
EV1

1
00:00:18,410 --> 00:00:15,519
why did you want to be an astronaut

2
00:00:20,420 --> 00:00:18,420
actually I'll correct you many people

3
00:00:22,670 --> 00:00:20,430
have asked me that question but it may

4
00:00:26,150 --> 00:00:22,680
be the first time I get to tell you the

5
00:00:33,440 --> 00:00:30,919
I believed growing up that we would all

6
00:00:38,229 --> 00:00:33,450
be astronauts by the time I was you know

7
00:00:40,700 --> 00:00:38,239
an adult that's not true obviously and

8
00:00:44,959 --> 00:00:40,710
we're not as advanced as I thought we

9
00:00:49,430 --> 00:00:44,969
would be but I believed when I was young

10
00:00:51,529 --> 00:00:49,440
that that would be my place for some

11
00:00:53,869 --> 00:00:51,539
period of time in my life was to do that

12
00:00:57,170 --> 00:00:53,879
and I think when I went through

13
00:01:00,260 --> 00:00:57,180

university I am a geologist a

14
00:01:02,599 --> 00:01:00,270
geophysicist and I thought well wouldn't

15
00:01:05,149 --> 00:01:02,609
it be great if I learned about rocks

16
00:01:07,990 --> 00:01:05,159
minerals in geology and then we went to

17
00:01:10,640 --> 00:01:08,000
the moon and I could help you know

18
00:01:13,750 --> 00:01:10,650
utilize resources on the moon because of

19
00:01:15,920 --> 00:01:13,760
my geological experiences and background

20
00:01:17,899 --> 00:01:15,930
so those are the things that interested

21
00:01:22,340 --> 00:01:17,909
me and you know I was always interested

22
00:01:24,859 --> 00:01:22,350
in jets and flying and you know watching

23
00:01:26,240 --> 00:01:24,869
the Apollo guys walk on the moon you

24
00:01:27,950 --> 00:01:26,250
know that was those were the things that

25
00:01:32,630 --> 00:01:27,960
that interested me and that they really

26
00:01:36,050 --> 00:01:32,640
caught my attention so I just thought

27
00:01:38,270 --> 00:01:36,060
that we would all as a trace be

28
00:01:41,450 --> 00:01:38,280
advancing to where it was standard for

29
00:01:45,319 --> 00:01:41,460
people to be space Ferris you know space

30
00:01:47,270 --> 00:01:45,329
explorers I want to get you to take us

31
00:01:48,770 --> 00:01:47,280
along that course but first let's start

32
00:01:50,179 --> 00:01:48,780
at the beginning tell me about your

33
00:01:52,160 --> 00:01:50,189
hometown tell me about where you grew up

34
00:01:54,710 --> 00:01:52,170
okay so I I grew up in Lake Orion

35
00:01:57,770 --> 00:01:54,720
Michigan from the age of 10 which is a

36
00:01:59,780 --> 00:01:57,780
suburb of Detroit and before that lived

37
00:02:01,850 --> 00:01:59,790
in Royal Oak Michigan also a suburb of

38
00:02:07,039 --> 00:02:01,860

Detroit Lake Orion was a little farther

39
00:02:09,199 --> 00:02:07,049
away have fond memories of summer and

40
00:02:11,660 --> 00:02:09,209
winter you know I think winters were

41
00:02:13,360 --> 00:02:11,670
quite enjoyable we used to do a lot of

42
00:02:15,130 --> 00:02:13,370
snowmobiling

43
00:02:18,910 --> 00:02:15,140
snow skiing and in the summers we spent

44
00:02:21,850 --> 00:02:18,920
our time waterskiing and being a suburb

45
00:02:23,440 --> 00:02:21,860
of Detroit Motor City I became

46
00:02:25,300 --> 00:02:23,450
interested in automobiles at an early

47
00:02:28,410 --> 00:02:25,310
age my father and uncle were both

48
00:02:30,759 --> 00:02:28,420
engineers at Ford Motor Company and so

49
00:02:32,289 --> 00:02:30,769
when you grow up in Detroit in the Motor

50
00:02:34,150 --> 00:02:32,299
City and everybody works for the auto

51
00:02:37,890 --> 00:02:34,160
industry you I think have a natural

52
00:02:41,680 --> 00:02:37,900
affinity to like vehicles and cars and

53
00:02:44,830 --> 00:02:41,690
you know raced motorcycles at a young

54
00:02:47,770 --> 00:02:44,840
age race bicycle motocross at a young

55
00:02:49,750 --> 00:02:47,780
age and race to go karts for you know a

56
00:02:51,430 --> 00:02:49,760
number of years after I got out of high

57
00:02:54,220 --> 00:02:51,440
school so I was always interested in

58
00:02:57,190 --> 00:02:54,230
doing those things mechanical things and

59
00:02:59,559 --> 00:02:57,200
worked as a mechanic at a at a shop

60
00:03:01,780 --> 00:02:59,569
outside of Detroit so that's sort of

61
00:03:03,729 --> 00:03:01,790
what my childhood was like it was you

62
00:03:05,410 --> 00:03:03,739
know doing all those fun things but a

63
00:03:09,880 --> 00:03:05,420

lot of it revolved around motor sports

64
00:03:14,170 --> 00:03:09,890
and and you know working on mechanical

65
00:03:16,270 --> 00:03:14,180
objects that place and those people had

66
00:03:18,699 --> 00:03:16,280
a real impact on the person that you

67
00:03:22,599 --> 00:03:18,709
turned out to be yeah I think so yeah

68
00:03:26,259 --> 00:03:22,609
yeah very directly yeah did you get a

69
00:03:28,870 --> 00:03:26,269
chance to see it on your last play I

70
00:03:32,289 --> 00:03:28,880
believe that the the you know the time

71
00:03:37,089 --> 00:03:32,299
I've spent in my life working with tools

72
00:03:39,580 --> 00:03:37,099
and familiarity with with with tools in

73
00:03:43,030 --> 00:03:39,590
that environment allowed me to be at

74
00:03:44,319 --> 00:03:43,040
ease with the things I was doing you

75
00:03:45,909 --> 00:03:44,329
know working with my hands when it came

76
00:03:47,860 --> 00:03:45,919
to that not so much with the space

77
00:03:51,520 --> 00:03:47,870
walking stuff because that's new to

78
00:03:54,159 --> 00:03:51,530
everybody but I didn't have to focus as

79
00:03:55,420 --> 00:03:54,169
much you know the actual tasks

80
00:03:57,370 --> 00:03:55,430
themselves made clear that they were

81
00:03:59,289 --> 00:03:57,380
important and critical but it it didn't

82
00:04:02,520 --> 00:03:59,299
require as much of my concentration and

83
00:04:04,720 --> 00:04:02,530
that allowed me to you know expand it to

84
00:04:05,920 --> 00:04:04,730
to understand what else was happening

85
00:04:07,780 --> 00:04:05,930
around me like the fact that the earth

86
00:04:09,879 --> 00:04:07,790
was spinning below us and we're you know

87
00:04:11,170 --> 00:04:09,889
traveling at 17,000 miles an hour above

88
00:04:12,819 --> 00:04:11,180

it and all those things you know that

89
00:04:14,620 --> 00:04:12,829
was it gave me a little more time to

90
00:04:18,210 --> 00:04:14,630
appreciate that I think what kind of

91
00:04:21,819 --> 00:04:18,220
view did you have of home from space

92
00:04:23,950 --> 00:04:21,829
well I was pretty good on sts-125 we

93
00:04:25,959 --> 00:04:23,960
were 300 or so miles up which is a

94
00:04:27,250 --> 00:04:25,969
roughly hundred miles higher than the

95
00:04:30,360 --> 00:04:27,260
more the Space Station fly

96
00:04:32,770 --> 00:04:30,370
so we had a broader view of the earth

97
00:04:34,990 --> 00:04:32,780
unfortunately because of the orbit of

98
00:04:37,900 --> 00:04:35,000
Hubble we stayed fairly close to the

99
00:04:39,730 --> 00:04:37,910
equator of the planet so we were roughly

100
00:04:41,380 --> 00:04:39,740
25 degrees on either side of the equator

101
00:04:43,750 --> 00:04:41,390
whereas a Space Station mission goes all

102
00:04:45,370 --> 00:04:43,760
the way up to 55 degrees so whereas a

103
00:04:48,400 --> 00:04:45,380
Space Station will fly over you know

104
00:04:49,840 --> 00:04:48,410
parts of Canada the Hubble for the

105
00:04:51,580 --> 00:04:49,850
Hubble mission we really didn't get any

106
00:04:54,400 --> 00:04:51,590
farther north than you know Cocoa Beach

107
00:04:58,690 --> 00:04:54,410
Florida you know that that was it so the

108
00:05:01,630 --> 00:04:58,700
view is is is higher and broader but we

109
00:05:03,370 --> 00:05:01,640
don't see as much of the planet because

110
00:05:05,080 --> 00:05:03,380
we don't fly as high north and south of

111
00:05:07,330 --> 00:05:05,090
the Equator think your chance to look

112
00:05:09,100 --> 00:05:07,340
straight down it right you see things at

113
