> 00:26:43,279
one who's keeping track of everything

816
00:26:46,789 --> 00:26:44,880
and also communicating with the ground

817
00:26:48,390 --> 00:26:46,799
and and being the interface between you

818
00:26:51,190 --> 00:26:48,400
know the crew in the ground and the plan

819
00:26:52,710 --> 00:26:51,200
and the and the you know and the and um

820
00:26:54,070 --> 00:26:52,720
you know how well the suit is doing and

821
00:26:55,029 --> 00:26:54,080
how much time we have left and all and

822
00:26:57,590 --> 00:26:55,039
everything

823
00:27:00,549 --> 00:26:57,600
and we just kind of rotate that so on on

824
00:27:01,909 --> 00:27:00,559
eva one i'm out the door with with drew

825
00:27:05,350 --> 00:27:01,919
mike's iv

826
00:27:07,110 --> 00:27:05,360
and then eva2 i'm uh ev i'm internal i'm

827
00:27:08,710 --> 00:27:07,120
iv and those two guys are out the door

828
00:27:11,350 --> 00:27:08,720
and we we rotate that way through all

829
00:27:13,350 --> 00:27:11,360
those space walks so uh in combination

830
00:27:14,789 --> 00:27:13,360
then with the ground team you know the

831
00:27:16,789 --> 00:27:14,799
we we have a whole team of folks that

832
00:27:18,470 --> 00:27:16,799
have been working on us now you know by

833
00:27:19,830 --> 00:27:18,480
the time we fly it'll probably be two

834
00:27:22,149 --> 00:27:19,840
years you know that they've all been

835
00:27:25,029 --> 00:27:22,159
working on this and uh so it's a really

836
00:27:27,190 --> 00:27:25,039
neat team of folks really focused on on

837
00:27:28,950 --> 00:27:27,200
making all this happen and

838
00:27:32,070 --> 00:27:28,960

who knows if we'll execute it exactly as

839
00:27:35,190 --> 00:27:32,080
planned but you know we uh we train to

840
00:27:36,789 --> 00:27:35,200
be able to be flexible and uh but it's

841
00:27:38,549 --> 00:27:36,799
exciting to be part of that team and and

842
00:27:39,830 --> 00:27:38,559
i like the way that that teamwork works

843
00:27:41,590 --> 00:27:39,840
it's a little different than the

844
00:27:43,669 --> 00:27:41,600
experience i had before training for

845
00:27:44,789 --> 00:27:43,679
space station because i was i was flying

846
00:27:46,789 --> 00:27:44,799
with two russians and a lot of my

847
00:27:48,549 --> 00:27:46,799
training was solo so it's a neat

848
00:27:50,870 --> 00:27:48,559
difference in the in the training to be

849
00:27:52,630 --> 00:27:50,880
on a team like that it gives you a bit

850
00:27:55,029 --> 00:27:52,640
wider experience

851
00:27:56,470 --> 00:27:55,039
for your future flights exactly well let

852
00:27:58,470 --> 00:27:56,480
me get you to tell us about what's going

853
00:28:00,470 --> 00:27:58,480
to happen let's start with eva number

854
00:28:02,230 --> 00:28:00,480
one you and drew are outside what's

855
00:28:04,310 --> 00:28:02,240
what's on the uh what's on the timeline

856
00:28:06,310 --> 00:28:04,320
all right let's see so uh an eva one so

857
00:28:07,750 --> 00:28:06,320
drew and i go out uh and this will be my

858
00:28:09,750 --> 00:28:07,760
first time out the door

859
00:28:11,269 --> 00:28:09,760
and um so the first thing i do is this

860
00:28:13,190 --> 00:28:11,279
thing that they haven't funny name for

861
00:28:15,110 --> 00:28:13,200
translation adaptation

862
00:28:18,549 --> 00:28:15,120
um because we're so used to training

863
00:28:20,549 --> 00:28:18,559

under water and you know underwater

864
00:28:21,590 --> 00:28:20,559
you know it helps you get a sense a

865
00:28:25,590 --> 00:28:21,600
sense of

866
00:28:27,350 --> 00:28:25,600
of course gravity is still there but the

867
00:28:30,389 --> 00:28:27,360
water resists your motion

868
00:28:32,070 --> 00:28:30,399
so it takes every effort to move and

869
00:28:33,909 --> 00:28:32,080
and very little effort to stop because

870
00:28:35,269 --> 00:28:33,919
the you you have the water helping you

871
00:28:38,149 --> 00:28:35,279
stop the motion

872
00:28:40,070 --> 00:28:38,159
um and in space your expectation is that

873
00:28:41,909 --> 00:28:40,080
you know that uh yeah it takes work to

874
00:28:44,630 --> 00:28:41,919
stop too because there's nothing slowing

875
00:28:46,789 --> 00:28:44,640
you down so uh so if i have a couple

876
00:28:48,630 --> 00:28:46,799
minutes do it to do that make sure i you

877
00:28:51,510 --> 00:28:48,640
know i don't go flinging myself off the

878
00:28:53,990 --> 00:28:51,520
station because i push too hard um while

879
00:28:55,590 --> 00:28:54,000
drew uh sets up a couple of tethers and

880
00:28:56,950 --> 00:28:55,600
uh and then the the main things we're

881
00:28:58,470 --> 00:28:56,960
doing this task is that there's an

882
00:29:00,230 --> 00:28:58,480
experiment called missy

883
00:29:02,070 --> 00:29:00,240
it's a space exposure experiment

884
00:29:03,750 --> 00:29:02,080
basically they're like large suitcases

885
00:29:05,990 --> 00:29:03,760
with lots of samples inside of it those

886
00:29:08,630 --> 00:29:06,000
samples can be everything from materials

887
00:29:10,389 --> 00:29:08,640
to paints to coatings to electronic

888
00:29:12,630 --> 00:29:10,399

equipment to biological samples and they

889
00:29:14,070 --> 00:29:12,640
could come from different organizations

890
00:29:15,269 --> 00:29:14,080
and it's the idea is to expose these

891
00:29:16,789 --> 00:29:15,279
things to the

892
00:29:18,870 --> 00:29:16,799
the harsh environment of space for a

893
00:29:20,950 --> 00:29:18,880
long period and see what happens you

894
00:29:22,950 --> 00:29:20,960
know see see if the seeds seeds will

895
00:29:25,029 --> 00:29:22,960
still germinate see if a paint material

896
00:29:27,269 --> 00:29:25,039
will protect you know

897
00:29:29,909 --> 00:29:27,279
what's what's below it see if a circuit

898
00:29:33,190 --> 00:29:29,919
can still work you know and to help us

899
00:29:34,870 --> 00:29:33,200
