1
00:00:12,390 --> 00:00:10,950
why did you want to be an astronaut you

2
00:00:13,910 --> 00:00:12,400
know it's funny they asked me that in

3
00:00:15,430 --> 00:00:13,920
the interview and i didn't have a good

4
00:00:17,109 --> 00:00:15,440
answer for them either it's something

5
00:00:18,470 --> 00:00:17,119
that caught a hold of me

6
00:00:19,830 --> 00:00:18,480
when i was in middle school believe it

7
00:00:21,349 --> 00:00:19,840
or not and

8
00:00:23,509 --> 00:00:21,359
i i've always liked science and

9
00:00:25,750 --> 00:00:23,519
technology and math it's always been fun

10
00:00:27,670 --> 00:00:25,760
to learn how the world works and to see

11
00:00:29,589 --> 00:00:27,680
new things and learn new things and

12
00:00:30,470 --> 00:00:29,599
there's something about flying in space

13
00:00:31,990 --> 00:00:30,480

that

14
00:00:33,990 --> 00:00:32,000
just grabbed a hold of me and didn't let

15
00:00:35,030 --> 00:00:34,000
go so here i am

16
00:00:37,430 --> 00:00:35,040
a little bit of luck a little bit of

17
00:00:39,590 --> 00:00:37,440
hard work here i am well let me find out

18
00:00:41,190 --> 00:00:39,600
how that how you got there so let's

19
00:00:43,830 --> 00:00:41,200
start with with your hometown tell me

20
00:00:45,430 --> 00:00:43,840
what it was like to grow up in your

21
00:00:46,549 --> 00:00:45,440
hometown i grew up in belleville

22
00:00:50,229 --> 00:00:46,559
illinois

23
00:00:52,430 --> 00:00:50,239
side of the river

24
00:00:55,029 --> 00:00:52,440
medium-sized town

25
00:00:57,189 --> 00:00:55,039
a lot of family living in the area it

26
00:01:00,310 --> 00:00:57,199
was really quite a nice place to grow up

27
00:01:02,150 --> 00:01:00,320
very solid well-grounded community lots

28
00:01:03,110 --> 00:01:02,160
of very nice people

29
00:01:04,710 --> 00:01:03,120
and

30
00:01:06,310 --> 00:01:04,720
i enjoyed it you know we had st louis

31
00:01:07,990 --> 00:01:06,320
nearby we wanted to do big city stuff

32
00:01:09,670 --> 00:01:08,000
but we were yet a smaller town so we

33
00:01:11,830 --> 00:01:09,680
didn't have a lot of the big city

34
00:01:12,550 --> 00:01:11,840
issues and it was a good place to grow

35
00:01:13,990 --> 00:01:12,560
up

36
00:01:17,190 --> 00:01:14,000
did you get a chance to see it from

37
00:01:19,429 --> 00:01:17,200
orbit i did i took some pictures of the

38
00:01:21,910 --> 00:01:19,439

area of course and showed them to my

39
00:01:23,429 --> 00:01:21,920
family found the street my mom lives on

40
00:01:25,590 --> 00:01:23,439
center of that

41
00:01:26,870 --> 00:01:25,600
big cities are easier to see than small

42
00:01:28,630 --> 00:01:26,880
towns and you're talking about picking

43
00:01:32,469 --> 00:01:28,640
out a street yeah but i had four and a

44
00:01:37,190 --> 00:01:35,350
how do you feel like the people there

45
00:01:39,429 --> 00:01:37,200
and that place helped make you the

46
00:01:41,109 --> 00:01:39,439
person that you are well as i said it's

47
00:01:42,950 --> 00:01:41,119
you know it's the midwest we're very

48
00:01:45,510 --> 00:01:42,960
well grounded in the midwest people are

49
00:01:47,350 --> 00:01:45,520
friendly they value you know hard work

50
00:01:49,270 --> 00:01:47,360
and discipline and

51
00:01:50,950 --> 00:01:49,280
and they help each other it's just a

52
00:01:53,429 --> 00:01:50,960
really nice community it's i really

53
00:01:55,190 --> 00:01:53,439
value the fact that i got to grow up in

54
00:01:57,670 --> 00:01:55,200
such a great place

55
00:01:59,670 --> 00:01:57,680
well tell me about uh how you going from

56
00:02:01,830 --> 00:01:59,680
belleville into college and into your

57
00:02:03,830 --> 00:02:01,840
professional career what's the path that

58
00:02:05,910 --> 00:02:03,840
led you from there to here

59
00:02:07,910 --> 00:02:05,920
well following my interest really is

60
00:02:10,630 --> 00:02:07,920
probably the best way to describe the

61
00:02:12,150 --> 00:02:10,640
path i enjoyed studying physics when i

62
00:02:13,589 --> 00:02:12,160
was an undergraduate

63
00:02:15,270 --> 00:02:13,599

i didn't know much about engineering

64
00:02:17,670 --> 00:02:15,280
until i got to college because there

65
00:02:20,070 --> 00:02:17,680
wasn't really any engineers in my

66
00:02:21,830 --> 00:02:20,080
immediate vicinity

67
00:02:23,430 --> 00:02:21,840
i got to college discovered engineering

68
00:02:25,110 --> 00:02:23,440
thought that was kind of interesting so

69
00:02:26,229 --> 00:02:25,120
i dabbled a little bit in electrical

70
00:02:28,070 --> 00:02:26,239
engineering and ended up doing a

71
00:02:29,510 --> 00:02:28,080
master's in that after i

72
00:02:31,270 --> 00:02:29,520
started working

73
00:02:32,550 --> 00:02:31,280
at mcdonald douglas for

74
00:02:34,630 --> 00:02:32,560
about four and a half years while i was

75
00:02:38,309 --> 00:02:34,640
at mcdonald douglas my job

76
00:02:39,670 --> 00:02:38,319
involved working with airplane design

77
00:02:41,350 --> 00:02:39,680
and materials

78
00:02:43,509 --> 00:02:41,360
specifically and how they function

79
00:02:44,790 --> 00:02:43,519
interact with electromagnetic fields

80
00:02:45,750 --> 00:02:44,800
and so i got interested in materials

81
00:02:47,350 --> 00:02:45,760
like oh that's kind of interesting i

82
00:02:50,070 --> 00:02:47,360
didn't know that existed so then i

83
00:02:52,470 --> 00:02:50,080
wandered off to georgia tech and did my

84
00:02:55,350 --> 00:02:52,480
phd in materials at that point i'm like

85
00:02:57,589 --> 00:02:55,360
okay i think my resume looks all right

86
00:02:58,790 --> 00:02:57,599
so i can apply to nasa and see what

87
00:03:02,550 --> 00:02:58,800
happened

88
00:03:05,589 --> 00:03:02,560

here i am

89
00:03:06,949 --> 00:03:05,599
was the idea of applying to nasa always

90
00:03:09,030 --> 00:03:06,959
there from

91
00:03:11,670 --> 00:03:09,040
undergraduate days on oh yeah it was

92
00:03:14,149 --> 00:03:11,680
always in the back of my mind um

93
00:03:16,229 --> 00:03:14,159
i just didn't feel ready to apply

94
00:03:18,790 --> 00:03:16,239
until i was nearing the completion of my

95
00:03:21,750 --> 00:03:18,800
phd

96
00:03:23,350 --> 00:03:21,760
you got into a job where

97
00:03:26,229 --> 00:03:23,360
there's there's a big part of it the

98
00:03:27,910 --> 00:03:26,239
flying in space part of it that has got

99
00:03:31,830 --> 00:03:27,920
dangers that

100
00:03:33,589 --> 00:03:31,840
most phds don't have to encounter

101
00:03:36,470 --> 00:03:33,599
sandy what is it that you think we get

102
00:03:39,110 --> 00:03:36,480
as a result of flying people in space

103
00:03:41,350 --> 00:03:39,120
that makes it worth that risk well a

104
00:03:43,589 --> 00:03:41,360
comment about the danger part first my

105
00:03:45,509 --> 00:03:43,599
brother is a police officer

106
00:03:48,229 --> 00:03:45,519
on a daily basis

107
00:03:50,630 --> 00:03:48,239
he's probably in more danger than i am

108
00:03:53,350 --> 00:03:50,640
because i don't fly in space every day i

109
00:03:55,270 --> 00:03:53,360
find space once every five years so i

110
00:03:57,270 --> 00:03:55,280
have like spikes of danger he's got sort

111
00:03:59,910 --> 00:03:57,280
of low level danger so i'll let people

112
00:04:03,350 --> 00:03:59,920
decide which one's actually truly in

113
00:04:05,990 --> 00:04:03,360

total the more dangerous job

114
00:04:07,670 --> 00:04:06,000
but aside from that yes flying in space

115
00:04:10,229 --> 00:04:07,680
is definitely risky

116
00:04:11,750 --> 00:04:10,239
but we learn a lot from being in space i

117
00:04:13,830 --> 00:04:11,760
mean even just about how the human body

118
00:04:14,710 --> 00:04:13,840
changes and these insights can help us

119
00:04:17,349 --> 00:04:14,720
fuel

120
00:04:18,789 --> 00:04:17,359
uh creative ideas on how to solve

121
00:04:20,229 --> 00:04:18,799
problems here on the earth you know for

122
00:04:22,629 --> 00:04:20,239
example if we can figure out what's

123
00:04:23,749 --> 00:04:22,639
going on with the bone density and and

124
00:04:25,749 --> 00:04:23,759
for example

125
00:04:27,270 --> 00:04:25,759
even if you don't lose bone density your

126
00:04:29,110 --> 00:04:27,280
bone regrows but the structure's a

127
00:04:31,510 --> 00:04:29,120
little different so what does that mean

128
00:04:33,110 --> 00:04:31,520
could that be harmful or beneficial and

129
00:04:34,469 --> 00:04:33,120
and could you and if it is beneficial

130
00:04:36,550 --> 00:04:34,479