00:05:10,960 --> 00:05:09,110

a very oblique angle which was also very

114
00:05:13,120 --> 00:05:10,970
beautiful because some of you know some

115
00:05:16,990 --> 00:05:13,130
of my best memories of space I have

116
00:05:21,280 --> 00:05:17,000
I've have really three or four and one

117
00:05:24,310 --> 00:05:21,290
of the best ones was during a spacewalk

118
00:05:27,130 --> 00:05:24,320
flying over just about New Orleans and

119
00:05:29,140 --> 00:05:27,140
looking north and seeing Michigan you

120
00:05:30,550 --> 00:05:29,150
know my home state I could see it in the

121
00:05:32,380 --> 00:05:30,560
distance and it was just beautiful it

122
00:05:34,420 --> 00:05:32,390
was really a slight angle so I could see

123
00:05:37,030 --> 00:05:34,430
the Great Lakes and it was just falling

124
00:05:38,680 --> 00:05:37,040
into the shadow you know of darkness but

125
00:05:40,240 --> 00:05:38,690
it was just a beautiful beautiful sight

126
00:05:41,680 --> 00:05:40,250
I thought hey that's pretty neat that's

127
00:05:43,180 --> 00:05:41,690
my home you know that's my state I can

128
00:05:45,340 --> 00:05:43,190
see you know where I where I grew up

129
00:05:46,630 --> 00:05:45,350
practically or at least whereabouts and

130
00:05:48,190 --> 00:05:46,640
the other one of the other great

131
00:05:49,000 --> 00:05:48,200
memories was flying over Houston and my

132
00:05:51,970 --> 00:05:49,010
first DVA

133
00:05:53,080 --> 00:05:51,980
right at the end of the the last you

134
00:05:57,010 --> 00:05:53,090
know right at the end of the spacewalk

135
00:05:58,690 --> 00:05:57,020
on the robotic arm but I was facing the

136
00:06:01,360 --> 00:05:58,700
earth and the shuttle was behind me so

137
00:06:03,490 --> 00:06:01,370
there was nothing between myself and the

138
00:06:05,410 --> 00:06:03,500

earth except my visor and just looking

139
00:06:08,170 --> 00:06:05,420
straight down at Houston I mean I could

140
00:06:09,970 --> 00:06:08,180
see everything I could see you know

141
00:06:11,950 --> 00:06:09,980
maybe I couldn't see it but I I

142
00:06:14,050 --> 00:06:11,960
certainly could identify where a Beltway

143
00:06:15,490 --> 00:06:14,060
8 was and 610 and all the freeways

144
00:06:17,680 --> 00:06:15,500
leading in you know and I could clearly

145
00:06:19,600 --> 00:06:17,690
look right down at Clear Lake where you

146
00:06:22,240 --> 00:06:19,610
know my house would be just about so

147
00:06:24,190 --> 00:06:22,250
that was pretty neat and then Hawaii

148
00:06:26,710 --> 00:06:24,200
seeing Hawaii from space was pretty

149
00:06:29,020 --> 00:06:26,720
pretty spectacular good vivid memories

150
00:06:31,180 --> 00:06:29,030
of that as well you touched on this let

151
00:06:33,640 --> 00:06:31,190
me get you to tell us the sketch out

152
00:06:36,070 --> 00:06:33,650
your your educational in your

153
00:06:37,150 --> 00:06:36,080
professional career that legit to be

154
00:06:42,130 --> 00:06:37,160
here to be asking

155
00:06:44,710 --> 00:06:42,140
oh I left high school and stayed home I

156
00:06:47,140 --> 00:06:44,720
went to Oakland Community College for

157
00:06:49,570 --> 00:06:47,150
three years to get a degree in

158
00:06:51,700 --> 00:06:49,580
geological well it's an associate

159
00:06:53,740 --> 00:06:51,710
science degree a two-year science degree

160
00:06:57,040 --> 00:06:53,750
I did that in three years specializing

161
00:07:01,000 --> 00:06:57,050
in geology with a minor in industrial

162
00:07:02,920 --> 00:07:01,010
design so you could say I was pursuing

163
00:07:04,930 --> 00:07:02,930

two careers one as a scientist one as an

164
00:07:06,670 --> 00:07:04,940
automotive designer those are the two

165
00:07:08,770 --> 00:07:06,680
things I wanted to do and I chose a

166
00:07:12,070 --> 00:07:08,780
scientific path over the I guess what

167
00:07:14,260 --> 00:07:12,080
you could say artistic path but while

168
00:07:16,860 --> 00:07:14,270
working or while going to school at the

169
00:07:19,360 --> 00:07:16,870
Community College I also worked as a

170
00:07:22,410 --> 00:07:19,370
automobile restoration

171
00:07:24,550 --> 00:07:22,420
you know mechanic in a shop was called

172
00:07:26,770 --> 00:07:24,560
International Auto Works and we restored

173
00:07:29,860 --> 00:07:26,780
1950s Jaguars and that's all we did we

174
00:07:33,070 --> 00:07:29,870
get these cars in and strip them down to

175
00:07:35,380 --> 00:07:33,080
just the frame and the shells and sent

176
00:07:37,300 --> 00:07:35,390
him off for metal stripping and then we

177
00:07:39,820 --> 00:07:37,310
would just slowly rebuild those cars

178
00:07:42,610 --> 00:07:39,830
with new pieces and parts and make

179
00:07:44,830 --> 00:07:42,620
vehicles out of them so that was you

180
00:07:46,930 --> 00:07:44,840
know three-year job while working and

181
00:07:49,210 --> 00:07:46,940
going to school at the same time worked

182
00:07:50,680 --> 00:07:49,220
a few summers after that but once I left

183
00:07:54,130 --> 00:07:50,690
Oakland Community College I went to

184
00:07:57,790 --> 00:07:54,140
Purdue and pursued a bachelor's degree

185
00:08:00,100 --> 00:07:57,800
in geophysics or salad salad or sciences

186
00:08:03,580 --> 00:08:00,110
so still geology but with a specialty on

187
00:08:06,040 --> 00:08:03,590
geophysics which is sort of like the

188
00:08:08,230 --> 00:08:06,050

physics of the earth or or using physics

189
00:08:12,070 --> 00:08:08,240
to sense what's you know underneath the

190
00:08:13,960 --> 00:08:12,080
surface of the earth and so with the

191
00:08:15,610 --> 00:08:13,970
credits from Oakland Community College

192
00:08:18,340 --> 00:08:15,620
transferred to Purdue I spent three

193
00:08:20,409 --> 00:08:18,350
years of getting the other two years of

194
00:08:24,040 --> 00:08:20,419
my degree for a for a bachelor's degree

195
00:08:28,780 --> 00:08:24,050
in in geophysics stayed there to do a

196
00:08:31,330 --> 00:08:28,790
master's degree in geophysics and then

197
00:08:33,339 --> 00:08:31,340
went on to Queen's University in

198
00:08:35,700 --> 00:08:33,349
Kingston Ontario from a PhD in

199
00:08:40,300 --> 00:08:35,710
seismology and there I studied

200
00:08:42,580 --> 00:08:40,310
underground mining seismology and spent

201
00:08:45,700 --> 00:08:42,590
some time working in mines in Canada and

202
00:08:47,050 --> 00:08:45,710
in the u.s. installing seismic

203
00:08:49,180 --> 00:08:47,060
monitoring or what you could consider

204
00:08:51,720 --> 00:08:49,190
earthquake monitoring systems in

205
00:08:54,460 --> 00:08:51,730
underground mines

206
00:08:57,850 --> 00:08:54,470
so I you know that was a four year

207
00:09:00,060 --> 00:08:57,860
program for a PhD worked a few years

208
00:09:04,379 --> 00:09:00,070
after that for a small engineering

209
00:09:07,449 --> 00:09:04,389
consulting firm in Kingston Ontario and

210
00:09:10,800 --> 00:09:07,459
and then came down to Houston to work

211
00:09:14,280 --> 00:09:10,810
for Exxon Exxon Mobil Corporation as a

212
00:09:16,470 --> 00:09:14,290
geophysical Operations Specialist and

213
00:09:19,889 --> 00:09:16,480

you know doing oil and gas exploration

214
00:09:24,040 --> 00:09:19,899
here in the US and actually worldwide

215
00:09:27,009 --> 00:09:24,050
surveys that lasted about three and a

216
00:09:29,410 --> 00:09:27,019
half years and in 2000 I was selected as

217
00:09:32,259 --> 00:09:29,420
an astronaut so it's been ten years

218
00:09:36,340 --> 00:09:32,269
since that point and here we are on the

219
00:09:39,310 --> 00:09:36,350
second flight STS 134 and the flying in

220
00:09:41,259 --> 00:09:39,320
space part of your chosen career is one

221
00:09:44,530 --> 00:09:41,269
that we know has the possibility of

222
00:09:46,060 --> 00:09:44,540
dangers so I need to ask drew what is it

223
00:09:48,759 --> 00:09:46,070
that you think that we're getting as a

224
00:09:52,030 --> 00:09:48,769
result of flying people in space that