design better systems for the future um

900
00:29:36,470 --> 00:29:34,880
and so there's a there's two experiments

901
00:29:38,549 --> 00:29:36,480
out there that are part of us missy

902
00:29:39,990 --> 00:29:38,559
seven we're going to retrieve those uh

903
00:29:41,110 --> 00:29:40,000
close them up

904
00:29:43,350 --> 00:29:41,120
take them back put them in the shuttle

905
00:29:45,190 --> 00:29:43,360
cargo bay and then we take new ones out

906
00:29:46,870 --> 00:29:45,200
of the cargo bay missy eight and we

907
00:29:48,630 --> 00:29:46,880
install them up on the up on the trust

908
00:29:50,630 --> 00:29:48,640
and they'll you know and they'll be out

909
00:29:53,269 --> 00:29:50,640
there for you know six months to a year

910
00:29:54,710 --> 00:29:53,279
before they uh come in so that's the

911
00:29:56,070 --> 00:29:54,720
first maintenance does this give you an

912
00:29:58,149 --> 00:29:56,080
opportunity to crawl way out on the end

913
00:30:00,070 --> 00:29:58,159

of the truck not way out but that comes

914
00:30:03,830 --> 00:30:00,080
later okay

915
00:30:05,190 --> 00:30:03,840
yeah so uh so we do that and um and then

916
00:30:06,950 --> 00:30:05,200
the thing that one of the part of this

917
00:30:08,870 --> 00:30:06,960
four eva sequence is

918
00:30:09,830 --> 00:30:08,880
refilling a radiator

919
00:30:13,350 --> 00:30:09,840
that's

920
00:30:15,430 --> 00:30:13,360
and to do that we have to sort of

921
00:30:17,510 --> 00:30:15,440
connect a lot of

922
00:30:19,669 --> 00:30:17,520
ammonia hoses between a lot of segments

923
00:30:20,789 --> 00:30:19,679
including one that jumps across the

924
00:30:22,789 --> 00:30:20,799
rotating

925
00:30:24,389 --> 00:30:22,799
solar alpha rotary joint which normally

926
00:30:25,990 --> 00:30:24,399
can't have a hose running across it's

927
00:30:27,510 --> 00:30:26,000
connected to both ends because it has to

928
00:30:28,470 --> 00:30:27,520
spin freely

929
00:30:30,549 --> 00:30:28,480
so we're going to go out and we're going

930
00:30:32,389 --> 00:30:30,559
to connect all these hoses and then vent

931
00:30:34,470 --> 00:30:32,399
them basically so that they're filled

932
00:30:36,389 --> 00:30:34,480
with into the nitrogen we're going to

933
00:30:38,630 --> 00:30:36,399
vent them so that they're ready to be

934
00:30:41,750 --> 00:30:38,640
used for the ammonia fill on the next

935
00:30:42,630 --> 00:30:41,760
eva so that's uh that's another uh task

936
00:30:44,630 --> 00:30:42,640
and then

937
00:30:46,230 --> 00:30:44,640
um and we connect them all and we

938
00:30:48,389 --> 00:30:46,240

disconnect the part that jumps that

939
00:30:49,669 --> 00:30:48,399
joint so that the joint can still spin

940
00:30:51,669 --> 00:30:49,679
freely and the solar panels are out here

941
00:30:53,430 --> 00:30:51,679
they have to be able to

942
00:30:55,590 --> 00:30:53,440
to continue rotating

943
00:30:57,110 --> 00:30:55,600
and also in this space walk we have um

944
00:30:58,870 --> 00:30:57,120
there's some external it's kind of like

945
00:31:01,110 --> 00:30:58,880
your wireless hubs in your house you

946
00:31:03,029 --> 00:31:01,120
know or a network it's basically a

947
00:31:04,630 --> 00:31:03,039
couple of antennas and that enables a

948
00:31:05,909 --> 00:31:04,640
wireless system to be working outside

949
00:31:07,590 --> 00:31:05,919
the station so they're they're

950
00:31:08,950 --> 00:31:07,600
experiments and payloads outside the

951
00:31:10,470 --> 00:31:08,960
space station they need to communicate

952
00:31:12,470 --> 00:31:10,480
to the data system

953
00:31:14,070 --> 00:31:12,480
and uh we're they're we're installing a

954
00:31:16,470 --> 00:31:14,080
couple of antennas and all the wiring

955
00:31:18,630 --> 00:31:16,480
for that to enable those

956
00:31:20,310 --> 00:31:18,640
those pieces of equipment or experiments

957
00:31:22,230 --> 00:31:20,320
whatever to communicate to internal

958
00:31:23,430 --> 00:31:22,240
systems through those antennas so it's a

959
00:31:25,909 --> 00:31:23,440
lot of wiring

960
00:31:26,549 --> 00:31:25,919
uh it's a little messy with long wires

961
00:31:30,070 --> 00:31:26,559
and

962
00:31:32,389 --> 00:31:30,080
it takes a while but um that's gonna be

963
00:31:34,230 --> 00:31:32,399

in the front of the space station near

964
00:31:35,830 --> 00:31:34,240
the shuttle and the thing that's still

965
00:31:37,590 --> 00:31:35,840
maybe interesting about that is just

966
00:31:40,310 --> 00:31:37,600
that in order for us to do that they

967
00:31:42,789 --> 00:31:40,320
have they have to disable some things

968
00:31:45,669 --> 00:31:42,799
you know internally that'll we may lose

969
00:31:47,190 --> 00:31:45,679
communication so um and we may have to

970
00:31:48,549 --> 00:31:47,200
like wave through the window and say

971
00:31:49,830 --> 00:31:48,559
everything's okay and then go down and

972
00:31:51,669 --> 00:31:49,840
finish the work and come back and say

973
00:31:54,389 --> 00:31:51,679
everything's okay so we'll see how that

974
00:31:56,230 --> 00:31:54,399
goes but it should be interesting

975
00:31:58,789 --> 00:31:56,240
as you mentioned two days later you and

976
00:32:00,549 --> 00:31:58,799
mike swaps places mike and drew go

977
00:32:02,149 --> 00:32:00,559
outside on the second space walk what

978
00:32:04,310 --> 00:32:02,159
are they going to do out there

979
00:32:06,549 --> 00:32:04,320
yeah so this is a very interesting uh

980
00:32:08,149 --> 00:32:06,559
challenging spacewalk

981
00:32:10,710 --> 00:32:08,159
there's two major tasks one of them is

982
00:32:12,789 --> 00:32:10,720
to refill that radiator that i mentioned

983
00:32:14,789 --> 00:32:12,799
and so ammonia has to fill these lines

984
00:32:16,870 --> 00:32:14,799
you know all the way out to the

985
00:32:19,990 --> 00:32:16,880
to the far end of the port side of the

986
00:32:22,630 --> 00:32:20,000