could you duplicate that down here and

131
00:04:38,870 --> 00:04:36,560
help people you know and and we get a

132
00:04:41,030 --> 00:04:38,880
lot of these serendipitous discoveries

133
00:04:42,950 --> 00:04:41,040
you know we've done some some

134
00:04:44,310 --> 00:04:42,960
cancer cell research up there and and

135
00:04:45,909 --> 00:04:44,320
find a little bit

136
00:04:47,430 --> 00:04:45,919
new and unusual things about how cancer

137
00:04:48,469 --> 00:04:47,440
cells grow we're finding interesting

138
00:04:50,310 --> 00:04:48,479

things about

139
00:04:52,310 --> 00:04:50,320
the virulency of

140
00:04:53,830 --> 00:04:52,320
some diseases we're finding interesting

141
00:04:55,909 --> 00:04:53,840
things about how materials operate we

142
00:04:57,990 --> 00:04:55,919
find interesting things about just fluid

143
00:04:59,749 --> 00:04:58,000
fluid dynamics and all these little

144
00:05:02,870 --> 00:04:59,759
pieces of information

145
00:05:04,070 --> 00:05:02,880
can be used here on the ground to create

146
00:05:06,150 --> 00:05:04,080
things that can help people or

147
00:05:07,990 --> 00:05:06,160
technology that can they can do new

148
00:05:09,350 --> 00:05:08,000
things and it's

149
00:05:11,189 --> 00:05:09,360
you know you just

150
00:05:12,870 --> 00:05:11,199
get a lot of information like this and

151
00:05:19,990 --> 00:05:12,880
we don't even know we don't know and by

152
00:05:24,070 --> 00:05:21,830
you're one of four crew members on the

153
00:05:26,070 --> 00:05:24,080
final flight of space shuttle atlantis

154
00:05:28,550 --> 00:05:26,080
sandy give me a summary of the work

155
00:05:30,070 --> 00:05:28,560
that's planned for mission sts-135 and

156
00:05:32,870 --> 00:05:30,080
what your jobs are going to be on this

157
00:05:34,870 --> 00:05:32,880
flight well it's a very busy mission

158
00:05:37,670 --> 00:05:34,880
our prime job of course is to take tons

159
00:05:39,110 --> 00:05:37,680
of logistics up to space station and

160
00:05:40,629 --> 00:05:39,120
get it up there while we still have the

161
00:05:42,870 --> 00:05:40,639
huge cargo carrying capacity of the

162
00:05:44,469 --> 00:05:42,880
shuttle available in addition we're

163
00:05:47,029 --> 00:05:44,479

tasked with bringing down the pump

164
00:05:48,390 --> 00:05:47,039
module which failed late last year

165
00:05:50,550 --> 00:05:48,400
because it failed a little bit earlier

166
00:05:53,110 --> 00:05:50,560
than expected and we need to dissect it

167
00:05:55,029 --> 00:05:53,120
and learn from what happened and how to

168
00:05:56,230 --> 00:05:55,039
improve our engineering designs

169
00:05:58,230 --> 00:05:56,240
so those are the

170
00:06:00,309 --> 00:05:58,240
primary mission parameters that we're

171
00:06:02,309 --> 00:06:00,319
working with and something new about

172
00:06:04,469 --> 00:06:02,319
this flight is that there are only four

173
00:06:05,990 --> 00:06:04,479
shuttle crew members why is that

174
00:06:07,510 --> 00:06:06,000
yeah it's going to be a challenging

175
00:06:09,430 --> 00:06:07,520
mission with only four of us but really

176
00:06:10,790 --> 00:06:09,440
the the driver for that is the fact that

177
00:06:12,950 --> 00:06:10,800
our rescue scenario is a little bit

178
00:06:14,790 --> 00:06:12,960
different than normal you know we ever

179
00:06:16,390 --> 00:06:14,800
since columbia we've

180
00:06:18,629 --> 00:06:16,400
been mandated to have a shuttle on the

181
00:06:20,390 --> 00:06:18,639
pad ready to launch in case the crew

182
00:06:22,469 --> 00:06:20,400
has an issue with the orbiter and then

183
00:06:25,029 --> 00:06:22,479
they need to be rescued because we are

184
00:06:27,270 --> 00:06:25,039
the last orbiter there's not an orbiter

185
00:06:29,430 --> 00:06:27,280
there waiting for us so our rescue

186
00:06:31,590 --> 00:06:29,440
scenario involves the soyuz

187
00:06:32,950 --> 00:06:31,600
capsules which were flying to station

188
00:06:34,710 --> 00:06:32,960

via the russians and on the soyuz

189
00:06:37,510 --> 00:06:34,720
capsules only one person can come down

190
00:06:39,430 --> 00:06:37,520
at a time so the crew of four that then

191
00:06:42,230 --> 00:06:39,440
for takes a year to get everybody down

192
00:06:43,670 --> 00:06:42,240
and and that was deemed to be

193
00:06:45,430 --> 00:06:43,680
enough you know you don't want to have

194
00:06:47,830 --> 00:06:45,440
six or seven people up there you take

195
00:06:50,230 --> 00:06:47,840
close to two years to get everybody down

196
00:06:51,909 --> 00:06:50,240
why would it take a year to get the four

197
00:06:53,749 --> 00:06:51,919
of you home that way well as i mentioned

198
00:06:55,909 --> 00:06:53,759
the soyuz is a three it's a three seat

199
00:06:57,589 --> 00:06:55,919
vehicle and of course

200
00:06:59,830 --> 00:06:57,599
you're still having crew rotations

201
00:07:01,670 --> 00:06:59,840
occurring on station and so they'll fly

202
00:07:03,510 --> 00:07:01,680
up with an empty right seat so that

203
00:07:06,150 --> 00:07:03,520
means one person will be able to be able

204
00:07:08,070 --> 00:07:06,160
to return with each soyuz and so for

205
00:07:10,309 --> 00:07:08,080
four of us when the soyuz is launching

206
00:07:12,309 --> 00:07:10,319
every three months or returning every

207
00:07:13,990 --> 00:07:12,319
three months that's a year

208
00:07:16,469 --> 00:07:14,000
and that's on the assumption that the

209
00:07:18,390 --> 00:07:16,479
soyuz flies at the same regularity yeah

210
00:07:20,390 --> 00:07:18,400
i think that's a pretty solid assumption

211
00:07:23,510 --> 00:07:20,400
how comfortable are you with the idea of

212
00:07:25,830 --> 00:07:23,520
flying on a soyuz and of maybe getting a

213
00:07:27,430 --> 00:07:25,840

few extra months in space well actually

214
00:07:28,870 --> 00:07:27,440
that for me it's not really a problem

215
00:07:30,629 --> 00:07:28,880
because as you know i've lived there for

216
00:07:32,309 --> 00:07:30,639
four and a half months already and this

217
00:07:33,909 --> 00:07:32,319
my stay would be about nine months so

218
00:07:35,909 --> 00:07:33,919
it'd be double the time that i've spent

219
00:07:37,990 --> 00:07:35,919
there already and i'm already trained on

220
00:07:39,589 --> 00:07:38,000
the soyuz since it was part of my space

221
00:07:41,189 --> 00:07:39,599
station training

222
00:07:42,710 --> 00:07:41,199
process so i feel pretty comfortable

223
00:07:43,670 --> 00:07:42,720
with it and i'm very familiar with the

224
00:07:45,029 --> 00:07:43,680
station

225
00:07:46,869 --> 00:07:45,039
and you know it's fun living on the

226
00:07:49,029 --> 00:07:46,879
space station it wouldn't be a problem

227
00:07:51,350 --> 00:07:49,039
well let's talk about that that training

228
00:07:53,029 --> 00:07:51,360
you have been to the station for months

229
00:07:55,270 --> 00:07:53,039
each of your shuttle crew mates has been

230
00:07:57,430 --> 00:07:55,280
to the space station before

231
00:07:59,510 --> 00:07:57,440
how's that experience help you folks get

232
00:08:01,029 --> 00:07:59,520
ready for this flight well clearly

233
00:08:03,029 --> 00:08:01,039
having been to the station before

234
00:08:05,909 --> 00:08:03,039
whether it's for a short duration or

235
00:08:07,350 --> 00:08:05,919
having lived there is very helpful in a

236
00:08:09,589 --> 00:08:07,360
training flow like this because we've

237
00:08:11,430 --> 00:08:09,599
already we're already familiar with what

238
00:08:13,350 --> 00:08:11,440

with what the station does how it

239
00:08:16,869 --> 00:08:13,360
operates we've been there we understand

240
00:08:20,710 --> 00:08:16,879
how how things work on board and we can

241
00:08:22,629 --> 00:08:20,720
very easily fall into the efficiency of

242
00:08:24,309 --> 00:08:22,639
operations that we need to have once we

243
00:08:25,990 --> 00:08:24,319
get there with four people in a short

244
00:08:28,150 --> 00:08:26,000
period of time to transfer all of these

245
00:08:29,909 --> 00:08:28,160
things that we're transferring

246
00:08:32,149 --> 00:08:29,919
what are you looking forward to

247
00:08:33,829 --> 00:08:32,159
seeing when you get back to the station

248
00:08:36,790 --> 00:08:33,839
well you know it's only been two years

249
00:08:39,029 --> 00:08:36,800
since i've come home and since i've been

250
00:08:41,350 --> 00:08:39,039
gone they've delivered

251
00:08:43,990 --> 00:08:41,360
three more modules in the cupola so the