225
00:09:54,250 --> 00:09:52,040
makes it worth doing it I think it's

226
00:09:58,380 --> 00:09:54,260
just that it's flying humans in space

227
00:10:00,610 --> 00:09:58,390
it's flying us off the planet it's

228
00:10:03,460 --> 00:10:00,620
considering the possibility of a

229
00:10:09,759 --> 00:10:03,470
different home besides Earth ultimately

230
00:10:12,069 --> 00:10:09,769
for the human species I think for humans

231
00:10:16,060 --> 00:10:12,079
it's always been about what's out there

232
00:10:19,150 --> 00:10:16,070
are we alone could we be the only ones

233
00:10:20,740 --> 00:10:19,160
in this infinite universe and I think

234
00:10:22,750 --> 00:10:20,750
the only way we're gonna find out is if

235
00:10:24,579 --> 00:10:22,760
we keep pushing the boundary and trying

236
00:10:26,650 --> 00:10:24,589
to get out there and and this is just

237
00:10:29,050 --> 00:10:26,660
the beginning I mean we're we're barely

238
00:10:30,880 --> 00:10:29,060

getting off our own planet but someday

239
00:10:33,040 --> 00:10:30,890
you know if we continue this and

240
00:10:35,889 --> 00:10:33,050
technology continues and as we get

241
00:10:37,389 --> 00:10:35,899
smarter or better at adapting to the

242
00:10:39,130 --> 00:10:37,399
world around us in the universe around

243
00:10:41,829 --> 00:10:39,140
us we will be traveling you know

244
00:10:44,800 --> 00:10:41,839
throughout the universe doing amazing

245
00:10:46,569 --> 00:10:44,810
different things and so I think what you

246
00:10:48,430 --> 00:10:46,579
know why is it worth it it's worth it

247
00:10:49,900 --> 00:10:48,440
because we can and we're capable and

248
00:10:52,389 --> 00:10:49,910
we're getting better at it and someday

249
00:10:54,970 --> 00:10:52,399
it'll be it'll be just like I thought it

250
00:10:57,910 --> 00:10:54,980
was supposed to be when I was a kid that

251
00:10:59,170 --> 00:10:57,920
we all fly in space all the time and

252
00:11:02,960 --> 00:10:59,180
travels through this through the

253
00:11:08,760 --> 00:11:05,250
you're a member of the crew on space

254
00:11:10,680 --> 00:11:08,770
shuttle mission sts-134 drew summarized

255
00:11:12,230 --> 00:11:10,690
the overall goals of this flight and

256
00:11:15,290 --> 00:11:12,240
tell me what your jobs are going to be

257
00:11:17,700 --> 00:11:15,300
the overall goals of this flight that's

258
00:11:22,290 --> 00:11:17,710
that's a pretty big question I'll try to

259
00:11:24,290 --> 00:11:22,300
summarize it our main payload is the

260
00:11:26,550 --> 00:11:24,300
Alpha Magnetic Spectrometer which is a

261
00:11:29,400 --> 00:11:26,560
science payload that we're carrying in

262
00:11:31,860 --> 00:11:29,410
the shuttle to place on the external

263
00:11:33,510 --> 00:11:31,870

truss of the space station that's a

264
00:11:35,900 --> 00:11:33,520
payload that's it's a two billion dollar

265
00:11:39,510 --> 00:11:35,910
payload with sixteen countries

266
00:11:42,030 --> 00:11:39,520
participating in some 500 scientists -

267
00:11:45,329 --> 00:11:42,040
that have worked over the past probably

268
00:11:48,449 --> 00:11:45,339
20 years to develop this experiment and

269
00:11:49,920 --> 00:11:48,459
it's a follow-on to AMS one Alpha

270
00:11:52,380 --> 00:11:49,930
Magnetic Spectrometer one that flew on

271
00:11:54,269 --> 00:11:52,390
Space Shuttle early on so this is a

272
00:11:56,280 --> 00:11:54,279
follow-on experiment to that but it will

273
00:11:58,430 --> 00:11:56,290
be permanently placed on the space

274
00:12:02,880 --> 00:11:58,440
station to hopefully collect data

275
00:12:04,889 --> 00:12:02,890
high-energy particle physics data for

276
00:12:07,280 --> 00:12:04,899
the life of the remaining life the space

277
00:12:09,600 --> 00:12:07,290
station so that is our primary payload

278
00:12:13,170 --> 00:12:09,610
we're launching six crew members to

279
00:12:16,170 --> 00:12:13,180
space all males one European astronaut

280
00:12:22,079 --> 00:12:16,180
Roberto Vittori and during the mission

281
00:12:25,920 --> 00:12:22,089
will do for EPA's now none of them are

282
00:12:28,230 --> 00:12:25,930
associated with AMS but they all are I

283
00:12:34,260 --> 00:12:28,240
guess what you could call standard space

284
00:12:38,820 --> 00:12:34,270
station repair or maintenance EBA

285
00:12:40,590 --> 00:12:38,830
activities all of your crewmates have

286
00:12:41,820 --> 00:12:40,600
been to the space station before all six

287
00:12:44,400 --> 00:12:41,830
of you of course have flown in space

288
00:12:46,560 --> 00:12:44,410

before two of them have actually done

289
00:12:48,840 --> 00:12:46,570
long-duration missions on the station

290
00:12:50,790 --> 00:12:48,850
does that benefit the group in getting

291
00:12:52,620 --> 00:12:50,800
prepared for this flight I think so yeah

292
00:12:54,750 --> 00:12:52,630
we have a unique crew in that sense so

293
00:12:58,610 --> 00:12:54,760
if you if you look at the makeup of our

294
00:13:04,019 --> 00:12:58,620
crew we have three space shuttle fliers

295
00:13:06,090 --> 00:13:04,029
myself Mark Kelly and Greg Johnson Greg

296
00:13:08,069 --> 00:13:06,100
shemitah' also flew on space shuttle but

297
00:13:09,690 --> 00:13:08,079
not as a crew member he was flying up to

298
00:13:11,730 --> 00:13:09,700
do his long-duration mission to spend

299
00:13:14,280 --> 00:13:11,740
six months on station Mike Fincke has

300
00:13:15,840 --> 00:13:14,290
never flown on a space shuttle but he's

301
00:13:18,740 --> 00:13:15,850
lived on space station for

302
00:13:21,509 --> 00:13:18,750
year but only flown on the Soyuz vehicle

303
00:13:23,730 --> 00:13:21,519
Roberto Vittori made two trips to the

304
00:13:26,009 --> 00:13:23,740
space station but never for a long long

305
00:13:28,110 --> 00:13:26,019
term so I think maybe he spent a week at

306
00:13:31,769 --> 00:13:28,120
a time up on the space station also only

307
00:13:33,660 --> 00:13:31,779
flown with the Russians so there's a lot

308
00:13:35,430 --> 00:13:33,670
of experience but we have varied

309
00:13:37,139 --> 00:13:35,440
experience that I myself have never seen

310
00:13:38,460 --> 00:13:37,149
the space station I've only flown to

311
00:13:41,040 --> 00:13:38,470
Hubble which is a completely different

312
00:13:42,889 --> 00:13:41,050
type of emission so for all of us

313
00:13:45,749 --> 00:13:42,899

although we have a lot of experience

314
00:13:49,100 --> 00:13:45,759
very few of us have the same experiences

315
00:13:50,910 --> 00:13:49,110
so that has benefited us in many ways

316
00:13:53,519 --> 00:13:50,920
preparing so everybody has a different

317
00:13:56,189 --> 00:13:53,529
way that they approach tasks and

318
00:13:57,569 --> 00:13:56,199
objectives and also problems and I think

319
00:13:59,519 --> 00:13:57,579
that's been a positive thing there's

320
00:14:01,110 --> 00:13:59,529
been a lot of growing pains with us or

321
00:14:02,280 --> 00:14:01,120
you know learning about each other in

322
00:14:04,650 --> 00:14:02,290
the ways that we've done things in the

323
00:14:06,329 --> 00:14:04,660
past and all of our experiences but I

324
00:14:08,939 --> 00:14:06,339
think overall it's made us a stronger

325
00:14:11,730 --> 00:14:08,949
crew with you know more ways to approach

326
00:14:12,930 --> 00:14:11,740
problems well let's talk about some of

327
00:14:14,730 --> 00:14:12,940
the cargo that you bring into the

328
00:14:16,999 --> 00:14:14,740
station start with the Express logistics

329
00:14:19,139 --> 00:14:17,009
carrier three tell me what that is

330
00:14:22,110 --> 00:14:19,149
Express logistics carrier three we

331
00:14:23,370 --> 00:14:22,120
called ELC three it's one of four that

332
00:14:26,790 --> 00:14:23,380
will live permanently on the space

333
00:14:28,559 --> 00:14:26,800
station and essentially they are storage

334
00:14:30,540 --> 00:14:28,569
shelves for spare parts for the space

335
00:14:34,650 --> 00:14:30,550