station and and while also that's going

987
00:32:25,029 --> 00:32:22,640
on that that rotary joint for the solar

988
00:32:26,230 --> 00:32:25,039

panel on that side has to be lubricated

989
00:32:27,990 --> 00:32:26,240
and this is a long-term maintenance

990
00:32:30,389 --> 00:32:28,000
thing just to make sure that it can go

991
00:32:31,909 --> 00:32:30,399
for 10 more years you know and and not

992
00:32:33,350 --> 00:32:31,919
have any uh

993
00:32:34,710 --> 00:32:33,360
friction you know in the with the

994
00:32:36,389 --> 00:32:34,720
bearings

995
00:32:38,230 --> 00:32:36,399
but that's a big joint i mean it's 15

996
00:32:39,509 --> 00:32:38,240
feet across it's got lots of covers on

997
00:32:40,549 --> 00:32:39,519
it all those covers have to come well

998
00:32:42,070 --> 00:32:40,559
not all of them some of the covers have

999
00:32:43,750 --> 00:32:42,080
to come off we're going to be inside

1000
00:32:46,470 --> 00:32:43,760
there with lubrication guns trying to

1001
00:32:48,789 --> 00:32:46,480
lubricate different surfaces

1002
00:32:49,830 --> 00:32:48,799
and this there's a lot of connectors to

1003
00:32:51,269 --> 00:32:49,840
do this

1004
00:32:53,430 --> 00:32:51,279
i think we're setting a record for how

1005
00:32:55,029 --> 00:32:53,440
many uh fluid line connectors were

1006
00:32:56,870 --> 00:32:55,039
connecting and disconnecting in order to

1007
00:32:59,350 --> 00:32:56,880
set up all these lines to do this this

1008
00:33:01,110 --> 00:32:59,360
ammonia fill and then take it all apart

1009
00:33:03,269 --> 00:33:01,120
at the end

1010
00:33:05,669 --> 00:33:03,279
and the danger is that

1011
00:33:07,350 --> 00:33:05,679
if there's a minor danger or just that

1012
00:33:09,110 --> 00:33:07,360
you know it could be with one of these

1013
00:33:11,269 --> 00:33:09,120

connectors that some ammonia leaks out

1014
00:33:13,669 --> 00:33:11,279
if ammonia gets on the suit

1015
00:33:16,310 --> 00:33:13,679
you know this is 100 ammonia

1016
00:33:17,909 --> 00:33:16,320
unlike the household variety and so if

1017
00:33:19,830 --> 00:33:17,919
any comes into the space station on the

1018
00:33:22,230 --> 00:33:19,840
suit that's a big problem

1019
00:33:23,990 --> 00:33:22,240
health-wise so we can't bring any in it

1020
00:33:25,430 --> 00:33:24,000
now we could bake it out on the suit but

1021
00:33:27,509 --> 00:33:25,440
we have to identify it and then go

1022
00:33:29,350 --> 00:33:27,519
through a procedure to make sure that uh

1023
00:33:31,269 --> 00:33:29,360
it's sort of

1024
00:33:33,029 --> 00:33:31,279
we can scrape it off or have it bake off

1025
00:33:35,029 --> 00:33:33,039
the soup so we'll be watching really

1026
00:33:36,710 --> 00:33:35,039
closely to see if you know

1027
00:33:39,029 --> 00:33:36,720
most likely drew

1028
00:33:40,870 --> 00:33:39,039
gets contaminated if he does then we'll

1029
00:33:42,230 --> 00:33:40,880
have to you know be out for a certain

1030
00:33:44,149 --> 00:33:42,240
amount of time to make sure that there's

1031
00:33:46,789 --> 00:33:44,159
enough time for the sun to make it off

1032
00:33:48,789 --> 00:33:46,799
the suit and uh there's clean up steps

1033
00:33:50,710 --> 00:33:48,799
we can do and and inside the airlock we

1034
00:33:53,110 --> 00:33:50,720
can check if there's any ammonia as we

1035
00:33:55,669 --> 00:33:53,120
repress rise so this is our main concern

1036
00:33:57,590 --> 00:33:55,679
on this on this spacewalk but um but

1037
00:33:59,590 --> 00:33:57,600
it's really a

1038
00:34:02,070 --> 00:33:59,600

a ballet between

1039
00:34:04,149 --> 00:34:02,080
uh timing because as we do this this

1040
00:34:06,149 --> 00:34:04,159
fill it depends on

1041
00:34:09,349 --> 00:34:06,159
you don't you never want a part of the

1042
00:34:11,510 --> 00:34:09,359
uh that segment of of of of hoses

1043
00:34:14,550 --> 00:34:11,520
essentially of lines um filled with

1044
00:34:16,389 --> 00:34:14,560
ammonia without any way to expand um out

1045
00:34:18,069 --> 00:34:16,399
in the sun so you really want to do

1046
00:34:20,069 --> 00:34:18,079
certain things at night you know other

1047
00:34:21,349 --> 00:34:20,079
things in the day and so we're watching

1048
00:34:22,950 --> 00:34:21,359
the timing and

1049
00:34:24,389 --> 00:34:22,960
it's an interesting choreography with

1050
00:34:26,710 --> 00:34:24,399
that one um just trying to make sure

1051
00:34:29,510 --> 00:34:26,720
that we never not nothing is left to

1052
00:34:31,750 --> 00:34:29,520
expand and have nowhere to go you know

1053
00:34:34,869 --> 00:34:31,760
and in the meantime

1054
00:34:36,710 --> 00:34:34,879
mike will be mostly focusing on on

1055
00:34:38,230 --> 00:34:36,720
the lubrication of the rotary joint

1056
00:34:40,629 --> 00:34:38,240
called the sarge joint solar alpha

1057
00:34:42,950 --> 00:34:40,639
rotary joint and drew will help him as

1058
00:34:44,310 --> 00:34:42,960
he can and then we have a couple of

1059
00:34:46,230 --> 00:34:44,320
other tasks while we're waiting they're

1060
00:34:48,230 --> 00:34:46,240
going to rotate the whole joint once

1061
00:34:50,230 --> 00:34:48,240
they've lubricated it and lubricate it

1062
00:34:51,589 --> 00:34:50,240
again in a different position

1063
00:34:53,349 --> 00:34:51,599

and then they'll put everything away so

1064
00:34:55,430 --> 00:34:53,359
it's it's a big spacewalk though a lot

1065
00:34:57,430 --> 00:34:55,440
of stuff and these same two guys are

1066
00:34:59,430 --> 00:34:57,440
going out again two days later but

1067
00:35:03,190 --> 00:34:59,440
before they do they're gonna

1068
00:35:04,950 --> 00:35:03,200
test out a new procedure for uh purging

1069
00:35:07,430 --> 00:35:04,960
nitrogen from a bloodstream right

1070
00:35:09,030 --> 00:35:07,440
spacewalkers have done this but you guys

1071
00:35:10,710 --> 00:35:09,040
are going to try out a new procedure