252
00:08:46,070 --> 00:08:44,000
station has grown even bigger and i'm

253
00:08:47,670 --> 00:08:46,080
looking forward to seeing what it looks

254
00:08:49,190 --> 00:08:47,680
like now i mean it was already huge

255
00:08:51,190 --> 00:08:49,200
while i was there

256
00:08:53,509 --> 00:08:51,200
and i've been told the views at the

257
00:08:54,949 --> 00:08:53,519
cupula are stupendous so i'm really

258
00:08:56,630 --> 00:08:54,959
looking forward to spending some time in

259
00:08:58,949 --> 00:08:56,640
there and seeing the

260
00:09:00,870 --> 00:08:58,959
the whole horizon at one time

261
00:09:02,630 --> 00:09:00,880
it's the station's bigger the crew is

262
00:09:05,509 --> 00:09:02,640
bigger too it'd be kind of a different

263
00:09:07,430 --> 00:09:05,519

experience definitely um there we were

264
00:09:09,430 --> 00:09:07,440
the last three person crew when i was on

265
00:09:12,470 --> 00:09:09,440
board two years ago now we have six

266
00:09:14,230 --> 00:09:12,480
people and with us we'll be 10 total

267
00:09:16,150 --> 00:09:14,240
which doesn't match the highest amount

268
00:09:17,990 --> 00:09:16,160
we've ever had but it'll be crowded but

269
00:09:19,350 --> 00:09:18,000
i don't think it'll be

270
00:09:21,990 --> 00:09:19,360
too crowded because as i said the

271
00:09:24,310 --> 00:09:22,000
station is really huge

272
00:09:26,310 --> 00:09:24,320
on this flight you're carrying a shuttle

273
00:09:28,870 --> 00:09:26,320
full of supplies for the international

274
00:09:31,110 --> 00:09:28,880
space station uh give us a sense of what

275
00:09:33,269 --> 00:09:31,120
kind of cargo you and your crewmates are

276
00:09:35,509 --> 00:09:33,279
bringing to orbit well we're taking a

277
00:09:37,110 --> 00:09:35,519
year's worth of food for one thing one

278
00:09:38,710 --> 00:09:37,120
year one year's worth of food we're

279
00:09:41,110 --> 00:09:38,720
taking about two thousand pounds of

280
00:09:43,430 --> 00:09:41,120
science equipment we're taking hygiene

281
00:09:45,670 --> 00:09:43,440
items we're taking clothing we're taking

282
00:09:47,030 --> 00:09:45,680
thousands of pounds of spare parts for

283
00:09:48,310 --> 00:09:47,040
the different systems you know life

284
00:09:50,070 --> 00:09:48,320
support system

285
00:09:51,910 --> 00:09:50,080
the electrical system the computer

286
00:09:53,030 --> 00:09:51,920
system and so forth

287
00:09:54,470 --> 00:09:53,040
these are the big things that we're

288
00:09:56,550 --> 00:09:54,480

taking because we're trying to supply

289
00:09:58,310 --> 00:09:56,560
the station for a whole year

290
00:09:59,509 --> 00:09:58,320
and that hedges our bets against when

291
00:10:01,190 --> 00:09:59,519
the commercial

292
00:10:03,590 --> 00:10:01,200
follow-on cargo contracts will be

293
00:10:04,630 --> 00:10:03,600
available and up and running

294
00:10:06,630 --> 00:10:04,640
that's

295
00:10:08,389 --> 00:10:06,640
i'm trying to envision all of that

296
00:10:09,910 --> 00:10:08,399
packed into the crew compartment of the

297
00:10:11,190 --> 00:10:09,920
space shuttle well it's not packed into

298
00:10:14,310 --> 00:10:11,200
the crew compartment we have a

299
00:10:16,150 --> 00:10:14,320
multi-purpose mission logistics module

300
00:10:17,750 --> 00:10:16,160
in the back end and so that as you know

301
00:10:19,509 --> 00:10:17,760
that comes out of the payload bay as a

302
00:10:21,030 --> 00:10:19,519
big cylinder comes out of the payload

303
00:10:22,710 --> 00:10:21,040
bay with the robot arm it gets attached

304
00:10:23,910 --> 00:10:22,720
to the the station and we open up the

305
00:10:25,430 --> 00:10:23,920
hatch and that's where all of the

306
00:10:28,389 --> 00:10:25,440
transfer really will take place the mid

307
00:10:30,630 --> 00:10:28,399
deck has several thousand pounds but the

308
00:10:32,310 --> 00:10:30,640
the mplm has several tens of thousands

309
00:10:34,230 --> 00:10:32,320
of pounds nothing to sneeze at what you

310
00:10:35,670 --> 00:10:34,240
can put in the mid-deck no we can get a

311
00:10:37,350 --> 00:10:35,680
lot into the mig these days and

312
00:10:39,110 --> 00:10:37,360
especially since we don't have anybody

313
00:10:40,870 --> 00:10:39,120

sitting on the mid deck they've instead

314
00:10:42,710 --> 00:10:40,880
of where the seats are they've put

315
00:10:44,630 --> 00:10:42,720
stowage bags so we have three extra

316
00:10:46,550 --> 00:10:44,640
storage bags in the midday than any

317
00:10:49,430 --> 00:10:46,560
other mission

318
00:10:51,750 --> 00:10:49,440
mplms as you mentioned have usually been

319
00:10:54,710 --> 00:10:51,760
attached to a place on the station on

320
00:10:56,710 --> 00:10:54,720
the unity module that's filled right now

321
00:10:58,710 --> 00:10:56,720
with it with a permanent attachment so

322
00:11:00,389 --> 00:10:58,720
where's the mplm going to go this time

323
00:11:03,509 --> 00:11:00,399
actually for the last few missions the

324
00:11:05,509 --> 00:11:03,519
mplm has gone uh nader on node two so

325
00:11:07,430 --> 00:11:05,519
we're not any different than and like

326
00:11:08,630 --> 00:11:07,440
for example when i flew on 126 we were

327
00:11:10,710 --> 00:11:08,640
an mplm

328
00:11:12,630 --> 00:11:10,720
module mission as well and we attached

329
00:11:15,110 --> 00:11:12,640
it to node two nader which is where ours

330
00:11:17,190 --> 00:11:15,120
is going to go the the permanent mplm

331
00:11:19,430 --> 00:11:17,200
which you're referring to is on node 1

332
00:11:21,350 --> 00:11:19,440
nader and so it's not really going to be

333
00:11:23,430 --> 00:11:21,360
an issue we'll take stuff out of the

334
00:11:25,269 --> 00:11:23,440
node 2 nader spot translate down the lab

335
00:11:26,710 --> 00:11:25,279
and most of the stowage and transfer

336
00:11:29,190 --> 00:11:26,720
that we're doing will be in the

337
00:11:31,190 --> 00:11:29,200
permanent mplm that's on board

338
00:11:33,829 --> 00:11:31,200

in terms of the robotic operations to

339
00:11:37,030 --> 00:11:33,839
install it then does the existence of

340
00:11:39,509 --> 00:11:37,040
this other mplm on the bottom of unity

341
00:11:41,990 --> 00:11:39,519
cause any any change to the way the arm

342
00:11:44,630 --> 00:11:42,000
has to maneuver to install the the new

343
00:11:46,389 --> 00:11:44,640
one no not really they may have to base

344
00:11:48,550 --> 00:11:46,399
it in a different location but i'm

345
00:11:49,829 --> 00:11:48,560
pretty sure it can still be on

346
00:11:51,430 --> 00:11:49,839
where it is

347
00:11:54,230 --> 00:11:51,440
now is pretty much where we had it from

348
00:11:55,829 --> 00:11:54,240
126 so that's not really a new element

349
00:11:57,269 --> 00:11:55,839
it is something however when we're

350
00:11:58,870 --> 00:11:57,279
flying procedures you know robotic

351
00:12:00,470 --> 00:11:58,880
procedures in support of eva we have

352
00:12:02,310 --> 00:12:00,480
another blevit that we have to watch out

353
00:12:04,150 --> 00:12:02,320
for so

354
00:12:07,030 --> 00:12:04,160
now there's also one spacewalk in the

355
00:12:08,629 --> 00:12:07,040
plan for this mission on flight day five

356
00:12:10,230 --> 00:12:08,639
but unlike previous shuttle flights

357
00:12:13,030 --> 00:12:10,240
there are station crew members who are

358
00:12:14,790 --> 00:12:13,040
going to be going outside to do the eva

359
00:12:16,470 --> 00:12:14,800
what's the reason for for that change in

360
00:12:17,829 --> 00:12:16,480
the in the assignment of course that's

361
00:12:19,990 --> 00:12:17,839
another consequence of having a

362
00:12:22,470 --> 00:12:20,000
four-person crew

363
00:12:24,629 --> 00:12:22,480

mike and ron are very experienced crew

364
00:12:26,629 --> 00:12:24,639
members are already on station

365
00:12:28,710 --> 00:12:26,639
they can train for the eva before they

366
00:12:30,870 --> 00:12:28,720
launch it'd be difficult for us as a

367
00:12:32,470 --> 00:12:30,880
four-person crew to train an eva crew in

368
00:12:33,430 --> 00:12:32,480
addition to everything else that we're

369
00:12:35,190 --> 00:12:33,440
doing

370
00:12:36,470 --> 00:12:35,200
because we're having to cross train a

371
00:12:38,150 --> 00:12:36,480
lot you know normally if a crew you have

372
00:12:39,990 --> 00:12:38,160
a crew of six or seven you can send the

373
00:12:41,269 --> 00:12:40,000
eva sub team off

374
00:12:42,790 --> 00:12:41,279
and they can do some training while the

375