station one of the components on our

336
00:14:39,110 --> 00:14:34,660
Express logistics carrier is a robotics

337
00:14:42,780 --> 00:14:39,120
arm called spdm a special purpose

338
00:14:45,929 --> 00:14:42,790

dexterous manipulator I believe and what

339
00:14:48,389 --> 00:14:45,939
that allows the canadarm2 that lives on

340
00:14:50,040 --> 00:14:48,399
space station to do is perform tasks

341
00:14:52,920 --> 00:14:50,050
that are normally done by space walkers

342
00:14:55,980 --> 00:14:52,930
so it gives it in a sense arms and hands

343
00:14:58,650 --> 00:14:55,990
and allows it to carry out activities

344
00:15:00,090 --> 00:14:58,660
that we would normally do but over a

345
00:15:02,100 --> 00:15:00,100
much longer period of time with

346
00:15:04,319 --> 00:15:02,110
significant input from a ground control

347
00:15:05,429 --> 00:15:04,329
team so that's that's one of the

348
00:15:08,329 --> 00:15:05,439
components that's probably one of the

349
00:15:14,030 --> 00:15:08,339
main components that we see on our ELC

350
00:15:16,920 --> 00:15:14,040
component but overall those pieces are

351
00:15:19,230 --> 00:15:16,930
you know spare parts racks for the space

352
00:15:21,389 --> 00:15:19,240
station so what does it take for you and

353
00:15:23,189 --> 00:15:21,399
your crewmates to install it get it out

354
00:15:25,470 --> 00:15:23,199
of the payload Bay and up on the top

355
00:15:27,720 --> 00:15:25,480
side of the truss where it's robotically

356
00:15:29,640 --> 00:15:27,730
installed there are no e VA activities

357
00:15:32,820 --> 00:15:29,650
associated with installing

358
00:15:35,130 --> 00:15:32,830
the elsi rack and what we do is use the

359
00:15:36,720 --> 00:15:35,140
Space Shuttle Canada arm to lift the

360
00:15:39,840 --> 00:15:36,730
component out of this space shuttle

361
00:15:42,090 --> 00:15:39,850
payload Bay and place it in a position

362
00:15:43,650 --> 00:15:42,100
that allows Canada arm to from the space

363
00:15:45,990 --> 00:15:43,660

station to come over and grab a hold of

364
00:15:47,780 --> 00:15:46,000
the LC and we call that a hand off and

365
00:15:50,820 --> 00:15:47,790
then they take it and move it on to its

366
00:15:52,590 --> 00:15:50,830
permanent location on Space Station the

367
00:15:54,540 --> 00:15:52,600
other major component that's riding up

368
00:15:57,030 --> 00:15:54,550
in your payload Bay is the Alpha

369
00:15:58,470 --> 00:15:57,040
Magnetic Spectrometer you touched on

370
00:16:00,960 --> 00:15:58,480
that a moment ago tell me more tell me

371
00:16:03,290 --> 00:16:00,970
about what this does from its perch out

372
00:16:07,769 --> 00:16:03,300
on the station's truss I'll give you the

373
00:16:11,340 --> 00:16:07,779
my best description as a non particle

374
00:16:13,410 --> 00:16:11,350
physicist if I can it's a fairly large

375
00:16:18,269 --> 00:16:13,420
component it is roughly the size of the

376
00:16:19,680 --> 00:16:18,279
payload Bay in diameter which which I

377
00:16:23,820 --> 00:16:19,690
guess makes it about twelve feet across

378
00:16:25,530 --> 00:16:23,830
or so and and it's it's sort of round

379
00:16:29,280 --> 00:16:25,540
shaped like a doughnut you can think of

380
00:16:32,790 --> 00:16:29,290
as that and its job is to detect

381
00:16:34,680 --> 00:16:32,800
particles cosmic rays and particles in

382
00:16:39,540 --> 00:16:34,690
space that pass through the magnet and

383
00:16:42,210 --> 00:16:39,550
the magnets function is to bend the

384
00:16:45,720 --> 00:16:42,220
particles as they pass through the

385
00:16:47,610 --> 00:16:45,730
middle of this doughnut to help detect

386
00:16:51,120 --> 00:16:47,620
or characterize what those particles are

387
00:16:55,019 --> 00:16:51,130
and AMS is designed to look for a dark

388
00:16:57,930 --> 00:16:55,029

matter in the universe which essentially

389
00:16:59,840 --> 00:16:57,940
makes up our 70% of the universe we

390
00:17:02,519 --> 00:16:59,850
believe it does based on estimates of

391
00:17:04,290 --> 00:17:02,529
planets sizes and stars and

392
00:17:05,699 --> 00:17:04,300
gravitational you know pull the way we

393
00:17:07,439 --> 00:17:05,709
understand it we think there's a lot

394
00:17:09,390 --> 00:17:07,449
more matter and energy out there than we

395
00:17:13,319 --> 00:17:09,400
can see dark dark matter and dark energy

396
00:17:16,140 --> 00:17:13,329
so AMS is goal is to characterize those

397
00:17:18,390 --> 00:17:16,150
high-energy particles and try to

398
00:17:20,490 --> 00:17:18,400
determine which of those our antimatter

399
00:17:24,299 --> 00:17:20,500
and specifically I think it's tuned to

400
00:17:26,460 --> 00:17:24,309
anti helium and anti carbon and then

401
00:17:28,230 --> 00:17:26,470
also to look at so to characterize each

402
00:17:30,390 --> 00:17:28,240
particle that passes through it based on

403
00:17:32,730 --> 00:17:30,400
its its mass its charge and its total

404
00:17:34,980 --> 00:17:32,740
energy and so there are there's a series

405
00:17:36,860 --> 00:17:34,990
of detectors kind of like a cake you

406
00:17:39,180 --> 00:17:36,870
know built like a layer cake inside that

407
00:17:40,919 --> 00:17:39,190
device that as the particles pass

408
00:17:42,270 --> 00:17:40,929
through the middle each of these layers

409
00:17:43,260 --> 00:17:42,280
has a different function to help

410
00:17:45,450 --> 00:17:43,270
characterize them

411
00:17:47,280 --> 00:17:45,460
to charge or the energy of that of that

412
00:17:50,010 --> 00:17:47,290
particle that's passing through it

413
00:17:53,220 --> 00:17:50,020

to determine what it really is the

414
00:17:55,740 --> 00:17:53,230
advantage of it is that on earth we can

415
00:17:57,510 --> 00:17:55,750
we build particle accelerators and track

416
00:17:59,970 --> 00:17:57,520
to with magnets accelerate particles

417
00:18:01,920 --> 00:17:59,980
around a ring and eventually smash those

418
00:18:04,560 --> 00:18:01,930
into a detector or another particle to

419
00:18:08,100 --> 00:18:04,570
make new particles but we really can't

420
00:18:10,440 --> 00:18:08,110
reach the level of energy that that's

421
00:18:12,090 --> 00:18:10,450
desired and in space we have very

422
00:18:14,490 --> 00:18:12,100
high-energy particles that are always

423
00:18:16,950 --> 00:18:14,500
present that don't get attenuated by the

424
00:18:19,920 --> 00:18:16,960
Earth's atmosphere or magnetic field so

425
00:18:21,450 --> 00:18:19,930
this is sort of a raw original place to

426
00:18:22,800 --> 00:18:21,460
measure these we call like an in situ

427
00:18:25,260 --> 00:18:22,810
measurement of these high-energy

428
00:18:26,850 --> 00:18:25,270
particles so that sits out there on the

429
00:18:28,530 --> 00:18:26,860
space station truss and these

430
00:18:30,060 --> 00:18:28,540
high-energy particles with very high

431
00:18:31,560 --> 00:18:30,070
velocities you know faster than we can

432
00:18:33,870 --> 00:18:31,570
accelerate them on earth are passing

433
00:18:35,370 --> 00:18:33,880
through this detector at all times and

434
00:18:36,810 --> 00:18:35,380
then and then we use the different

435
00:18:38,580 --> 00:18:36,820
layers in there to characterize what

436
00:18:39,960 --> 00:18:38,590
those particles are so it's something

437
00:18:42,720 --> 00:18:39,970
that we believe we can't achieve on

438
00:18:44,610 --> 00:18:42,730

earth in terms of creating the particles

439
00:18:47,100 --> 00:18:44,620
to then characterize what they are I

440
00:18:50,130 --> 00:18:47,110
think the next question though is is why

441
00:18:51,630 --> 00:18:50,140
why do we want to detect those particles

442
00:18:54,960 --> 00:18:51,640
what was the significance of what it's

443
00:18:57,030 --> 00:18:54,970
looking for well you know that's sort of

444
00:18:59,040 --> 00:18:57,040
a philosophical question I mean that's a

445
00:19:00,630 --> 00:18:59,050
question of science why do we explore

446