1072
00:35:12,310 --> 00:35:10,720
yeah tell me tell me about what th that

1073
00:35:14,069 --> 00:35:12,320
new procedure yeah this is very exciting

1074
00:35:15,910 --> 00:35:14,079
you know i mean it shouldn't you know it

1075
00:35:17,190 --> 00:35:15,920
when you watch a science fiction movie

1076
00:35:19,270 --> 00:35:17,200
and two people go out the door for a

1077
00:35:20,470 --> 00:35:19,280
spacewalk they don't take 48 hours to do

1078
00:35:22,710 --> 00:35:20,480
it you know they just somehow jump in

1079
00:35:25,030 --> 00:35:22,720
the suit and they're gone

1080
00:35:26,870 --> 00:35:25,040
in real life takes us a lot of time and

1081
00:35:28,870 --> 00:35:26,880
we'd like that to be you know

1082
00:35:30,390 --> 00:35:28,880
faster

1083
00:35:31,910 --> 00:35:30,400
for example on the first spacewalk we're

1084
00:35:33,589 --> 00:35:31,920
doing kampa which is one of the normal

1085
00:35:35,829 --> 00:35:33,599
things we do on the space station is we

1086
00:35:38,470 --> 00:35:35,839
go into the airlock the night before we

1087
00:35:40,870 --> 00:35:38,480
depressurize the airlock down to 10.2

1088
00:35:43,430 --> 00:35:40,880

14.7 is a normal atmospheric pressure

1089
00:35:45,750 --> 00:35:43,440
down at 10.2 we breathe some oxygen off

1090
00:35:47,270 --> 00:35:45,760
masks in that process and we sleep at

1091
00:35:48,470 --> 00:35:47,280
the lower pressure and it's just like

1092
00:35:49,829 --> 00:35:48,480
scuba diving in a sense one you know

1093
00:35:52,950 --> 00:35:49,839
what you're trying to do is get the get

1094
00:35:55,270 --> 00:35:52,960
nitrogen out of your out of your body uh

1095
00:35:57,910 --> 00:35:55,280
out of your bloodstream you know and uh

1096
00:35:59,910 --> 00:35:57,920
out of your tissues and um and that

1097
00:36:01,349 --> 00:35:59,920
process you know by going by sleeping at

1098
00:36:03,190 --> 00:36:01,359
ten two overnight you get a certain

1099
00:36:04,630 --> 00:36:03,200
amount out by breathing oxygen you're

1100
00:36:06,150 --> 00:36:04,640
you know that helps them and then the

1101
00:36:08,150 --> 00:36:06,160
rest of the process to getting out the

1102
00:36:10,390 --> 00:36:08,160
door make sure that when you go all the

1103
00:36:12,710 --> 00:36:10,400
way out it it's like coming up from you

1104
00:36:14,950 --> 00:36:12,720
know depth i mean it's the opposite of

1105
00:36:17,270 --> 00:36:14,960
scuba diving super having you go down

1106
00:36:18,470 --> 00:36:17,280
and it pressurizes then if it pushes

1107
00:36:19,910 --> 00:36:18,480
nitrogen into your tissues and if you

1108
00:36:21,829 --> 00:36:19,920
come up too fast the nitrogen can't

1109
00:36:23,510 --> 00:36:21,839
escape and can give you the bends here

1110
00:36:25,030 --> 00:36:23,520
it's the opposite we're going up first

1111
00:36:27,349 --> 00:36:25,040
you know we're going to a lower pressure

1112
00:36:29,190 --> 00:36:27,359
first and so that you you would get the

1113
00:36:31,430 --> 00:36:29,200

bends on the way out you know not on the

1114
00:36:32,470 --> 00:36:31,440
way back in so

1115
00:36:34,790 --> 00:36:32,480
anyway

1116
00:36:36,470 --> 00:36:34,800
this is the normal process we go through

1117
00:36:39,109 --> 00:36:36,480
by sleeping overnight in the in the

1118
00:36:41,030 --> 00:36:39,119
airlock another technique is to do

1119
00:36:43,190 --> 00:36:41,040
exercise where you know we're we're

1120
00:36:44,790 --> 00:36:43,200
breathing 100 oxygen and we do exercise

1121
00:36:46,950 --> 00:36:44,800
on a on a bike

1122
00:36:49,430 --> 00:36:46,960
and um do a certain prescription of that

1123
00:36:51,990 --> 00:36:49,440
which is based on our our particular you

1124
00:36:53,510 --> 00:36:52,000
know uh physiology you know body weight

1125
00:36:58,470 --> 00:36:53,520
and and

1126
00:37:00,069 --> 00:36:58,480
know another sequence of oxygen

1127
00:37:02,310 --> 00:37:00,079
breathing and pressure changes before we

1128
00:37:03,829 --> 00:37:02,320
go out the door so this is a brand new

1129
00:37:05,349 --> 00:37:03,839
technique that would allow us not to

1130
00:37:07,190 --> 00:37:05,359
have to spend the night sleeping in the

1131
00:37:09,270 --> 00:37:07,200
airlock locked up not have to do the

1132
00:37:11,270 --> 00:37:09,280
exercise you know before

1133
00:37:12,630 --> 00:37:11,280
basically get in the suit

1134
00:37:14,390 --> 00:37:12,640
and spend a little more time in the suit

1135
00:37:17,750 --> 00:37:14,400
doing some you know

1136
00:37:19,430 --> 00:37:17,760
with 100 oxygen doing very small motions

1137
00:37:23,510 --> 00:37:19,440
um just to make sure that you're you

1138
00:37:25,589 --> 00:37:23,520

have some metabolic uh metabolism

1139
00:37:27,670 --> 00:37:25,599
you know going you're not sleeping in

1140
00:37:29,349 --> 00:37:27,680
there you have to be doing something

1141
00:37:31,510 --> 00:37:29,359
you're in there a little longer waiting

1142
00:37:34,310 --> 00:37:31,520
to go out the door but um you know

1143
00:37:35,349 --> 00:37:34,320
overall the the whole process is

1144
00:37:37,670 --> 00:37:35,359
you know

1145
00:37:39,430 --> 00:37:37,680
much simpler and and you can do it on

1146
00:37:41,829 --> 00:37:39,440
the day of the spacewalk so we're going

1147
00:37:43,109 --> 00:37:41,839
to try that on uh a lot of work has been

1148
00:37:45,670 --> 00:37:43,119
done by a lot of people to make this

1149
00:37:47,190 --> 00:37:45,680
protocol work out and i will try that on

1150
00:37:49,190 --> 00:37:47,200
the third spacewalk and if it works

1151
00:37:51,510 --> 00:37:49,200
great we can do it on the fourth one too

1152
00:37:53,589 --> 00:37:51,520
okay eva number three as we said mike

1153
00:37:54,790 --> 00:37:53,599
and drew are going back outside what if

1154
00:37:57,990 --> 00:37:54,800
they what kind of work have they got in

1155