00:12:45,110 --> 00:12:42,800
flight deck team is doing some other

376
00:12:46,629 --> 00:12:45,120
training and you can work in parallel

377
00:12:47,910 --> 00:12:46,639
that way well we can't do that because

378
00:12:49,910 --> 00:12:47,920
there's only four of us we all have to

379
00:12:51,670 --> 00:12:49,920
be at every single training event

380
00:12:54,069 --> 00:12:51,680
that they have

381
00:12:57,350 --> 00:12:54,079
basically and so by offloading the

382
00:12:59,030 --> 00:12:57,360
actual eba to the station guys that that

383
00:13:00,550 --> 00:12:59,040
allows our turning flow to be reasonable

384
00:13:02,069 --> 00:13:00,560
now we're all supporting the eva for

385
00:13:04,710 --> 00:13:02,079
example rex is

386
00:13:07,350 --> 00:13:04,720
uh operating as the iv fergie's the

387
00:13:08,550 --> 00:13:07,360
airlock iv he'll be suiting up the guys

388
00:13:09,750 --> 00:13:08,560

to get ready to take him out and doug

389
00:13:11,750 --> 00:13:09,760
and i will be supporting doing the

390
00:13:13,030 --> 00:13:11,760
robotics so we're involved in the eva

391
00:13:15,430 --> 00:13:13,040
but the actual

392
00:13:16,230 --> 00:13:15,440
eva operation will be run by the station

393
00:13:18,710 --> 00:13:16,240
guys

394
00:13:21,269 --> 00:13:18,720
okay well tell us what's on the what's

395
00:13:23,030 --> 00:13:21,279
on the agenda what are mike and ron

396
00:13:25,030 --> 00:13:23,040
going to do outside and what kind of arm

397
00:13:27,509 --> 00:13:25,040
support is required well as i mentioned

398
00:13:29,509 --> 00:13:27,519
one of the prime

399
00:13:32,310 --> 00:13:29,519
mission goals is to bring back the pump

400
00:13:35,990 --> 00:13:32,320
module which failed last year

401
00:13:37,509 --> 00:13:36,000
and so the mission 133 mission placed

402
00:13:39,509 --> 00:13:37,519
the pump module

403
00:13:41,350 --> 00:13:39,519
on the storage platform just outside the

404
00:13:43,590 --> 00:13:41,360
airlock and we're going to go basically

405
00:13:46,150 --> 00:13:43,600
pick it up and put it in the payload bay

406
00:13:48,949 --> 00:13:46,160
and it's very huge and so you need the

407
00:13:52,230 --> 00:13:48,959
robot arm to move it from place to place

408
00:13:54,790 --> 00:13:52,240
so mike ron will get on the arm and then

409
00:13:56,949 --> 00:13:54,800
they'll remove the pump module and we'll

410
00:13:58,790 --> 00:13:56,959
carry him over to the payload bay and

411
00:14:00,629 --> 00:13:58,800
then mike and ron will attach it so

412
00:14:02,550 --> 00:14:00,639
while we're in the payload bay attaching

413
00:14:04,870 --> 00:14:02,560

the pump module to the logistics carrier

414
00:14:06,629 --> 00:14:04,880
will retrieve this experiment for the

415
00:14:07,990 --> 00:14:06,639
special purpose dexterous manipulator

416
00:14:10,069 --> 00:14:08,000
that will allow

417
00:14:13,030 --> 00:14:10,079
the robotics community to show the

418
00:14:14,790 --> 00:14:13,040
ability to do remote refueling and other

419
00:14:18,389 --> 00:14:14,800
dexterous attacks that might be involved

420
00:14:20,470 --> 00:14:18,399
in servicing satellites so this this

421
00:14:21,990 --> 00:14:20,480
payload will go out on the truss and

422
00:14:23,189 --> 00:14:22,000
then they'll bring the spdm over and

423
00:14:25,990 --> 00:14:23,199
they'll practice all these different

424
00:14:28,470 --> 00:14:26,000
very delicate operations as a technology

425
00:14:30,389 --> 00:14:28,480
demonstration and operational concept

426
00:14:32,790 --> 00:14:30,399
development so that perhaps someday you

427
00:14:34,470 --> 00:14:32,800
could send robots to service satellites

428
00:14:37,189 --> 00:14:34,480
and those those are activities that are

429
00:14:38,710 --> 00:14:37,199
going to happen later yeah but your your

430
00:14:40,870 --> 00:14:38,720
job is to get it out there yeah we're

431
00:14:42,870 --> 00:14:40,880
delivering the we're delivering the task

432
00:14:45,670 --> 00:14:42,880
board so that they can go

433
00:14:47,910 --> 00:14:45,680
do their development later on and that

434
00:14:49,829 --> 00:14:47,920
pretty much the the eva tasks are for

435
00:14:52,230 --> 00:14:49,839
your mission those are the two prime

436
00:14:54,550 --> 00:14:52,240
ones there's several reserve tasks that

437
00:14:57,110 --> 00:14:54,560
the program is looking at based on the

438
00:14:59,189 --> 00:14:57,120

time that it takes to do these two tasks

439
00:15:01,430 --> 00:14:59,199
and where we are in transfer because the

440
00:15:02,150 --> 00:15:01,440
primary driver for our mission schedule

441
00:15:04,389 --> 00:15:02,160
is

442
00:15:05,670 --> 00:15:04,399
getting things transferred from the mplm

443
00:15:07,990 --> 00:15:05,680
into the station and then bringing

444
00:15:09,910 --> 00:15:08,000
things home and repac you know to pack

445
00:15:11,350 --> 00:15:09,920
to bring home in the mplm and everything

446
00:15:13,670 --> 00:15:11,360
revolves around making sure we have

447
00:15:15,350 --> 00:15:13,680
enough crew time to get the transfer

448
00:15:17,189 --> 00:15:15,360
done so it's determined that we have

449
00:15:18,629 --> 00:15:17,199
enough crew time and we're doing well

450
00:15:21,590 --> 00:15:18,639
with transfer then doug and i can

451
00:15:23,350 --> 00:15:21,600
support robotically a little bit longer

452
00:15:25,269 --> 00:15:23,360
in the eva time frame and there's a few

453
00:15:26,790 --> 00:15:25,279
other tasks that could be attacked at

454
00:15:28,870 --> 00:15:26,800
that point so there's still a little bit

455
00:15:30,949 --> 00:15:28,880
of flux there and it's in the the

456
00:15:32,550 --> 00:15:30,959
scheduling is that fine that tight this

457
00:15:34,949 --> 00:15:32,560
mission the scheduling is that tight

458
00:15:37,110 --> 00:15:34,959
they're looking at 15 minute windows

459
00:15:38,949 --> 00:15:37,120
half an hour windows and having debates

460
00:15:40,790 --> 00:15:38,959
at that level to figure out how to get

461
00:15:42,230 --> 00:15:40,800
enough transfer time on the book so they

462
00:15:44,150 --> 00:15:42,240
feel confident that we'll be able to

463
00:15:45,910 --> 00:15:44,160

move everything from

464
00:15:47,990 --> 00:15:45,920
mplm to station and then from station

465
00:15:50,230 --> 00:15:48,000
back to mplm and the mid deck well as

466
00:15:51,910 --> 00:15:50,240
you say the transfer work is is the top

467
00:15:54,389 --> 00:15:51,920
priority and it takes up most of the

468
00:15:57,269 --> 00:15:54,399
time it's almost like you're packing up

469
00:15:59,189 --> 00:15:57,279
and moving two houses back and forth

470
00:16:01,910 --> 00:15:59,199
within the within the body of the space

471
00:16:04,150 --> 00:16:01,920
station can you give me a sense of what

472
00:16:06,389 --> 00:16:04,160
is involved in not just moving things

473
00:16:08,150 --> 00:16:06,399
but knowing where things are all the

474
00:16:09,829 --> 00:16:08,160
time and coordinating what's going in

475
00:16:12,230 --> 00:16:09,839
which direction that of course is the

476
00:16:14,069 --> 00:16:12,240
tricky part uh and i am the load master

477
00:16:16,150 --> 00:16:14,079
for this flight so i'm intimately

478
00:16:18,069 --> 00:16:16,160
involved in that and uh there's a great

479
00:16:20,230 --> 00:16:18,079
team working on it we're coming up with

480
00:16:22,550 --> 00:16:20,240
a very efficient plan for

481
00:16:24,150 --> 00:16:22,560
how to move things out of the implant um

482
00:16:25,350 --> 00:16:24,160
very efficiently and then move things

483
00:16:27,430 --> 00:16:25,360
back because there's a lot of

484
00:16:29,749 --> 00:16:27,440
constraints and and dependencies you

485
00:16:31,430 --> 00:16:29,759
know this is this mplm is all stowage

486
00:16:33,269 --> 00:16:31,440
there's no racks that get transferred in

487
00:16:34,710 --> 00:16:33,279
the past we've been able to transfer

488
00:16:37,670 --> 00:16:34,720

whole racks of

489
00:16:39,590 --> 00:16:37,680
of equipment and so we have to rotate

490
00:16:41,430 --> 00:16:39,600
some racks there are some racks that

491
00:16:44,230 --> 00:16:41,440
block access to other racks and the

492
00:16:45,430 --> 00:16:44,240
storage in there and so there's a very

493
00:16:47,269 --> 00:16:45,440
um

494
00:16:48,389 --> 00:16:47,279
efficient plan that has to be thought of

495
00:16:50,389 --> 00:16:48,399
so you're not constantly having to

496
00:16:52,470 --> 00:16:50,399
backtrack and get into things that