00:19:03,630 --> 00:19:00,640
anything so it's in a sense its

447
00:19:06,300 --> 00:19:03,640
exploration of the of the universe and

448
00:19:07,590 --> 00:19:06,310
it's a way for us to help determine what

449
00:19:09,420 --> 00:19:07,600
is out there you know what does a

450
00:19:11,520 --> 00:19:09,430
universe made made up where did it all

451
00:19:12,990 --> 00:19:11,530
start similar to what Hubble does you

452
00:19:14,790 --> 00:19:13,000
know how the telescope looking back at

453
00:19:16,590 --> 00:19:14,800
the origins of the universe by

454
00:19:18,570 --> 00:19:16,600
characterizing these particles that we

455
00:19:21,450 --> 00:19:18,580
can't see we can't detect we can only

456
00:19:23,640 --> 00:19:21,460
infer on earth by trying to search for

457
00:19:25,800 --> 00:19:23,650
them in space we may better define and

458
00:19:27,480 --> 00:19:25,810
understand you know what is the makeup

459
00:19:29,280 --> 00:19:27,490
of the universe what is its origins how

460
00:19:30,630 --> 00:19:29,290
did it develop and where is it where is

461
00:19:33,420 --> 00:19:30,640
it headed so that's the only

462
00:19:35,370 --> 00:19:33,430
significance of well that's the

463
00:19:37,680 --> 00:19:35,380

significance that I can relate to

464
00:19:40,170 --> 00:19:37,690
I'm sure there's much much more but it's

465
00:19:42,570 --> 00:19:40,180
an important experiment yet talk about

466
00:19:43,720 --> 00:19:42,580
the procedure how does AMS get out of

467
00:19:46,240 --> 00:19:43,730
the payload Bay and

468
00:19:48,820 --> 00:19:46,250
into its position AMS is positioned

469
00:19:52,030 --> 00:19:48,830
similar to what the ELC palate is or

470
00:19:53,680 --> 00:19:52,040
really any any payload that flies to

471
00:19:56,560 --> 00:19:53,690
Space Station in the back of the shuttle

472
00:19:57,880 --> 00:19:56,570
payload base so we use the shuttles

473
00:20:00,370 --> 00:19:57,890
Canada arm to lift it out of the payload

474
00:20:02,710 --> 00:20:00,380
Bay and canadarm2 comes over and picks

475
00:20:05,020 --> 00:20:02,720
it up and does a handoff and places it

476
00:20:08,080 --> 00:20:05,030
up high on the truss and in particular

477
00:20:10,750 --> 00:20:08,090
it's sitting on a inboard location of

478
00:20:12,070 --> 00:20:10,760
one of the starboard side trusses so if

479
00:20:13,810 --> 00:20:12,080
you're looking at the front of the space

480
00:20:17,080 --> 00:20:13,820
station it would be on the left

481
00:20:18,940 --> 00:20:17,090
on the top of the truss which is

482
00:20:20,440 --> 00:20:18,950
presumably where the cosmic rays are

483
00:20:23,800 --> 00:20:20,450
coming well you know I'm not so sure

484
00:20:25,720 --> 00:20:23,810
that it matters where its position that

485
00:20:28,090 --> 00:20:25,730
happened to be the best position from a

486
00:20:30,460 --> 00:20:28,100
thermal standpoint and also an available

487
00:20:31,840 --> 00:20:30,470
place to put it because of course those

488
00:20:35,890 --> 00:20:31,850

particles are coming from all different

489
00:20:38,890 --> 00:20:35,900
directions really up their plan for this

490
00:20:41,440 --> 00:20:38,900
mission as you said calls for three four

491
00:20:45,400 --> 00:20:41,450
rather four spacewalks by three teams of

492
00:20:48,190 --> 00:20:45,410
space walkers what's your role in this

493
00:20:50,470 --> 00:20:48,200
group activity so we do have three teams

494
00:20:52,420 --> 00:20:50,480
of space walkers and I was fortunate to

495
00:20:56,260 --> 00:20:52,430
be assigned as evreyone or the lead

496
00:20:58,330 --> 00:20:56,270
spacewalker on this mission and I I'm

497
00:21:00,580 --> 00:20:58,340
heading up a team of two others Mike

498
00:21:03,460 --> 00:21:00,590
Fincke and Greg Chamitoff both who are

499
00:21:05,740 --> 00:21:03,470
long-duration space station members greg

500
00:21:07,180 --> 00:21:05,750
has not previously done a spacewalk so

501
00:21:09,130 --> 00:21:07,190
he's really looking forward to this

502
00:21:12,070 --> 00:21:09,140
opportunity to do two spacewalks on the

503
00:21:13,620 --> 00:21:12,080
mission and Mike think we'll be working

504
00:21:16,510 --> 00:21:13,630
well be working together with Mike on

505
00:21:21,460 --> 00:21:16,520
the three other spacewalks for the

506
00:21:25,180 --> 00:21:21,470
mission so ETA 1 is myself from Greg

507
00:21:27,640 --> 00:21:25,190
Shama Tov Evy a2 is is myself and Mike

508
00:21:29,500 --> 00:21:27,650
think Evy a3 is myself and Mike Fincke

509
00:21:32,920 --> 00:21:29,510
and then Evie a4 is is Mike thinking

510
00:21:36,520 --> 00:21:32,930
Greg Shambo Tov so that's the way it's

511
00:21:39,040 --> 00:21:36,530
playing out and it's you know it's

512
00:21:40,480 --> 00:21:39,050
interesting to lead somebody Greg Mike

513
00:21:43,300 --> 00:21:40,490

Fincke was a commander of the space

514
00:21:45,400 --> 00:21:43,310
station so as a lead spacewalker it's

515
00:21:46,570 --> 00:21:45,410
it's interesting and I think it's neat

516
00:21:49,210 --> 00:21:46,580
for us to work together human he's a

517
00:21:51,370 --> 00:21:49,220
former commander and I'm sort of the

518
00:21:53,650 --> 00:21:51,380
lead Evy a space Walker so there's a lot

519
00:21:55,450 --> 00:21:53,660
of great information that's that's built

520
00:21:57,039 --> 00:21:55,460
into that team you know we've all got a

521
00:21:59,739 --> 00:21:57,049
lot of experience he's

522
00:22:02,529 --> 00:21:59,749
I believe six or lon evie A's in the

523
00:22:04,799 --> 00:22:02,539
Russian spacesuit so he has spacewalking

524
00:22:08,409 --> 00:22:04,809
experience just not in a u.s. spacesuit

525
00:22:10,090 --> 00:22:08,419
and during the the spacewalks the one of

526
00:22:11,590 --> 00:22:10,100
you that's not outside is gonna be

527
00:22:14,289 --> 00:22:11,600
running things inside that's right the

528
00:22:16,239 --> 00:22:14,299
the the person who's not outside is is I

529
00:22:18,909 --> 00:22:16,249
guess you could say the quarterback or

530
00:22:22,090 --> 00:22:18,919
the you know the director inside working

531
00:22:23,889 --> 00:22:22,100
from the shuttle flight deck reading the

532
00:22:25,389 --> 00:22:23,899
choreography of the steps and you know

533
00:22:27,729 --> 00:22:25,399
trying to keep us on track on the

534
00:22:29,649 --> 00:22:27,739
timeline telling us which tax tasks are

535
00:22:33,159 --> 00:22:29,659
next and you know it keeps all of you

536
00:22:34,779 --> 00:22:33,169
familiar with all of four EPS yeah yeah

537
00:22:36,039 --> 00:22:34,789
yeah it does it really helps in that

538
00:22:37,749 --> 00:22:36,049

sense because and we've also

539
00:22:39,669 --> 00:22:37,759
cross-trained in the neutral buoyancy

540
00:22:41,379 --> 00:22:39,679
lab as well so we all have a good

541
00:22:43,180 --> 00:22:41,389
understanding of what the spacewalkers

542
00:22:44,799 --> 00:22:43,190
are going through and the and as

543
00:22:46,859 --> 00:22:44,809
spacewalkers you do need to have some

544
00:22:49,479 --> 00:22:46,869
appreciation of what you're putting the

545
00:22:51,129 --> 00:22:49,489
the IV crew member or the you know the

546
00:22:52,930 --> 00:22:51,139
quarterback inside to because there are

547
00:22:56,229 --> 00:22:52,940
a lot of tasks or a lot of activities

548
00:22:58,479 --> 00:22:56,239
we're not always working in unison

549
00:23:00,460 --> 00:22:58,489
sometimes we get split up and so the

550
00:23:03,070 --> 00:23:00,470
individual inside is responsible for the

551
00:23:04,810 --> 00:23:03,080
two of us in keeping us on track and

552
00:23:06,849 --> 00:23:04,820
also coordinating with ground controls

553
00:23:09,190 --> 00:23:06,859
so there is a significant amount of

554
00:23:10,720 --> 00:23:09,200
effort that goes on inside the space

555
00:23:12,849 --> 00:23:10,730
shell trying to keep the people outside

556
00:23:15,970 --> 00:23:12,859
you know working productively and not

557