00:38:00,550 --> 00:37:58,000
front of them so on ava3 uh um

1156
00:38:02,710 --> 00:38:00,560
this is related to setting up um

1157
00:38:05,190 --> 00:38:02,720
ultimately it'd be nice if the if we had

1158
00:38:06,630 --> 00:38:05,200
the ability to have a our robotic arm

1159
00:38:08,470 --> 00:38:06,640
which can sort of inchworm around the

1160
00:38:10,150 --> 00:38:08,480
station you know it can grab in one

1161
00:38:11,750 --> 00:38:10,160
place and work from the other end and it

1162
00:38:13,670 --> 00:38:11,760
could it could also put that end down

1163
00:38:16,069 --> 00:38:13,680

and and and inchworm and then use the

1164
00:38:17,829 --> 00:38:16,079
other end as the active end to do work

1165
00:38:19,270 --> 00:38:17,839
we'd like a base for that closer to the

1166
00:38:20,550 --> 00:38:19,280
russian segment so we're basically

1167
00:38:23,430 --> 00:38:20,560
installing that

1168
00:38:25,750 --> 00:38:23,440
and uh it's a very big um

1169
00:38:27,670 --> 00:38:25,760
you know i'd say contraption in a sense

1170
00:38:30,630 --> 00:38:27,680
it's a combining russian and american

1171
00:38:33,109 --> 00:38:30,640
hardware um so it'll attach to the you

1172
00:38:35,270 --> 00:38:33,119
know to the front of the of the fgb the

1173
00:38:36,470 --> 00:38:35,280
for the the you know the forward most

1174
00:38:38,390 --> 00:38:36,480
part of the russian part of the space

1175
00:38:40,150 --> 00:38:38,400
station so we're bringing that out to

1176
00:38:42,710 --> 00:38:40,160
the hatch it's a very big thing

1177
00:38:44,470 --> 00:38:42,720
um it's got a lot of connections to make

1178
00:38:46,630 --> 00:38:44,480
and installing it

1179
00:38:49,030 --> 00:38:46,640
there and that'll allow the uh you know

1180
00:38:51,589 --> 00:38:49,040
the robotic arm to base itself in that

1181
00:38:53,430 --> 00:38:51,599
point and then do do work you know

1182
00:38:56,470 --> 00:38:53,440
closer to that part of the space station

1183
00:38:57,910 --> 00:38:56,480
so for the long duration um you know

1184
00:38:59,589 --> 00:38:57,920
it's a good thing for us to have that

1185
00:39:00,870 --> 00:38:59,599
ability to have the robotic arm work

1186
00:39:03,109 --> 00:39:00,880
there and i think they have some

1187
00:39:04,470 --> 00:39:03,119
specific tasks in mind you know for that

1188
00:39:05,349 --> 00:39:04,480

potentially later

1189
00:39:12,069 --> 00:39:05,359
um

1190
00:39:14,710 --> 00:39:12,079
i guess you could say power optimization

1191
00:39:15,589 --> 00:39:14,720
uh cabling to do and that that uh you

1192
00:39:17,349 --> 00:39:15,599
know

1193
00:39:19,750 --> 00:39:17,359
for things that are already working but

1194
00:39:22,150 --> 00:39:19,760
but could fail if if power channel went

1195
00:39:24,390 --> 00:39:22,160
down um they're not the the power

1196
00:39:26,150 --> 00:39:24,400
channels aren't optimally

1197
00:39:27,990 --> 00:39:26,160
distributed so that you lose the least

1198
00:39:29,990 --> 00:39:28,000
number of things you know if one thing

1199
00:39:32,550 --> 00:39:30,000
fails and so there's some cables that

1200
00:39:34,310 --> 00:39:32,560
we're going to reroute um that basically

1201
00:39:37,030 --> 00:39:34,320
go forward from the russian segment to

1202
00:39:39,829 --> 00:39:37,040
the u to the u s segment um that that

1203
00:39:41,670 --> 00:39:39,839
changes that that improves that and uh

1204
00:39:43,670 --> 00:39:41,680
so it's it's just a matter of routing

1205
00:39:45,109 --> 00:39:43,680
some cables and some

1206
00:39:46,390 --> 00:39:45,119
connectors that are difficult to get to

1207
00:39:48,150 --> 00:39:46,400
but those are the main two tasks they'll

1208
00:39:50,550 --> 00:39:48,160
be doing on that space one and much of

1209
00:39:52,710 --> 00:39:50,560
this work was a

1210
00:39:54,710 --> 00:39:52,720
relatively late addition to your flight

1211
00:39:57,510 --> 00:39:54,720
right uh what were the circumstances

1212
00:39:59,589 --> 00:39:57,520
that caused these jobs to to move back

1213
00:40:00,950 --> 00:39:59,599

and to end up on your mission well i

1214
00:40:03,190 --> 00:40:00,960
think there's a there's a lot of things

1215
00:40:04,309 --> 00:40:03,200
that are always in flux you know and uh

1216
00:40:06,630 --> 00:40:04,319
i think as we get closer and closer you

1217
00:40:08,230 --> 00:40:06,640
know by the time we get cl you know uh i

1218
00:40:09,589 --> 00:40:08,240
mean now we're you know four months from

1219
00:40:11,030 --> 00:40:09,599
flight and we think we know what we're

1220
00:40:13,190 --> 00:40:11,040
going to be doing

1221
00:40:15,910 --> 00:40:13,200
but when the actual day comes

1222
00:40:17,190 --> 00:40:15,920
you know there's pro it could change and

1223
00:40:18,710 --> 00:40:17,200
i think this is one of those things it

1224
00:40:21,270 --> 00:40:18,720
just became a higher priority than

1225
00:40:22,870 --> 00:40:21,280
something else and

1226
00:40:25,910 --> 00:40:22,880
you know and also it's a matter of what

1227
00:40:28,309 --> 00:40:25,920
could be done on previous flights um

1228
00:40:29,910 --> 00:40:28,319
there was uh you may

1229
00:40:32,950 --> 00:40:29,920
recall not not too long ago there was a

1230
00:40:35,430 --> 00:40:32,960
problem with the ammonia

1231
00:40:37,349 --> 00:40:35,440
a pump system on the space station and

1232
00:40:39,270 --> 00:40:37,359
uh the the expedition crew the station

1233
00:40:41,190 --> 00:40:39,280
crew was supposed to go out and do part

1234
00:40:42,790 --> 00:40:41,200
of this spacewalk that we're doing now

1235
00:40:44,069 --> 00:40:42,800
and instead they spent three spacewalks

1236
00:40:45,670 --> 00:40:44,079
fixing this ammonia pump they're

1237
00:40:47,349 --> 00:40:45,680
replacing it which is you know those

1238
00:40:48,950 --> 00:40:47,359

pumps are made are expected to fail we

1239