497
00:16:54,389 --> 00:16:52,480
you've already buckled down

498
00:16:56,470 --> 00:16:54,399
as well we've got bags on the station

499
00:16:58,629 --> 00:16:56,480
that are waiting to come back in

500
00:16:59,990 --> 00:16:58,639
and getting them inefficiently and then

501
00:17:02,470 --> 00:17:00,000
dealing with some of the

502
00:17:04,710 --> 00:17:02,480
remnant foam that we inevitably send up

503
00:17:06,150 --> 00:17:04,720
to station that'll keep us busy but

504
00:17:07,429 --> 00:17:06,160
because the team on the ground is so

505
00:17:09,669 --> 00:17:07,439
solid i feel that we'll have a really

506
00:17:12,069 --> 00:17:09,679
good plan to operate on the foam you're

507
00:17:14,230 --> 00:17:12,079
talking about that's packing material

508
00:17:16,789 --> 00:17:14,240
yes we we are very enthusiastic in our

509
00:17:18,710 --> 00:17:16,799
use of packing material here at nasa and

510
00:17:20,630 --> 00:17:18,720
the goal is to not leave a lot of that

511
00:17:23,110 --> 00:17:20,640
excess up on station because it's just

512
00:17:25,510 --> 00:17:23,120
trash that has to be gotten rid of later

513
00:17:27,270 --> 00:17:25,520

and so one of the prime my personal

514
00:17:29,350 --> 00:17:27,280
goals for this

515
00:17:31,669 --> 00:17:29,360
mission is to minimize the amount of

516
00:17:34,390 --> 00:17:31,679
foam that we leave on the station

517
00:17:35,110 --> 00:17:34,400
the task you described seems

518
00:17:37,669 --> 00:17:35,120
like

519
00:17:39,669 --> 00:17:37,679
it almost has to be scripted out

520
00:17:41,830 --> 00:17:39,679
one bag at a time in order to make it

521
00:17:43,909 --> 00:17:41,840
work well you don't have to go one bag

522
00:17:46,630 --> 00:17:43,919
at a time but you do need to think about

523
00:17:48,150 --> 00:17:46,640
how the racks interfere with each other

524
00:17:49,909 --> 00:17:48,160
and so you have to think maybe at rack

525
00:17:52,950 --> 00:17:49,919
level or even half a rack level but

526
00:17:55,270 --> 00:17:52,960
again the team that is planning this is

527
00:17:57,430 --> 00:17:55,280
very experienced a very competent i have

528
00:17:59,029 --> 00:17:57,440
huge amounts of faith in them and i

529
00:18:00,470 --> 00:17:59,039
think we'll have a really good going-in

530
00:18:02,390 --> 00:18:00,480
plan of course you always have to alter

531
00:18:04,630 --> 00:18:02,400
it as things happen but if you have a

532
00:18:06,390 --> 00:18:04,640
really solid going in plan you know 98

533
00:18:08,310 --> 00:18:06,400
of getting anything done is the planning

534
00:18:10,390 --> 00:18:08,320
and and we're going to have a great plan

535
00:18:13,190 --> 00:18:10,400
is it is a general philosophy to like

536
00:18:15,990 --> 00:18:13,200
first empty the mplm and then bring the

537
00:18:17,590 --> 00:18:16,000
the the returning stuff in the past that

538
00:18:19,350 --> 00:18:17,600

is the philosophy but that's not

539
00:18:20,950 --> 00:18:19,360
necessarily the most efficient way to do

540
00:18:22,310 --> 00:18:20,960
it again it's because how you have to

541
00:18:23,990 --> 00:18:22,320
access the rack so we're going to

542
00:18:26,630 --> 00:18:24,000
actually be emptying and filling all at

543
00:18:30,150 --> 00:18:26,640
the same time for example there's some

544
00:18:34,230 --> 00:18:32,630
some these support structures we have to

545
00:18:37,190 --> 00:18:34,240
fold out of the way to get to some

546
00:18:38,710 --> 00:18:37,200
blocked access so when we take the

547
00:18:40,549 --> 00:18:38,720
resupply items that need to go to

548
00:18:41,750 --> 00:18:40,559
station out of that spot while we have

549
00:18:43,190 --> 00:18:41,760
that structure out of the way we're

550
00:18:44,230 --> 00:18:43,200
going to put the return items that are

551
00:18:46,150 --> 00:18:44,240
coming home

552
00:18:47,590 --> 00:18:46,160
in at that moment so we don't have to

553
00:18:48,789 --> 00:18:47,600
move the structure out of the way more

554
00:18:50,789 --> 00:18:48,799
than once so

555
00:18:52,390 --> 00:18:50,799
it's it's better as you plan to think

556
00:18:54,950 --> 00:18:52,400
about these kinds of things so you can

557
00:18:57,510 --> 00:18:54,960
do the swap and not have to like i said

558
00:18:59,350 --> 00:18:57,520
go backwards it's a giant puzzle it is

559
00:19:01,990 --> 00:18:59,360
it's a three-dimensional puzzle it's a

560
00:19:03,990 --> 00:19:02,000
giant three-dimensional puzzle so

561
00:19:05,830 --> 00:19:04,000
we'll be busy

562
00:19:06,789 --> 00:19:05,840
when the joint timeline on the station

563
00:19:08,150 --> 00:19:06,799

is over

564
00:19:09,750 --> 00:19:08,160
you and your shuttle crewmates are going

565
00:19:11,350 --> 00:19:09,760
to mark a milestone with the last

566
00:19:13,110 --> 00:19:11,360
undocking of the shuttle from the

567
00:19:14,789 --> 00:19:13,120
international space station

568
00:19:17,270 --> 00:19:14,799
is there anything special on the plan

569
00:19:19,510 --> 00:19:17,280
for that undocking operation itself as

570
00:19:21,590 --> 00:19:19,520
atlantis finishes the shuttle's mission

571
00:19:23,350 --> 00:19:21,600
at the station well we're hoping we

572
00:19:25,350 --> 00:19:23,360
we've had some discussions with the

573
00:19:27,029 --> 00:19:25,360
imagery folks and you know that we do a

574
00:19:29,350 --> 00:19:27,039
lot of photo documentation of the

575
00:19:31,110 --> 00:19:29,360
station as we do the fly around as we

576
00:19:32,950 --> 00:19:31,120
leave so that they can keep an eye on

577
00:19:35,510 --> 00:19:32,960
you know how the the station is doing if

578
00:19:37,270 --> 00:19:35,520
there's you know micrometeor hits or how

579
00:19:39,029 --> 00:19:37,280
the solar rays radiators things like

580
00:19:41,110 --> 00:19:39,039
this and one of the things that we've

581
00:19:41,990 --> 00:19:41,120
really not been able to do you know all

582
00:19:47,110 --> 00:19:42,000
of the

583
00:19:49,590 --> 00:19:47,120
forward this is aft and the solar the

584
00:19:50,630 --> 00:19:49,600
truss is this way we're going to uh this

585
00:19:51,830 --> 00:19:50,640
program

586
00:19:55,029 --> 00:19:51,840
of the both the shuttle the station

587
00:19:57,590 --> 00:19:55,039
program are working on actually rotating

588
00:19:59,430 --> 00:19:57,600

the shuttle either 45 or the station 45

589
00:20:00,789 --> 00:19:59,440
or 90 degrees and we'll do a fly around

590
00:20:02,390 --> 00:20:00,799
in an opposite

591
00:20:04,870 --> 00:20:02,400
manner and we're able able to photo

592
00:20:06,789 --> 00:20:04,880
document the station from a different

593
00:20:08,390 --> 00:20:06,799
aspect and get some very valuable

594
00:20:09,830 --> 00:20:08,400
information for the imagery guys so that

595
00:20:11,190 --> 00:20:09,840
will be very interesting because we'll

596
00:20:13,270 --> 00:20:11,200
have different

597
00:20:14,870 --> 00:20:13,280
you know very different photos from our

598
00:20:16,310 --> 00:20:14,880
fly around than any other mission before

599
00:20:18,230 --> 00:20:16,320
us and we're looking forward to trying

600
00:20:20,549 --> 00:20:18,240
to do that a view that the very few of

601
00:20:21,830 --> 00:20:20,559
us have ever seen i

602
00:20:23,510 --> 00:20:21,840
was thinking about is there anything

603
00:20:25,750 --> 00:20:23,520
special that you're going to be keeping

604
00:20:28,070 --> 00:20:25,760
your eyes open for during that that last

605
00:20:29,830 --> 00:20:28,080
fly around and that final separation

606
00:20:32,230 --> 00:20:29,840
well i'm lucky enough to be the photo

607
00:20:34,470 --> 00:20:32,240
person during the docking and undocking

608
00:20:37,190 --> 00:20:34,480
time frame and i'm very much looking

609
00:20:39,190 --> 00:20:37,200
forward to just having some nice time at

610
00:20:41,190 --> 00:20:39,200
the window and just taking tons of

611
00:20:43,190 --> 00:20:41,200
photos of the station hopefully getting

612
00:20:45,990 --> 00:20:43,200
first of all good documentation for the

613
00:20:48,470 --> 00:20:46,000

engineering folks who need the photos to

614
00:20:49,909 --> 00:20:48,480
study how the station's doing and second

615
00:20:52,310 --> 00:20:49,919
try and get some of those pretty shots

616
00:20:53,909 --> 00:20:52,320
that that nasa chooses to use every now

617
00:20:55,669 --> 00:20:53,919
and then we'll see it'll be it'll be a

618
00:20:57,510 --> 00:20:55,679
really unique view though we need more