00:23:18,099 --> 00:23:15,980
getting behind them so that things can

558
00:23:20,919 --> 00:23:18,109
keep moving let's talk about what's on

559
00:23:24,099 --> 00:23:20,929
the plan at least as we as we tell you

560
00:23:27,190 --> 00:23:24,109
today first spacewalk you and Greg are

561
00:23:30,220 --> 00:23:27,200
outside what is review so the big plan

562
00:23:32,139 --> 00:23:30,230
EBA one the the first couple of

563
00:23:35,739 --> 00:23:32,149

objectives involved the missies which

564
00:23:37,810 --> 00:23:35,749
are experiments static experiments some

565
00:23:41,739 --> 00:23:37,820
are powered some are not that that sit

566
00:23:43,749 --> 00:23:41,749
out on the space station trusses and are

567
00:23:47,080 --> 00:23:43,759
open to space and they're they

568
00:23:48,820 --> 00:23:47,090
essentially capture space particles as

569
00:23:52,180 --> 00:23:48,830
well not in the same way that AMS does

570
00:23:54,700 --> 00:23:52,190
but they they have exposed surfaces in

571
00:23:56,830 --> 00:23:54,710
those there's sort of calm expose

572
00:23:58,389 --> 00:23:56,840
facilities so they have materials they

573
00:24:01,509 --> 00:23:58,399
may have different materials in there or

574
00:24:03,340 --> 00:24:01,519
metals or fabrics or gels or whatever

575
00:24:06,220 --> 00:24:03,350
that they're either looking at the

576
00:24:08,019 --> 00:24:06,230
effects of space on those materials or

577
00:24:10,570 --> 00:24:08,029
actually trying to capture you know

578
00:24:10,840 --> 00:24:10,580
little particles for later analysis you

579
00:24:12,880 --> 00:24:10,850
know

580
00:24:15,730 --> 00:24:12,890
then gels are some some material like

581
00:24:17,080 --> 00:24:15,740
that so on the first spacewalk Greg

582
00:24:20,200 --> 00:24:17,090
Shama Tov and I will go out and retrieve

583
00:24:23,800 --> 00:24:20,210
two that have been out there for I

584
00:24:25,390 --> 00:24:23,810
believe over a year about a year so by

585
00:24:28,270 --> 00:24:25,400
the time we get to him and then we'll

586
00:24:30,850 --> 00:24:28,280
we'll place two two new ones out in

587
00:24:33,790 --> 00:24:30,860
those same locations that's first and

588
00:24:37,360 --> 00:24:33,800

then what's next for us on that day is

589
00:24:39,970 --> 00:24:37,370
to set up for evey a2 which involves

590
00:24:41,500 --> 00:24:39,980
filling some filling ammonia back into

591
00:24:43,720 --> 00:24:41,510
one of the radiators that has leaked out

592
00:24:46,300 --> 00:24:43,730
over a number of years so we'll spend

593
00:24:49,810 --> 00:24:46,310
evey a1 preparing for those activities

594
00:24:52,780 --> 00:24:49,820
on TV a2 and then we'll end the day with

595
00:24:54,220 --> 00:24:52,790
work on the the u.s. laboratory and

596
00:24:57,400 --> 00:24:54,230
notes section where we're laying out

597
00:24:59,110 --> 00:24:57,410
some wireless antennas that are actually

598
00:25:01,060 --> 00:24:59,120
designed to communicate with the ELC

599
00:25:03,040 --> 00:25:01,070
palates and these are new antennas so

600
00:25:03,670 --> 00:25:03,050
there's some wiring and cabling involved

601
00:25:05,140 --> 00:25:03,680
with that

602
00:25:06,850 --> 00:25:05,150
that takes up the last couple of hours

603
00:25:08,950 --> 00:25:06,860
of that EBA let's give you an

604
00:25:10,720 --> 00:25:08,960
opportunity to crawl around a

605
00:25:14,440 --> 00:25:10,730
significant portion of the station it

606
00:25:16,300 --> 00:25:14,450
does will will be traversing from one

607
00:25:18,660 --> 00:25:16,310
end to the other of the space station on

608
00:25:21,910 --> 00:25:18,670
just about every VA except for e VA

609
00:25:23,800 --> 00:25:21,920
three and that'll be new for me because

610
00:25:25,180 --> 00:25:23,810
of course on the Hubble mission I we

611
00:25:27,880 --> 00:25:25,190
lived in the back of the payload Bay and

612
00:25:29,530 --> 00:25:27,890
Hubble wasn't very far and on the space

613
00:25:31,510 --> 00:25:29,540

station mission usually spend you know

614
00:25:34,150 --> 00:25:31,520
get a lot of mileage out of the out of

615
00:25:36,430 --> 00:25:34,160
the suit two days after the first

616
00:25:39,490 --> 00:25:36,440
spacewalk Mike and Greg are swapping

617
00:25:41,770 --> 00:25:39,500
places and for the for the second D

618
00:25:44,140 --> 00:25:41,780
being one of the jobs for for you

619
00:25:45,910 --> 00:25:44,150
outside on EB a number two so Mike

620
00:25:47,500 --> 00:25:45,920
Fincke and I go out on e VA to Micah

621
00:25:49,870 --> 00:25:47,510
think comes out the door first we call

622
00:25:51,820 --> 00:25:49,880
him essentially eveyone for the day and

623
00:25:55,390 --> 00:25:51,830
we just take turns you know leaving each

624
00:25:57,250 --> 00:25:55,400
day's activities so we go out on evey a

625
00:25:58,600 --> 00:25:57,260
to and that whole day is really

626
00:26:02,740 --> 00:25:58,610
dedicated to two things

627
00:26:03,880 --> 00:26:02,750
filling the port radiator with refilling

628
00:26:07,660 --> 00:26:03,890
up one of the port radiators with

629
00:26:10,180 --> 00:26:07,670
ammonia and rotate lubricating the solar

630
00:26:12,040 --> 00:26:10,190
array rotary joint on the port side of

631
00:26:16,240 --> 00:26:12,050
the space station that's something

632
00:26:19,930 --> 00:26:16,250
that's been done in the past we have in

633
00:26:23,140 --> 00:26:19,940
in history three or four times no I

634
00:26:24,710 --> 00:26:23,150
think actually rotated the solar solar

635
00:26:26,270 --> 00:26:24,720
array rotary joints and that involves

636
00:26:29,120 --> 00:26:26,280
removing some covers using an actual

637
00:26:31,430 --> 00:26:29,130
grease gun with some special lubricant

638
00:26:33,799 --> 00:26:31,440

to provide grease for this bearing

639
00:26:36,110 --> 00:26:33,809
surface that rotates in space and then

640
00:26:38,360 --> 00:26:36,120
the ammonia fill is also a very

641
00:26:40,610 --> 00:26:38,370
time-consuming job not a lot of work to

642
00:26:42,140 --> 00:26:40,620
do aside from opening and closing valves

643
00:26:45,260 --> 00:26:42,150
and mating and demanding ammonia lines

644
00:26:49,310 --> 00:26:45,270
but that in itself is fairly tricky and

645
00:26:51,080 --> 00:26:49,320
wrought with peril so we will we will do

646
00:26:54,590 --> 00:26:51,090
our best you know we've trained hard for

647
00:26:57,740 --> 00:26:54,600
that activity and we'll do our best to

648
00:26:59,720 --> 00:26:57,750
to not let any ammonia leak out it that

649
00:27:02,720 --> 00:26:59,730
because if it does that involve some

650
00:27:06,039 --> 00:27:02,730
other actions on our part to allow that

651
00:27:08,330 --> 00:27:06,049
ammonia to what we call baked out or

652
00:27:09,980 --> 00:27:08,340
sublimate off of the spacesuits before

653
00:27:11,299 --> 00:27:09,990
we go back inside it's not a substance

654
00:27:14,060 --> 00:27:11,309
we like to take inside of the space

655
00:27:15,740 --> 00:27:14,070
station with us that lube job on the

656
00:27:17,630 --> 00:27:15,750
rotary joint not exactly what you

657
00:27:19,010 --> 00:27:17,640
learned as a kid working on cars but

658
00:27:20,870 --> 00:27:19,020
well that's probably exactly what I

659
00:27:22,490 --> 00:27:20,880
learned working on cars the grease guns

660
00:27:24,680 --> 00:27:22,500
look the same it looks like a caulking

661
00:27:26,210 --> 00:27:24,690
gun but the concept is the same I mean

662
00:27:27,350 --> 00:27:26,220
and I think all of us understand that

663
00:27:29,990 --> 00:27:27,360

pretty well you know what we're trying

664
00:27:32,990 --> 00:27:30,000
to do carrying out as it's always a

665
00:27:35,659 --> 00:27:33,000
little bit more challenging in space for

666
00:27:36,260 --> 00:27:35,669
the wild mouse when space walks done on

667
00:27:38,149 --> 00:27:36,270
the station

668
00:27:40,279 --> 00:27:38,159
prior to spacewalk the night before

669
00:27:43,490 --> 00:27:40,289