00:40:51,270 --> 00:40:48,960
have the spares up there they had to do

1240
00:40:52,790 --> 00:40:51,280
the change out and they did and it took

1241
00:40:54,870 --> 00:40:52,800
them three space walks and this fell off

1242
00:40:56,309 --> 00:40:54,880
their plate and fell into ours so and

1243
00:40:58,069 --> 00:40:56,319
that could happen again before we fly

1244
00:41:00,710 --> 00:40:58,079
you know you never know

1245
00:41:03,510 --> 00:41:00,720
with that in mind for the last eva with

1246
00:41:05,589 --> 00:41:03,520
uh you and mike going out the door uh

1247
00:41:08,150 --> 00:41:05,599
what's on the plan then for you guys on

1248
00:41:10,550 --> 00:41:08,160
eva number four so this is a this is an

1249
00:41:12,069 --> 00:41:10,560
exciting spacewalk for me uh

1250
00:41:14,470 --> 00:41:12,079
partly because i get to ride on top of

1251
00:41:15,510 --> 00:41:14,480
the robotic arm so box will be flying

1252
00:41:16,790 --> 00:41:15,520
the arm

1253
00:41:19,670 --> 00:41:16,800
but what we're doing is we're leaving

1254
00:41:21,750 --> 00:41:19,680
the boom there's a orbital it's called

1255
00:41:24,150 --> 00:41:21,760
obss it's the inspection boom we have on

1256
00:41:25,109 --> 00:41:24,160
the shuttle to use to inspect the tiles

1257
00:41:26,550 --> 00:41:25,119
and

1258
00:41:28,150 --> 00:41:26,560
that you know that boom will be left

1259
00:41:30,550 --> 00:41:28,160
behind on the space station you know

1260
00:41:32,550 --> 00:41:30,560
with the idea that at some point if the

1261
00:41:34,309 --> 00:41:32,560
space station has to do some work it

1262
00:41:36,230 --> 00:41:34,319
would give the robotic arm more reach if

1263
00:41:37,990 --> 00:41:36,240

it could use this boom as well

1264
00:41:39,910 --> 00:41:38,000
and we have left it up there before we

1265
00:41:41,750 --> 00:41:39,920
have the mechanisms in place to leave it

1266
00:41:43,430 --> 00:41:41,760
up there so

1267
00:41:46,069 --> 00:41:43,440
we'll be attaching that boom to the

1268
00:41:48,470 --> 00:41:46,079
truss and locking it in place

1269
00:41:50,309 --> 00:41:48,480
and normally the shuttle arm grabs that

1270
00:41:52,069 --> 00:41:50,319
boom at the end and

1271
00:41:53,589 --> 00:41:52,079
the station arm has a grapple fixture in

1272
00:41:55,910 --> 00:41:53,599
the middle but if we're going to use it

1273
00:41:57,510 --> 00:41:55,920
on the station at some future point you

1274
00:41:59,030 --> 00:41:57,520
want to be able to grab it from the end

1275
00:42:00,550 --> 00:41:59,040
so the grapple fixture at the end is not

1276
00:42:02,550 --> 00:42:00,560
the right kind and we have to change it

1277
00:42:03,829 --> 00:42:02,560
so it'll be kind of fun for mike and i

1278
00:42:05,750 --> 00:42:03,839
because we're kind of tearing this thing

1279
00:42:07,430 --> 00:42:05,760
apart in a way we're taking off that and

1280
00:42:09,670 --> 00:42:07,440
replacing it with a shuttle

1281
00:42:11,750 --> 00:42:09,680
a station a grapple fixture and we have

1282
00:42:13,589 --> 00:42:11,760
to cut some wires and pull this thing

1283
00:42:15,190 --> 00:42:13,599
off completely

1284
00:42:17,349 --> 00:42:15,200
and while we're doing that i'll be on

1285
00:42:19,510 --> 00:42:17,359
the station robotic arm and box will be

1286
00:42:21,670 --> 00:42:19,520
flying me around so uh that'll be an

1287
00:42:22,470 --> 00:42:21,680
exciting task to do

1288
00:42:23,910 --> 00:42:22,480

um

1289
00:42:26,870 --> 00:42:23,920
and

1290
00:42:28,550 --> 00:42:26,880
so we you know we do all of that uh

1291
00:42:29,349 --> 00:42:28,560
and um and

1292
00:42:31,750 --> 00:42:29,359
and

1293
00:42:34,470 --> 00:42:31,760
when it's done um uh mike will be

1294
00:42:36,069 --> 00:42:34,480
bringing the old uh grapple fixture back

1295
00:42:37,670 --> 00:42:36,079
and putting it in the shuttle cargo bay

1296
00:42:40,870 --> 00:42:37,680
i'll be doing a couple of miscellaneous

1297
00:42:43,589 --> 00:42:40,880
tasks uh and then we'll meet on top of

1298
00:42:44,710 --> 00:42:43,599
um the the elc platform that we just

1299
00:42:45,510 --> 00:42:44,720
installed

1300
00:42:47,990 --> 00:42:45,520
and

1301
00:42:50,150 --> 00:42:48,000
the the uh i mentioned before the spdm

1302
00:42:52,470 --> 00:42:50,160
the the robotic

1303
00:42:54,069 --> 00:42:52,480
spare mechanism that's on that platform

1304
00:42:55,990 --> 00:42:54,079
they want to release some bolts on that

1305
00:42:57,910 --> 00:42:56,000
to make sure that it can be utilized

1306
00:42:59,270 --> 00:42:57,920
when needed and so mike and i are going

1307
00:43:00,550 --> 00:42:59,280
to be up there

1308
00:43:01,750 --> 00:43:00,560
these bolt there's there's some extra

1309
00:43:03,510 --> 00:43:01,760
stress on these bolts so we have a

1310
00:43:06,150 --> 00:43:03,520
special pry bar we expect to be doing

1311
00:43:08,069 --> 00:43:06,160
some you know serious manual labor and

1312
00:43:10,550 --> 00:43:08,079
to try to break this thing free so we

1313
00:43:12,950 --> 00:43:10,560

can get those bolts off um

1314
00:43:15,030 --> 00:43:12,960
and uh but the neat thing about being on

1315
00:43:17,910 --> 00:43:15,040
on top of there is that so this will be

1316
00:43:19,829 --> 00:43:17,920
the last spacewalk uh potentially of the

1317
00:43:22,150 --> 00:43:19,839
entire shuttle program in terms of

1318
00:43:24,390 --> 00:43:22,160
building the space station and on top of

1319
00:43:26,069 --> 00:43:24,400
elc3 it's sort of the highest perch you

1320
00:43:27,349 --> 00:43:26,079
know above the whole space station so

1321
00:43:29,270 --> 00:43:27,359
we'll be on top

1322
00:43:30,950 --> 00:43:29,280
looking back at this the entire space

1323
00:43:33,349 --> 00:43:30,960
station that has been built now you know

1324
00:43:35,670 --> 00:43:33,359
by over 10 years by 15 countries and all

1325
00:43:38,069 --> 00:43:35,680