619
00:21:04,390 --> 00:20:57,520
beauty shots yeah the station's a

620
00:21:07,830 --> 00:21:05,909
when you were assigned to this flight it

621
00:21:10,070 --> 00:21:07,840
was supposed to be a rescue mission for

622
00:21:13,029 --> 00:21:10,080
what was the last shuttle mission and it

623
00:21:16,070 --> 00:21:13,039
was going to fly in the summer of 2010

624
00:21:17,830 --> 00:21:16,080
the plans for that have all changed what

625
00:21:20,549 --> 00:21:17,840
was your reaction when you came to

626
00:21:22,390 --> 00:21:20,559
realize i'm flying on the last space

627
00:21:24,630 --> 00:21:22,400
shuttle mission well first of all i have

628
00:21:26,710 --> 00:21:24,640
to say being assigned to a shuttle

629
00:21:28,310 --> 00:21:26,720
mission again of any kind was a big

630
00:21:30,950 --> 00:21:28,320
surprise for me and you know after doing

631
00:21:33,750 --> 00:21:30,960
my long duration mission i assumed i was

632
00:21:35,270 --> 00:21:33,760
now in the long duration pool of folks

633
00:21:37,110 --> 00:21:35,280
and i was actually up working in

634
00:21:39,510 --> 00:21:37,120
washington dc when i got the phone call

635
00:21:41,110 --> 00:21:39,520
to come back to houston and and train

636
00:21:42,950 --> 00:21:41,120
for this so i was surprised just in

637
00:21:43,750 --> 00:21:42,960
general to be assigned

638
00:21:45,510 --> 00:21:43,760

and

639
00:21:47,990 --> 00:21:45,520
of course we've always known that the

640
00:21:50,310 --> 00:21:48,000
last the the rescue mission could

641
00:21:52,230 --> 00:21:50,320
potentially turn into a mission

642
00:21:54,070 --> 00:21:52,240
and so that wasn't you know that's all

643
00:21:55,590 --> 00:21:54,080
that's always been a 50 50 proposition

644
00:21:57,430 --> 00:21:55,600
so the big surprise for me was just

645
00:21:58,390 --> 00:21:57,440
getting assigned to a shuttle mission at

646
00:22:00,149 --> 00:21:58,400
all

647
00:22:02,549 --> 00:22:00,159
is there a special sense of

648
00:22:04,630 --> 00:22:02,559
responsibility or honor of being part of

649
00:22:06,630 --> 00:22:04,640
the last crew well i certainly feel

650
00:22:08,549 --> 00:22:06,640
honored to be part of the last crew you

651
00:22:10,870 --> 00:22:08,559
know i think and the thing

652
00:22:12,710 --> 00:22:10,880
i think that i'm i feel the most honored

653
00:22:15,350 --> 00:22:12,720
about is it requires a special skill set

654
00:22:17,669 --> 00:22:15,360
to operate with the crew for and i

655
00:22:19,750 --> 00:22:17,679
i'm very flattered that it's felt that i

656
00:22:22,710 --> 00:22:19,760
have that skill set that is needed to do

657
00:22:24,310 --> 00:22:22,720
that i'm very very flattered by that

658
00:22:26,310 --> 00:22:24,320
the end of the shuttle program means a

659
00:22:27,750 --> 00:22:26,320
lot of change at nasa and that includes

660
00:22:29,750 --> 00:22:27,760
layoffs and shutting down some

661
00:22:31,350 --> 00:22:29,760
historical facilities

662
00:22:33,110 --> 00:22:31,360
what's your feeling about the decision

663
00:22:34,950 --> 00:22:33,120

that was made to stop flying the

664
00:22:37,270 --> 00:22:34,960
shuttles well as you know the decision

665
00:22:38,710 --> 00:22:37,280
was made to stop flying the shuttle back

666
00:22:41,190 --> 00:22:38,720
after columbia

667
00:22:43,430 --> 00:22:41,200
when the columbia commission reported

668
00:22:45,110 --> 00:22:43,440
that you know the shuttles have clearly

669
00:22:47,510 --> 00:22:45,120
been flying for decades they weren't

670
00:22:50,470 --> 00:22:47,520
designed to fly for decades so at in

671
00:22:52,070 --> 00:22:50,480
2010 we have nasa has to make a decision

672
00:22:53,510 --> 00:22:52,080
whether to overhaul the shuttles and

673
00:22:54,630 --> 00:22:53,520
give them a really good down to make

674
00:22:55,510 --> 00:22:54,640
sure they're going to continue to be

675
00:22:57,990 --> 00:22:55,520
able to

676
00:23:00,310 --> 00:22:58,000
fly safely or cancel the program and

677
00:23:02,710 --> 00:23:00,320
move on so that decision was made

678
00:23:05,190 --> 00:23:02,720
a long time ago

679
00:23:07,029 --> 00:23:05,200
so i think you know

680
00:23:09,669 --> 00:23:07,039
looking back that was probably the right

681
00:23:12,470 --> 00:23:09,679
that is the right choice to make the

682
00:23:14,230 --> 00:23:12,480
unfortunate thing is how the transition

683
00:23:15,430 --> 00:23:14,240
is actually occurring you know we're at

684
00:23:17,110 --> 00:23:15,440
a very

685
00:23:19,830 --> 00:23:17,120
that basically from that point when that

686
00:23:21,350 --> 00:23:19,840
decision was was made that we're gonna

687
00:23:23,830 --> 00:23:21,360
in 2010

688
00:23:25,350 --> 00:23:23,840

cancel the shuttles that put nasa into a

689
00:23:29,510 --> 00:23:25,360
time of transition

690
00:23:32,390 --> 00:23:29,520
last for a decade

691
00:23:33,510 --> 00:23:32,400
and we've had a lot of turmoil during

692
00:23:34,470 --> 00:23:33,520
this time

693
00:23:40,710 --> 00:23:34,480
as

694
00:23:43,669 --> 00:23:40,720
and it's caused because of the way it's

695
00:23:45,029 --> 00:23:43,679
all played out we're in a situation now

696
00:23:47,269 --> 00:23:45,039
where unfortunately we're losing a lot

697
00:23:48,470 --> 00:23:47,279
of important skill sets you know you

698
00:23:51,990 --> 00:23:48,480
mentioned the layoffs as a matter of

699
00:23:54,230 --> 00:23:52,000
fact we had our ceit just last week

700
00:23:55,830 --> 00:23:54,240
and the people who were there helping us

701
00:23:57,350 --> 00:23:55,840
get through the ceit were getting laid

702
00:23:58,870 --> 00:23:57,360
off the next day

703
00:24:00,070 --> 00:23:58,880
it was it was very it's really

704
00:24:01,190 --> 00:24:00,080
heart-wrenching you know when you come

705
00:24:04,950 --> 00:24:01,200
down to the

706
00:24:06,870 --> 00:24:04,960
individual level um

707
00:24:08,630 --> 00:24:06,880
so during this time of transition we're

708
00:24:11,350 --> 00:24:08,640
finding ourselves

709
00:24:13,590 --> 00:24:11,360
not able to enact the next

710
00:24:15,029 --> 00:24:13,600
plan in time to save certain skill sets

711
00:24:16,390 --> 00:24:15,039
and that i think is the unfortunate

712
00:24:18,230 --> 00:24:16,400
thing

713
00:24:20,149 --> 00:24:18,240

i think we will get a plan i think it'll

714
00:24:22,549 --> 00:24:20,159
be a good plan if you if you listen to

715
00:24:24,710 --> 00:24:22,559
the agendas of of different entities

716
00:24:26,149 --> 00:24:24,720
that are arguing over the national space

717
00:24:27,669 --> 00:24:26,159
policy and trying to formulate it

718
00:24:29,909 --> 00:24:27,679
there's general agreement that we should

719
00:24:31,590 --> 00:24:29,919
go beyond low earth orbit

720
00:24:33,830 --> 00:24:31,600
and that of course reinforces the idea

721
00:24:35,269 --> 00:24:33,840
that the shuttle's time has come because

722
00:24:36,549 --> 00:24:35,279
it's a vehicle that was designed for low

723
00:24:38,230 --> 00:24:36,559
earth orbit

724
00:24:41,190 --> 00:24:38,240
and so we will get our plan but in the

725
00:24:45,029 --> 00:24:41,200
meantime it's it's been a little

726
00:24:46,549 --> 00:24:45,039
unsettling in the transition

727
00:24:49,269 --> 00:24:46,559
every mission has to come up with a

728
00:24:50,549 --> 00:24:49,279
patch and yours we see on your shirt

729
00:24:52,630 --> 00:24:50,559
talk about some of the elements that are

730
00:24:54,630 --> 00:24:52,640
there because you see parts of the nasa

731
00:24:56,149 --> 00:24:54,640
emblem but also the last letter of the

732
00:24:58,950 --> 00:24:56,159
greek alphabet well of course you know

733
00:25:00,549 --> 00:24:58,960
omega came to mind immediately as

734
00:25:02,070 --> 00:25:00,559
as it is the last letter of the greek

735
00:25:03,029 --> 00:25:02,080
alphabet and we are the last shuttle

736
00:25:05,269 --> 00:25:03,039
mission

737
00:25:07,669 --> 00:25:05,279
um so we wanted to sort of highlight

738
00:25:11,110 --> 00:25:07,679

that this was the end of

739
00:25:13,190 --> 00:25:11,120
the shuttle program and of course

740
00:25:15,269 --> 00:25:13,200
it's not just something that affects the

741
00:25:17,590 --> 00:25:15,279
shuttle program but it affects all of

742
00:25:19,909 --> 00:25:17,600
nasa so we felt like having

743
00:25:22,310 --> 00:25:19,919
part of the nasa symbol and our patch

744
00:25:23,510 --> 00:25:22,320
was appropriate as well

745
00:25:25,830 --> 00:25:23,520