space walkers had camped out in the

670
00:27:46,279 --> 00:27:43,500
airlock as a way to get their bodies

671
00:27:47,180 --> 00:27:46,289
ready to fight against any decompression

672
00:27:49,430 --> 00:27:47,190
sickness Hey

673
00:27:51,020 --> 00:27:49,440
before the 30 VA on this mission you're

674
00:27:53,570 --> 00:27:51,030
looking at trying out a different

675
00:27:55,970 --> 00:27:53,580
pre-breathe protocol tell us a little

676
00:27:59,740 --> 00:27:55,980
bit about what this new procedure is all

677
00:28:04,279 --> 00:27:59,750
right so we we were introduced to

678
00:28:06,380 --> 00:28:04,289
pre-breathe option by Mike Bernhardt an

679
00:28:08,750 --> 00:28:06,390
astronaut in the Corps and it's called

680
00:28:12,140 --> 00:28:08,760
the insuit light exercise pre-breathe

681
00:28:14,330 --> 00:28:12,150
protocol we call it aisle is le for in

682
00:28:16,399 --> 00:28:14,340
suit light exercise protocol and it

683
00:28:18,260 --> 00:28:16,409
offers us as you mentioned what we

684
00:28:21,440 --> 00:28:18,270
typically do for a Space Station mission

685
00:28:25,130 --> 00:28:21,450
is we camp out in the station's airlock

686
00:28:28,039 --> 00:28:25,140
with at a lower pressure to allow our

687
00:28:30,950 --> 00:28:28,049
bodies to purge other nitrogen that's

688
00:28:34,100 --> 00:28:30,960

that's in in our bloodstream and then in

689
00:28:35,570 --> 00:28:34,110
the morning when we wake up and start

690
00:28:36,980 --> 00:28:35,580
prepare for the EBA and have to allow

691
00:28:38,560 --> 00:28:36,990
other crew members to come and help us

692
00:28:41,119 --> 00:28:38,570
we have to put on

693
00:28:43,580 --> 00:28:41,129
oxygen high percent oxygen breathing Max

694
00:28:44,959 --> 00:28:43,590
and maintain that oxygen seal around our

695
00:28:48,200 --> 00:28:44,969
face so that we don't introduce more

696
00:28:49,009 --> 00:28:48,210
nitrogen back into our blood we have

697
00:28:50,899 --> 00:28:49,019
another option

698
00:28:53,119 --> 00:28:50,909
aside from camp out which is called

699
00:28:56,659 --> 00:28:53,129
exercise pre-breathe protocol which

700
00:28:58,369 --> 00:28:56,669
doesn't involve capping out at 10.2 psi

701
00:28:59,539 --> 00:28:58,379
overnight in an airlock but involves us

702
00:29:01,759 --> 00:28:59,549
waking up in the morning

703
00:29:03,859 --> 00:29:01,769
donning an oxygen mask and riding a

704
00:29:07,339 --> 00:29:03,869
bicycle for 10 minutes at a fairly high

705
00:29:08,989 --> 00:29:07,349
level of exertion to to you know get the

706
00:29:10,729 --> 00:29:08,999
100 percent oxygen flowing through our

707
00:29:13,729 --> 00:29:10,739
blood and then purging that nitrogen by

708
00:29:15,289 --> 00:29:13,739
doing exercise and now we have a third

709
00:29:17,239 --> 00:29:15,299
option which is called the insuit light

710
00:29:19,669 --> 00:29:17,249
exercise pre breeze protocol which

711
00:29:21,919 --> 00:29:19,679
involves us having a normal sleep period

712
00:29:25,639 --> 00:29:21,929
the night before waking up in the

713
00:29:27,349 --> 00:29:25,649

morning and then donning the spacesuit

714
00:29:32,209 --> 00:29:27,359
so getting into the spacesuit like we

715
00:29:33,769 --> 00:29:32,219
normally would and then decreasing the

716
00:29:36,259 --> 00:29:33,779
pressure in the airlock and having the

717
00:29:38,629 --> 00:29:36,269
pressure the suits at nominal pressure

718
00:29:40,639 --> 00:29:38,639
and then performing exercise in the

719
00:29:42,799 --> 00:29:40,649
suits and it's not really exercised as

720
00:29:46,489 --> 00:29:42,809
much as it is just moving your arms and

721
00:29:48,049 --> 00:29:46,499
legs for a certain period of time - so

722
00:29:50,659 --> 00:29:48,059
now you've got the advantage of you're

723
00:29:53,329 --> 00:29:50,669
out 100% oxygen and you're at a lower

724
00:29:55,219 --> 00:29:53,339
pressure and you're exercising so you

725
00:29:57,619 --> 00:29:55,229
are sort of combining the the airlock

726
00:29:59,989 --> 00:29:57,629
campout pre breeze with the exercise

727
00:30:01,159 --> 00:29:59,999
pre-breathe with the suit itself and

728
00:30:02,930 --> 00:30:01,169
you're already in the sea and you're

729
00:30:05,299 --> 00:30:02,940
already in the suit right so that that

730
00:30:06,919 --> 00:30:05,309
sort of avoids exercising on a bike or

731
00:30:09,139 --> 00:30:06,929
camping out overnight it just puts you

732
00:30:10,940 --> 00:30:09,149
in the suit start you moving your arms

733
00:30:12,979 --> 00:30:10,950
and legs while you're breathing 100% o2

734
00:30:15,320 --> 00:30:12,989
at a lower pressure and all those things

735
00:30:17,719 --> 00:30:15,330
combined allow us to go out the door and

736
00:30:21,129 --> 00:30:17,729
have as you mentioned better protection

737
00:30:23,899 --> 00:30:21,139
against decompression sickness symptoms

738
00:30:25,639 --> 00:30:23,909

while we're outside working at those at

739
00:30:29,389 --> 00:30:25,649
those lower pressures there's the

740
00:30:31,969 --> 00:30:29,399
activity in the suit does normal pre e

741
00:30:34,009 --> 00:30:31,979
VA activities or something special

742
00:30:36,919 --> 00:30:34,019
Lejeune it's a little bit special I had

743
00:30:39,680 --> 00:30:36,929
somebody tell me today our when our suit

744
00:30:42,889 --> 00:30:39,690
trainers she mentioned that we're gonna

745
00:30:46,700 --> 00:30:42,899
do the Hokey Pokey in the suit so pretty

746
00:30:48,649 --> 00:30:46,710
simple activities we're just gonna we're

747
00:30:50,539 --> 00:30:48,659
just gonna move our arms move our legs a

748
00:30:51,350 --> 00:30:50,549
little bit and try to get the blood

749
00:30:53,419 --> 00:30:51,360
flowing a little

750
00:30:56,210 --> 00:30:53,429
more than we normally would and sort of

751
00:30:57,950 --> 00:30:56,220
wait there and purposely do it so it's

752
00:30:59,450 --> 00:30:57,960
really not much more than the things you

753
00:31:01,880 --> 00:30:59,460
would normally do moving your arms and

754
00:31:04,940 --> 00:31:01,890
legs as you get into suit but it's it's

755
00:31:06,650 --> 00:31:04,950
purposely taking those actions to ensure

756
00:31:07,789 --> 00:31:06,660
that you've covered yourself and

757
00:31:10,250 --> 00:31:07,799
provided that level of protection

758
00:31:12,140 --> 00:31:10,260
against decompression sickness okay the

759
00:31:13,910 --> 00:31:12,150
plan is to do this before the third

760
00:31:16,520 --> 00:31:13,920
spacewalk which is you and Mike going

761
00:31:19,299 --> 00:31:16,530
next Mike and Mike and I yet what what

762
00:31:21,919 --> 00:31:19,309
are you gonna do well we're number three

763
00:31:24,890 --> 00:31:21,929

evie a number three was a late add you

764
00:31:28,570 --> 00:31:24,900
know so we've been training for about a

765
00:31:31,190 --> 00:31:28,580
year now together and all along up until

766
00:31:32,870 --> 00:31:31,200
probably a month and a half ago we had

767
00:31:36,789 --> 00:31:32,880
been training three EVs and we've just

768
00:31:39,620 --> 00:31:36,799
added this fourth EBA and this involves

769
00:31:43,610 --> 00:31:39,630
installing a power and data grapple

770
00:31:45,770 --> 00:31:43,620
fixture or a base for Canada arm - so

771
00:31:48,470 --> 00:31:45,780
the Canada arm you know Space Station

772
00:31:50,299 --> 00:31:48,480
arm has a capability of walking around

773
00:31:52,190 --> 00:31:50,309
the space station from end to end to do

774
00:31:54,110 --> 00:31:52,200
different tasks the Russian segment

775
00:31:56,900 --> 00:31:54,120
doesn't really have any of those bases

776
00:31:58,730 --> 00:31:56,910
for the arm to walk on - and this is an

777
00:32:01,820 --> 00:31:58,740
opportunity for us to actually attach

778
00:32:05,240 --> 00:32:01,830
one of these base station mechanisms on

779
00:32:07,190 --> 00:32:05,250
to the what we call the FGB or

780
00:32:09,320 --> 00:32:07,200
functional cargo block portion of the