the shuttle flights and um

1326
00:43:40,550 --> 00:43:38,079
and on this last task we'll be able to

1327
00:43:41,750 --> 00:43:40,560
look and see the you know the fruits of

1328
00:43:43,589 --> 00:43:41,760
all that labor

1329
00:43:45,750 --> 00:43:43,599
the whole space station you know below

1330
00:43:47,510 --> 00:43:45,760
us so uh i think that's going to be a

1331
00:43:48,950 --> 00:43:47,520
special moment and we're bringing us a

1332
00:43:49,829 --> 00:43:48,960
good camera out to take some pictures up

1333
00:43:52,630 --> 00:43:49,839
there

1334
00:43:54,230 --> 00:43:52,640
of course sts-134 is the last flight

1335
00:43:56,150 --> 00:43:54,240
space shuttle endeavour you have any

1336
00:43:57,829 --> 00:43:56,160
thoughts about this ship's place in the

1337
00:43:59,190 --> 00:43:57,839
history of the human space flight

1338
00:44:01,109 --> 00:43:59,200

program

1339
00:44:02,790 --> 00:44:01,119
well i think that the whole shuttle

1340
00:44:03,589 --> 00:44:02,800
program um

1341
00:44:08,069 --> 00:44:03,599
you know

1342
00:44:09,990 --> 00:44:08,079
it leaves us kind of with a legacy of of

1343
00:44:10,630 --> 00:44:10,000
incredible amount of experience in space

1344
00:44:33,030 --> 00:44:10,640
i

1345
00:44:34,470 --> 00:44:33,040
over those 30 years

1346
00:44:36,470 --> 00:44:34,480
you know we've learned how to do so much

1347
00:44:38,230 --> 00:44:36,480
from you know

1348
00:44:41,349 --> 00:44:38,240
not just of course launching and landing

1349
00:44:43,510 --> 00:44:41,359
a giant spaceship but but uh

1350
00:44:45,190 --> 00:44:43,520
um you know having cameras operating up

1351
00:44:47,510 --> 00:44:45,200
there and and the rendezvous and the

1352
00:44:49,349 --> 00:44:47,520
docking and spacewalks and robotics and

1353
00:44:51,829 --> 00:44:49,359
all this equipment that works in you

1354
00:44:53,510 --> 00:44:51,839
know in a vacuum and you know and how to

1355
00:44:56,069 --> 00:44:53,520
optimize it to work in a vacuum and

1356
00:44:57,829 --> 00:44:56,079
bring it in and out

1357
00:44:59,510 --> 00:44:57,839
and you know and everything from you

1358
00:45:01,430 --> 00:44:59,520
know from the food

1359
00:45:03,349 --> 00:45:01,440
that we eat in space now which is which

1360
00:45:05,349 --> 00:45:03,359
is a much expanded menu compared to what

1361
00:45:06,870 --> 00:45:05,359
was originally you know to how to build

1362
00:45:09,430 --> 00:45:06,880
a space toilet i mean everything in

1363
00:45:10,710 --> 00:45:09,440

between you know all the stuff that that

1364
00:45:12,790 --> 00:45:10,720
has been figured out during the space

1365
00:45:14,550 --> 00:45:12,800
shuttle program you know it's taken

1366
00:45:16,470 --> 00:45:14,560
it's taken you know science fiction

1367
00:45:19,670 --> 00:45:16,480
really and and made it reality over

1368
00:45:21,270 --> 00:45:19,680
those 30 years i think in the

1369
00:45:24,390 --> 00:45:21,280
you know in the early days the things

1370
00:45:25,190 --> 00:45:24,400
that we did before the shuttle um

1371
00:45:26,790 --> 00:45:25,200
were

1372
00:45:27,990 --> 00:45:26,800
magnificent and you know even though we

1373
00:45:30,150 --> 00:45:28,000
haven't been back to the moon yet and we

1374
00:45:32,390 --> 00:45:30,160
haven't gone on to mars and further out

1375
00:45:34,470 --> 00:45:32,400
yet what we have done is learn how to

1376
00:45:37,109 --> 00:45:34,480
get incredible amount of hardware and

1377
00:45:39,670 --> 00:45:37,119
complex hardware in space and and and

1378
00:45:40,710 --> 00:45:39,680
operate with it and so i think that's

1379
00:45:43,349 --> 00:45:40,720
you know one of the things that the

1380
00:45:45,270 --> 00:45:43,359
space shuttle program has done for us um

1381
00:45:46,870 --> 00:45:45,280
has really made it possible to do all

1382
00:45:48,630 --> 00:45:46,880
the future things that we want to do in

1383
00:45:51,190 --> 00:45:48,640
space and with a lot of know-how an

1384
00:45:53,589 --> 00:45:51,200
unbelievable amount of know-how

1385
00:45:56,069 --> 00:45:53,599
and the legacy of the the shuttle

1386
00:45:58,790 --> 00:45:56,079
program i think is the is really the

1387
00:46:01,109 --> 00:45:58,800
space station you know we spent you know

1388
00:46:04,069 --> 00:46:01,119

the last more than a decade building the

1389
00:46:05,829 --> 00:46:04,079
space station and uh and there it is so

1390
00:46:07,589 --> 00:46:05,839
you know i mean you fly up to it and and

1391
00:46:09,589 --> 00:46:07,599
there's another there's another

1392
00:46:10,950 --> 00:46:09,599
spaceship in the sky as you approach it

1393
00:46:12,309 --> 00:46:10,960
and you get closer and closer and it

1394
00:46:14,069 --> 00:46:12,319
gets bigger and bigger and bigger and

1395
00:46:15,510 --> 00:46:14,079
bigger and it's a it's a massive

1396
00:46:16,630 --> 00:46:15,520
structure you know

1397
00:46:18,069 --> 00:46:16,640
it's uh

1398
00:46:20,069 --> 00:46:18,079
uh you know as you know it's you know

1399
00:46:21,510 --> 00:46:20,079
two foot football fields and sizes if

1400
00:46:22,790 --> 00:46:21,520
you lay it down and when you're inside

1401
00:46:24,790 --> 00:46:22,800
it you look at the window and you look

1402
00:46:26,470 --> 00:46:24,800
out the to this you know solar panels

1403
00:46:28,150 --> 00:46:26,480
out on the truss

1404
00:46:30,470 --> 00:46:28,160
it's far out there and those are big

1405
00:46:32,390 --> 00:46:30,480
solar panels and this big giant thing

1406
00:46:33,829 --> 00:46:32,400
that has all the science capability and

1407
00:46:35,510 --> 00:46:33,839
ability to keep six people living

1408
00:46:37,430 --> 00:46:35,520
comfortably you know for months at a

1409
00:46:39,430 --> 00:46:37,440
time it's just flying around the earth

1410
00:46:41,190 --> 00:46:39,440
you know running only on solar power you

1411
00:46:43,030 --> 00:46:41,200