what do you think are the most

746
00:25:27,110 --> 00:25:25,840
significant moments in the space shuttle

747
00:25:29,909 --> 00:25:27,120
history

748
00:25:31,430 --> 00:25:29,919
oh my you know there are so many

749
00:25:33,190 --> 00:25:31,440
we can talk about the launch of the

750
00:25:34,390 --> 00:25:33,200
hubble we can talk about the repair of

751
00:25:36,870 --> 00:25:34,400
the hubble

752
00:25:38,310 --> 00:25:36,880
we can talk about the space station

753
00:25:39,510 --> 00:25:38,320
program and what it's been able to do

754
00:25:41,269 --> 00:25:39,520
there we can talk about some of the

755
00:25:43,510 --> 00:25:41,279
great science missions

756
00:25:44,950 --> 00:25:43,520
you know the radar mapping missions and

757
00:25:47,269 --> 00:25:44,960
and and there's so much that the

758
00:25:48,630 --> 00:25:47,279
shuttle's been able to accomplish but i

759
00:25:51,110 --> 00:25:48,640
think really

760
00:25:53,110 --> 00:25:51,120
the one some of the greatest moments in

761
00:25:55,269 --> 00:25:53,120
uh our history as a shuttle program has

762
00:25:59,029 --> 00:25:55,279
come after our disasters

763
00:26:01,029 --> 00:25:59,039

because you see there what the people of

764
00:26:02,630 --> 00:26:01,039
our space industry are really made of

765
00:26:04,149 --> 00:26:02,640
you know what the

766
00:26:04,870 --> 00:26:04,159
what the space industry is really made

767
00:26:06,950 --> 00:26:04,880
of

768
00:26:09,350 --> 00:26:06,960
we have this horrible event we lose a

769
00:26:12,549 --> 00:26:09,360
vehicle we lose crew

770
00:26:14,950 --> 00:26:12,559
and everybody pulls together

771
00:26:16,710 --> 00:26:14,960
and just tackles the problem

772
00:26:19,190 --> 00:26:16,720
and i was involved in some of the

773
00:26:21,750 --> 00:26:19,200
columbia work and i i was just so

774
00:26:24,390 --> 00:26:21,760
impressed and so amazed you have this

775
00:26:27,430 --> 00:26:24,400
extremely complex problem we broke it

776
00:26:30,070 --> 00:26:27,440
down into little pieces everybody worked

777
00:26:31,510 --> 00:26:30,080
so hard with such fierce determination

778
00:26:33,669 --> 00:26:31,520
to solve it

779
00:26:35,190 --> 00:26:33,679
brought all the pieces back together

780
00:26:37,510 --> 00:26:35,200
found the solution

781
00:26:38,390 --> 00:26:37,520
and continued to fly

782
00:26:41,750 --> 00:26:38,400
and

783
00:26:44,950 --> 00:26:41,760
i can't think of any other industry

784
00:26:46,390 --> 00:26:44,960
on this planet that can do that

785
00:26:48,149 --> 00:26:46,400
and it says a lot about the people that

786
00:26:49,110 --> 00:26:48,159
work in the space program it says a lot

787
00:26:51,029 --> 00:26:49,120
about

788
00:26:52,470 --> 00:26:51,039

just the shuttle program in general and

789
00:26:54,630 --> 00:26:52,480
doing it out in public in front of

790
00:26:56,390 --> 00:26:54,640
everybody definitely and doing it with a

791
00:26:58,789 --> 00:26:56,400
lot of an emotional

792
00:27:00,149 --> 00:26:58,799
context to it because you know we lost

793
00:27:02,470 --> 00:27:00,159
people there and

794
00:27:04,630 --> 00:27:02,480
that's just hard

795
00:27:06,549 --> 00:27:04,640
what do you think about atlantis this

796
00:27:08,710 --> 00:27:06,559
particular orbiter what would it be

797
00:27:10,149 --> 00:27:08,720
remembered for oh gosh you know i have

798
00:27:12,470 --> 00:27:10,159
to tell you at least in my heart

799
00:27:14,950 --> 00:27:12,480
atlantis was the first one that i flew

800
00:27:17,190 --> 00:27:14,960
on for sts-112 and that'll be my last

801
00:27:19,590 --> 00:27:17,200
mission as well

802
00:27:20,789 --> 00:27:19,600
so i have it has a holds a special place

803
00:27:22,149 --> 00:27:20,799
in my heart but i think you know all

804
00:27:24,389 --> 00:27:22,159
three or

805
00:27:26,870 --> 00:27:24,399
all of the orbiters each have their own

806
00:27:29,350 --> 00:27:26,880
personality have their own

807
00:27:30,870 --> 00:27:29,360
sort of following and so you know for

808
00:27:32,389 --> 00:27:30,880
the people who who have worked on

809
00:27:34,070 --> 00:27:32,399
atlantis for so long i think it's

810
00:27:36,070 --> 00:27:34,080
special for them that it will be the

811
00:27:38,710 --> 00:27:36,080
last mission for the people who are not

812
00:27:40,230 --> 00:27:38,720
as close to it they all look alike

813
00:27:43,029 --> 00:27:40,240

what's what makes atlantis different

814
00:27:46,149 --> 00:27:43,039
what's what's peculiar about it well i

815
00:27:47,990 --> 00:27:46,159
mean technically speaking atlantis

816
00:27:49,510 --> 00:27:48,000
does not have a modification that allows

817
00:27:51,430 --> 00:27:49,520
it to pull power from the space station

818
00:27:53,590 --> 00:27:51,440
so it's a little bit different there

819
00:27:55,110 --> 00:27:53,600
but i don't it's hard to put your finger

820
00:27:56,789 --> 00:27:55,120
on it you know they just they all have

821
00:27:59,350 --> 00:27:56,799
their own little quirks and their own

822
00:28:00,830 --> 00:27:59,360
little personalities and

823
00:28:03,110 --> 00:28:00,840
it's just hard to

824
00:28:05,830 --> 00:28:03,120
describe how

825
00:28:08,710 --> 00:28:05,840
will the work of the shuttle program the

826
00:28:10,389 --> 00:28:08,720
whole program be remembered

827
00:28:12,870 --> 00:28:10,399
i think it'll be remembered as one of

828
00:28:14,630 --> 00:28:12,880
the most unique programs in

829
00:28:16,070 --> 00:28:14,640
on in the history of space flight you

830
00:28:18,630 --> 00:28:16,080
know if you look at what the shuttle can

831
00:28:20,070 --> 00:28:18,640
do it's a very versatile vehicle it can

832
00:28:21,350 --> 00:28:20,080
we mentioned already the science

833
00:28:22,870 --> 00:28:21,360
missions that it had we mentioned

834
00:28:25,669 --> 00:28:22,880
already the repair

835
00:28:27,990 --> 00:28:25,679
uh deploying re and

836
00:28:30,070 --> 00:28:28,000
and capture of satellites we mentioned

837
00:28:32,549 --> 00:28:30,080
the space station and if you look at how

838
00:28:33,990 --> 00:28:32,559

the shuttle programs evolved

839
00:28:35,110 --> 00:28:34,000
it wasn't clear when the shuttle was

840
00:28:37,430 --> 00:28:35,120
first built

841
00:28:38,870 --> 00:28:37,440
what it was going to be doing

842
00:28:41,350 --> 00:28:38,880
in particular for all these different

843
00:28:42,630 --> 00:28:41,360
missions it sort of grew into

844
00:28:44,389 --> 00:28:42,640
being able to carry out all these

845
00:28:45,750 --> 00:28:44,399
missions because of the the versatility

846
00:28:47,590 --> 00:28:45,760
that was inherent in the design of the

847
00:28:48,870 --> 00:28:47,600
vehicle and because of the dedication

848
00:28:50,630 --> 00:28:48,880
and the creativity of the people who

849
00:28:51,990 --> 00:28:50,640
worked on the program for so long so i

850
00:28:54,230 --> 00:28:52,000
think when you look back at the shuttle

851
00:28:57,510 --> 00:28:54,240
program you're going to see

852
00:28:59,669 --> 00:28:57,520
a vehicle that was adaptable

853
00:29:02,070 --> 00:28:59,679
to the fullest extent over the 30-year

854
00:29:04,789 --> 00:29:02,080
life in ways that the original designers

855
00:29:07,029 --> 00:29:04,799
maybe have had vague ideas about but

856
00:29:08,710 --> 00:29:07,039
certainly no concept of the wide variety

857
00:29:10,470 --> 00:29:08,720
of tasks that the vehicle was going to

858
00:29:13,110 --> 00:29:10,480
be able to perform

859
00:29:15,430 --> 00:29:13,120
in addition it'll be unique i think in

860
00:29:17,590 --> 00:29:15,440
history for a very long time and its

861
00:29:19,669 --> 00:29:17,600
ability to return

862
00:29:22,149 --> 00:29:19,679
cargo from space

863
00:29:23,990 --> 00:29:22,159

and that's been key for a lot of science

864
00:29:25,590 --> 00:29:24,000
that we've been able to do because it's

865
00:29:26,950 --> 00:29:25,600
not only important to do the experiments

866
00:29:29,110 --> 00:29:26,960
on orbit but it's also important to be

867
00:29:31,269 --> 00:29:29,120
able to bring your samples back and get

868
00:29:34,549 --> 00:29:31,279
your data back and things like that and

869
00:29:36,149 --> 00:29:34,559
and the orbiter has been very unique in

870
00:29:37,669 --> 00:29:36,159
that sense in addition to things like

871
00:29:39,269 --> 00:29:37,679
bringing the pump module back and other

872
00:29:40,950 --> 00:29:39,279
large pieces of equipment on the space

873
00:29:43,110 --> 00:29:40,960
station that have failed over the years

874
00:29:44,870 --> 00:29:43,120
we bring those back on the orbiter

875
00:29:46,950 --> 00:29:44,880
and we can learn from them

876
00:29:49,590 --> 00:29:46,960
and it's been able to do that for us as

877
00:29:51,750 --> 00:29:49,600
well so i think there's a lot of key

878
00:29:53,510 --> 00:29:51,760
things and capabilities and qualities

879
00:29:55,510 --> 00:29:53,520
that the orbiters had that the shuttle

880
00:29:57,190 --> 00:29:55,520
program has used it for

881
00:29:58,310 --> 00:29:57,200
that will be celebrated for a very long

882
00:30:00,549 --> 00:29:58,320
time

883
00:30:02,870 --> 00:30:00,559
lately excuse me lately we've been using

884
00:30:04,389 --> 00:30:02,880
it to build a space station

885
00:30:05,990 --> 00:30:04,399
what kind of space station might we have

886
00:30:08,070 --> 00:30:06,000
today if we didn't have the space

887
00:30:11,190 --> 00:30:08,080
shuttle to use to build it a much

888
00:30:13,909 --> 00:30:11,200

smaller and much less capable one

889
00:30:15,269 --> 00:30:13,919
if you look at the space station now

890
00:30:18,549 --> 00:30:15,279
you'll see this

891
00:30:21,350 --> 00:30:18,559
huge monster building in space you will

892
00:30:23,909 --> 00:30:21,360
see science racks and and

893
00:30:25,350 --> 00:30:23,919
experiment facilities that are on board

894
00:30:26,789 --> 00:30:25,360
because the shuttle could take them

895
00:30:28,310 --> 00:30:26,799
there

896
00:30:30,310 --> 00:30:28,320
without that

897
00:30:32,230 --> 00:30:30,320
the station would be much less capable

898
00:30:34,149 --> 00:30:32,240
and have a lot less going on than it

899
00:30:36,789 --> 00:30:34,159
does now

900
00:30:38,630 --> 00:30:36,799
after sts-135 it's going to be up to

901
00:30:41,190 --> 00:30:38,640
spaceships from other nations and

902
00:30:43,669 --> 00:30:41,200
perhaps private industry to get crews

903
00:30:45,110 --> 00:30:43,679
and cargo to orbit for the foreseeable

904
00:30:47,110 --> 00:30:45,120
future anyway

905
00:30:48,630 --> 00:30:47,120
as an american astronaut how do you feel

906
00:30:50,549 --> 00:30:48,640
about the future for the international

907
00:30:51,909 --> 00:30:50,559
space station oh the future is very

908
00:30:53,350 --> 00:30:51,919
strong for the international space

909
00:30:55,110 --> 00:30:53,360
station i think

910
00:30:57,430 --> 00:30:55,120
at you know it's an entity that we're

911
00:30:58,950 --> 00:30:57,440
flying with a lot of other countries

912
00:31:01,110 --> 00:30:58,960
there's a lot of interest in it there's

913
00:31:02,870 --> 00:31:01,120

a lot of useful things we can do

914
00:31:05,350 --> 00:31:02,880
on the space station we know for sure

915
00:31:07,509 --> 00:31:05,360
it's going to 2020 it could even go

916
00:31:09,830 --> 00:31:07,519
farther who knows so i think there's

917
00:31:11,269 --> 00:31:09,840
still a lot of of capability in the

918
00:31:12,789 --> 00:31:11,279
space station and there will be a lot of

919
00:31:15,110 --> 00:31:12,799
good science to come out of the work

920
00:31:16,230 --> 00:31:15,120
that we're doing on the space station

921
00:31:19,110 --> 00:31:16,240
do you remember where you were when

922
00:31:20,950 --> 00:31:19,120
sts-1 took off and what you thought

923
00:31:22,149 --> 00:31:20,960
about that fight gosh i was in high

924
00:31:26,470 --> 00:31:22,159
school

925
00:31:27,830 --> 00:31:26,480
you know it was just pretty spectacular

926
00:31:29,430 --> 00:31:27,840
to see

927
00:31:32,549 --> 00:31:29,440
something launching with people in it

928
00:31:34,070 --> 00:31:32,559
even on tv it was like wow look at that

929
00:31:35,750 --> 00:31:34,080
you know that's really cool it looks

930
00:31:37,269 --> 00:31:35,760
like an airplane but it's lunging like a

931
00:31:39,190 --> 00:31:37,279
rocket

932
00:31:40,549 --> 00:31:39,200
wow you know it was really it was really

933
00:31:42,789 --> 00:31:40,559
different

934
00:31:44,549 --> 00:31:42,799
what's your favorite memory out of the

935
00:31:47,509 --> 00:31:44,559
space shuttle program

936
00:31:48,789 --> 00:31:47,519
well i have to say my my favorite memory

937
00:31:50,630 --> 00:31:48,799
is very personal

938
00:31:52,950 --> 00:31:50,640

i was on atlantis

939
00:31:54,870 --> 00:31:52,960
when we opened the payload bay doors

940
00:31:56,870 --> 00:31:54,880
right after we got to orbit i was on the

941
00:31:58,630 --> 00:31:56,880
flight deck working in the athletic area

942
00:32:01,509 --> 00:31:58,640
opening the payload bay doors

943
00:32:03,590 --> 00:32:01,519
and as the payload doors opened i looked

944
00:32:05,029 --> 00:32:03,600
down at the earth for the first time and

945
00:32:06,230 --> 00:32:05,039
saw the horizon

946
00:32:09,029 --> 00:32:06,240
and

947
00:32:11,269 --> 00:32:09,039
that was very special

948
00:32:13,430 --> 00:32:11,279
destinations have changed a lot in the

949
00:32:15,269 --> 00:32:13,440
30 years since sts-1

950
00:32:16,630 --> 00:32:15,279
kicked off this era

951
00:32:18,870 --> 00:32:16,640
where do you think we're going to go in

952
00:32:21,669 --> 00:32:18,880
the next era of space exploration now as

953
00:32:25,190 --> 00:32:21,679
you know that's a very hotly contested

954
00:32:27,190 --> 00:32:25,200
debate going on right now with a camp

955
00:32:29,110 --> 00:32:27,200
stating that we need to go to the moon

956
00:32:31,509 --> 00:32:29,120
another camp stating that we should go

957
00:32:32,950 --> 00:32:31,519
to asteroid another camp stadium we

958
00:32:35,110 --> 00:32:32,960
should skip all that and go directly to

959
00:32:37,190 --> 00:32:35,120
mars those are the the three that i hear

960
00:32:38,389 --> 00:32:37,200
the most about

961
00:32:40,230 --> 00:32:38,399
i think

962
00:32:41,750 --> 00:32:40,240
as i mentioned earlier everyone's agreed

963
00:32:43,590 --> 00:32:41,760

we need to get out of low earth orbit

964
00:32:45,509 --> 00:32:43,600
and the next step is to go forward and

965
00:32:47,669 --> 00:32:45,519
that's a good thing i think we'll find

966
00:32:49,669 --> 00:32:47,679
that it'll be almost irresistible to use

967
00:32:52,070 --> 00:32:49,679
the moon as a test bed of some sort and

968
00:32:53,590 --> 00:32:52,080
then the big debate would be how long

969
00:32:55,350 --> 00:32:53,600
but it's in our backyard and it makes

970
00:32:57,909 --> 00:32:55,360
sense to do some technology testing

971
00:32:59,350 --> 00:32:57,919
there and technology development there

972
00:33:01,350 --> 00:32:59,360
and it's quite possible that the

973
00:33:03,750 --> 00:33:01,360
destination

974
00:33:05,029 --> 00:33:03,760
that we will end up going to is one we

975
00:33:06,950 --> 00:33:05,039
don't even know yet because you know

976
00:33:09,590 --> 00:33:06,960
we're still exploring there's other

977
00:33:10,630 --> 00:33:09,600
places of interest in our solar system

978
00:33:13,269 --> 00:33:10,640
and

979
00:33:15,590 --> 00:33:13,279
who knows i think anywhere we go is good

980
00:33:17,590 --> 00:33:15,600
because it's broadening the frontier

981
00:33:19,590 --> 00:33:17,600
it's pushing technology and it's getting

982
00:33:21,750 --> 00:33:19,600
us further and further out into the

983
00:33:23,269 --> 00:33:21,760
solar system

984
00:33:25,269 --> 00:33:23,279
who knows what we might

985
00:33:27,029 --> 00:33:25,279
find is some place we want to look at we

986
00:33:28,470 --> 00:33:27,039
still have all these telescopes up there

987
00:33:30,389 --> 00:33:28,480
and they're still telling us a lot about

988
00:33:32,549 --> 00:33:30,399

the universe and the solar system so

989
00:33:34,149 --> 00:33:32,559
we'll see

990
00:33:35,430 --> 00:33:34,159
it's interesting though the technology

991
00:33:37,750 --> 00:33:35,440
that would need to do any of these

992
00:33:40,549 --> 00:33:37,760
destinations is pretty much the same

993
00:33:42,950 --> 00:33:40,559
so we can move forward and get ourselves

994
00:33:44,149 --> 00:33:42,960
ready to make the jump while we're still

995
00:33:46,389 --> 00:33:44,159
having this

996
00:33:48,470 --> 00:33:46,399
debate about what the final destination

997
00:33:50,630 --> 00:33:48,480
should be and and final sort of relative

998
00:33:52,230 --> 00:33:50,640
term isn't it because once we get to the

999
00:33:53,590 --> 00:33:52,240
next destination then we'll have one

1000
00:33:55,430 --> 00:33:53,600
after that so