know and we built this we built this

1412
00:46:44,630 --> 00:46:43,040
thing you know with the space shuttle so

1413
00:46:46,550 --> 00:46:44,640

i think the i think as the space shuttle

1414
00:46:49,670 --> 00:46:46,560
retires you know i think the legacy left

1415
00:46:51,750 --> 00:46:49,680
behind is really you know uh the the the

1416
00:46:53,030 --> 00:46:51,760
foothold that we have now on you know

1417
00:46:54,870 --> 00:46:53,040
everything we can do in the future in

1418
00:46:57,430 --> 00:46:54,880
space and the space station is that

1419
00:46:59,270 --> 00:46:57,440
foothold well on the subject of legacies

1420
00:47:00,950 --> 00:46:59,280
and and perspectives you're going to be

1421
00:47:02,870 --> 00:47:00,960
flying this mission right around the

1422
00:47:05,430 --> 00:47:02,880
50th anniversary of the first human

1423
00:47:07,109 --> 00:47:05,440
spaceflight by yuri gagarin and the 30th

1424
00:47:08,390 --> 00:47:07,119
anniversary of the first shuttle flight

1425
00:47:09,829 --> 00:47:08,400
yeah and

1426
00:47:11,589 --> 00:47:09,839
close to the 50th anniversary of the

1427
00:47:12,870 --> 00:47:11,599
first american space flight by alan

1428
00:47:14,470 --> 00:47:12,880
shepard yeah

1429
00:47:16,309 --> 00:47:14,480
what are your thoughts about

1430
00:47:18,710 --> 00:47:16,319
the fact that you are going to be in

1431
00:47:21,430 --> 00:47:18,720
space while everybody is paying

1432
00:47:22,790 --> 00:47:21,440
attention to these milestones

1433
00:47:24,950 --> 00:47:22,800
yeah it's amazing

1434
00:47:27,349 --> 00:47:24,960
i feel very lucky uh you know it's a

1435
00:47:29,270 --> 00:47:27,359
whole generation of of dreamers you know

1436
00:47:32,150 --> 00:47:29,280
like me who you know

1437
00:47:34,870 --> 00:47:32,160
who uh grew up on star trek you know and

1438
00:47:36,549 --> 00:47:34,880

uh and what saw apollo and and watched

1439
00:47:38,790 --> 00:47:36,559
all this happen and it's amazing you

1440
00:47:41,030 --> 00:47:38,800
know what we've accomplished in that

1441
00:47:43,030 --> 00:47:41,040
time you know i um

1442
00:47:44,710 --> 00:47:43,040
you can look back 100 years you know and

1443
00:47:45,910 --> 00:47:44,720
look at i mean kitty hawk the first

1444
00:47:46,870 --> 00:47:45,920
powered flight

1445
00:47:49,190 --> 00:47:46,880
and

1446
00:47:51,109 --> 00:47:49,200
that you know in fact if you look at the

1447
00:47:52,710 --> 00:47:51,119
you know the right flyer it almost kind

1448
00:47:55,430 --> 00:47:52,720
of looks similar to the space station in

1449
00:47:56,950 --> 00:47:55,440
its shape in a way and the first flight

1450
00:47:58,470 --> 00:47:56,960
of the right flyer would have would have

1451
00:48:00,069 --> 00:47:58,480
only been half the

1452
00:48:01,990 --> 00:48:00,079
distance of the size of the space

1453
00:48:04,790 --> 00:48:02,000
station you know in 100 years we've gone

1454
00:48:07,589 --> 00:48:04,800
from that to this incredible facility

1455
00:48:09,030 --> 00:48:07,599
you know flying in space so it's a

1456
00:48:09,829 --> 00:48:09,040
we've accomplished a lot i mean you know

1457
00:48:12,870 --> 00:48:09,839
the

1458
00:48:14,470 --> 00:48:12,880
uh

1459
00:48:16,150 --> 00:48:14,480
you know i think a lot of people wish we

1460
00:48:18,870 --> 00:48:16,160
were back on the moon and on to mars by

1461
00:48:21,349 --> 00:48:18,880
now and and so do i i hope i hope that i

1462
00:48:22,549 --> 00:48:21,359
would walk on mars in my career time but

1463
00:48:24,870 --> 00:48:22,559

but it is amazing how much we've

1464
00:48:26,790 --> 00:48:24,880
accomplished in 50 years and and uh it

1465
00:48:29,430 --> 00:48:26,800
took so many people to make all that

1466
00:48:30,870 --> 00:48:29,440
possible and it's it's an unbelievable

1467
00:48:32,950 --> 00:48:30,880
honor to kind of be the representative

1468
00:48:35,349 --> 00:48:32,960
of of that generation of dreamers for

1469
00:48:36,790 --> 00:48:35,359
for me if we've done that much in the

1470
00:48:38,150 --> 00:48:36,800
last 50 years

1471
00:48:39,990 --> 00:48:38,160
where do you think we're going to be 50

1472
00:48:41,750 --> 00:48:40,000
years from now

1473
00:48:43,430 --> 00:48:41,760
well i think that i think the key is

1474
00:48:45,990 --> 00:48:43,440
going to be you know the time when it

1475
00:48:47,670 --> 00:48:46,000
becomes profitable for for

1476
00:48:49,510 --> 00:48:47,680
more than just governments to be

1477
00:48:52,230 --> 00:48:49,520
operating in space and that time is

1478
00:48:54,069 --> 00:48:52,240
coming and um you know and once we kind

1479
00:48:55,349 --> 00:48:54,079
of pass that that transition i think

1480
00:48:56,710 --> 00:48:55,359
there'll be a lot more traffic you know

1481
00:48:58,630 --> 00:48:56,720
i hope to see

1482
00:49:00,309 --> 00:48:58,640
uh you know i said i'd like to i'd like

1483
00:49:02,630 --> 00:49:00,319
to have walked on mars in my career time

1484
00:49:04,790 --> 00:49:02,640
but maybe i can go as a for retirement

1485
00:49:06,309 --> 00:49:04,800
vacation someday you know but you know i

1486
00:49:07,670 --> 00:49:06,319
think we're going to see you know many

1487
00:49:09,190 --> 00:49:07,680
more people getting a chance to fly in

1488
00:49:10,790 --> 00:49:09,200

space and you know

1489
00:49:12,470 --> 00:49:10,800
i'm sure we'll see bases starting to

1490
00:49:14,390 --> 00:49:12,480
grow throughout the solar system you

1491
00:49:18,069 --> 00:49:14,400
know starting on the moon

1492
00:49:20,470 --> 00:49:18,079
um mars and and first colony and we'll

1493
00:49:22,630 --> 00:49:20,480
have the first people born in space and

1494
00:49:25,510 --> 00:49:22,640
and uh i think the future history our

1495
00:49:27,349 --> 00:49:25,520
future history will will have uh more

1496
00:49:28,150 --> 00:49:27,359
and more happening away from earth and