781
00:32:12,110 --> 00:32:09,330
space station to allow the arm to walk

782
00:32:14,180 --> 00:32:12,120
on to that position and you know do some

783
00:32:16,490 --> 00:32:14,190
tasks in areas that it wouldn't have

784
00:32:18,440 --> 00:32:16,500
been able to reach you know previous to

785
00:32:20,210 --> 00:32:18,450
this so this is an activity that's but

786
00:32:22,760 --> 00:32:20,220
on the book I believe on the books for a

787
00:32:24,830 --> 00:32:22,770
number of years and hasn't found a home

788
00:32:27,260 --> 00:32:24,840

and we think we found an opportunity to

789
00:32:29,960 --> 00:32:27,270
do it then on our mission the advantage

790
00:32:31,310 --> 00:32:29,970
to doing it on our mission on EBA 3 is

791
00:32:33,020 --> 00:32:31,320
that Mike Fink has suspend a

792
00:32:34,880 --> 00:32:33,030
considerable amount of time on the

793
00:32:36,530 --> 00:32:34,890
Russian segment in the Orlan spacesuit

794
00:32:38,990 --> 00:32:36,540
so by having he and I go out on that

795
00:32:41,960 --> 00:32:39,000
task he has some familiar back there

796
00:32:43,700 --> 00:32:41,970
that that I don't have and so that

797
00:32:45,560 --> 00:32:43,710
that's an advantage just as a team to

798
00:32:47,690 --> 00:32:45,570
get out there and do that work and this

799
00:32:51,549 --> 00:32:47,700
was actually in the plan for the summer

800
00:32:53,750 --> 00:32:51,559
of 2010 and got delayed because of a

801
00:32:56,180 --> 00:32:53,760
different of a different issue right

802
00:32:59,000 --> 00:32:56,190
right it got they got pushed off so it

803
00:33:00,799 --> 00:32:59,010
fell and that's not uncommon for you

804
00:33:02,870 --> 00:33:00,809
know the stuff to roll downhill and land

805
00:33:03,820 --> 00:33:02,880
on the next point of opportunity which

806
00:33:06,970 --> 00:33:03,830
which happened to be

807
00:33:10,330 --> 00:33:06,980
and that's gonna be your task for the

808
00:33:11,980 --> 00:33:10,340
entirety of evo III it is essentially

809
00:33:14,799 --> 00:33:11,990
that's the main task although we have

810
00:33:18,370 --> 00:33:14,809
some other cable routing which we're

811
00:33:19,659 --> 00:33:18,380
calling Y cables for for lack of a

812
00:33:22,240 --> 00:33:19,669
better word but they're essentially two

813
00:33:24,669 --> 00:33:22,250

cables that have a Y split and I'm there

814
00:33:27,970 --> 00:33:24,679
they're fairly long but they also are

815
00:33:30,490 --> 00:33:27,980
strung along the Russian module and part

816
00:33:33,460 --> 00:33:30,500
of the US module right where the

817
00:33:35,230 --> 00:33:33,470
connections made with the the node what

818
00:33:37,360 --> 00:33:35,240
we call node one and the Russian module

819
00:33:40,029 --> 00:33:37,370
and these are redundant power supply

820
00:33:42,490 --> 00:33:40,039
cables for the Russian segment so we're

821
00:33:44,230 --> 00:33:42,500
gonna install two of those and allow

822
00:33:45,730 --> 00:33:44,240
their you know provide the capability

823
00:33:47,769 --> 00:33:45,740
for redundant power supply to the

824
00:33:50,230 --> 00:33:47,779
portions of the Russian segment okay

825
00:33:53,139 --> 00:33:50,240
then the last TVA number four this would

826
00:33:55,419 --> 00:33:53,149
be Mike and Greg going inside what's on

827
00:33:57,759 --> 00:33:55,429
the schedule for this the last deviate

828
00:34:00,009 --> 00:33:57,769
in Greg is going out first for that e VA

829
00:34:03,250 --> 00:34:00,019
and that'll be this second of his

830
00:34:06,190 --> 00:34:03,260
spacewalks the third for four Mike

831
00:34:10,409 --> 00:34:06,200
Fincke and that that primary focus of

832
00:34:15,070 --> 00:34:10,419
that EBA is to leave the space shuttle

833
00:34:17,409 --> 00:34:15,080
boom the o BSS the device that we use to

834
00:34:22,329 --> 00:34:17,419
extend the capabilities of the space

835
00:34:24,399 --> 00:34:22,339
shuttle robotic arm that lives on the on

836
00:34:26,139 --> 00:34:24,409
the starboard side of the space shuttle

837
00:34:28,839 --> 00:34:26,149
payload Bay and when we do inspections

838
00:34:30,820 --> 00:34:28,849

of the the belly of the orbiter we use

839
00:34:32,379 --> 00:34:30,830
the robotic arm to take that boom out

840
00:34:34,240 --> 00:34:32,389
and it's got some cameras on the end of

841
00:34:37,270 --> 00:34:34,250
it and we use it to extend you know what

842
00:34:39,250 --> 00:34:37,280
the capabilities of the RMR as it as it

843
00:34:41,230 --> 00:34:39,260
looks around the different components of

844
00:34:45,220 --> 00:34:41,240
the of the shuttle we're gonna leave

845
00:34:47,560 --> 00:34:45,230
that boom on space station just in the

846
00:34:51,490 --> 00:34:47,570
case that the space station ever has

847
00:34:53,619 --> 00:34:51,500
need for a extended you know canadarm2

848
00:34:56,109 --> 00:34:53,629
if some reason they want their arm to be

849
00:34:58,870 --> 00:34:56,119
longer this device will be on the space

850
00:35:00,370 --> 00:34:58,880
station we will change the grapple

851
00:35:02,260 --> 00:35:00,380
fixture that's on the end of the boom

852
00:35:04,150 --> 00:35:02,270
right now it's designed to accept the

853
00:35:05,940 --> 00:35:04,160
Space Shuttle robotic arm but we're

854
00:35:08,890 --> 00:35:05,950
going to put a new fixture on the end

855
00:35:11,800 --> 00:35:08,900
which is again one of these power data

856
00:35:12,760 --> 00:35:11,810
grapple fixtures PDGF the same component

857
00:35:13,900 --> 00:35:12,770
that we're putting on the Russian

858
00:35:16,850 --> 00:35:13,910
segment we're going to apply one of

859
00:35:19,070 --> 00:35:16,860
these devices at the end of the boom

860
00:35:20,900 --> 00:35:19,080
and leave it resident on space station

861
00:35:22,490 --> 00:35:20,910
in case the station arm wants to use the

862
00:35:25,750 --> 00:35:22,500
boom tell me about where it's gonna go

863
00:35:28,610 --> 00:35:25,760

and what it takes to prepare that site

864
00:35:33,050 --> 00:35:28,620
it will live it's been left one time

865
00:35:35,630 --> 00:35:33,060
before I believe sts-123 left a boom on

866
00:35:38,060 --> 00:35:35,640
orbit and it lives essentially right on

867
00:35:41,060 --> 00:35:38,070
top of the US segments on the truss so

868
00:35:42,860 --> 00:35:41,070
it's sort of on s0 and s1 so the

869
00:35:44,900 --> 00:35:42,870
starboard side you know just just to the

870
00:35:49,120 --> 00:35:44,910
left of the long axis of the space

871
00:35:52,550 --> 00:35:49,130
station up on the truss and it involves

872
00:35:56,390 --> 00:35:52,560
coordination with the Canada arm of the

873
00:36:01,430 --> 00:35:56,400
space station arm to place the boom in a

874
00:36:03,740 --> 00:36:01,440
position where Mike and Greg are ready

875
00:36:05,150 --> 00:36:03,750
to receive the boom into some what we

876
00:36:07,040 --> 00:36:05,160
call them call them gun racks but

877
00:36:08,780 --> 00:36:07,050
there's essentially set of jaws that

878
00:36:11,060 --> 00:36:08,790
grab on to fixtures that are on the boom

879
00:36:13,310 --> 00:36:11,070
and closed down like hands that hold it

880
00:36:14,930 --> 00:36:13,320
in place and and they you know tighten

881
00:36:15,440 --> 00:36:14,940
down those fixtures and secure it into

882
00:36:18,860 --> 00:36:15,450
place

883
00:36:23,180 --> 00:36:18,870
so for spacewalks is uh it's pretty busy

884
00:36:24,860 --> 00:36:23,190
will be busy yeah but that's not unlike

885
00:36:27,020 --> 00:36:24,870
what you were experienced on yours first

886
00:36:29,210 --> 00:36:27,030
light that's right and you know for the

887
00:36:31,970 --> 00:36:29,220
sts-125 mission we did five spacewalks

888
00:36:34,190 --> 00:36:31,980

and we didn't have a day in between as a

889
00:36:36,320 --> 00:36:34,200
break I personally did so I did Evy A's

890
00:36:38,870 --> 00:36:36,330
won three and five with a day off in

891
00:36:40,520 --> 00:36:38,880
between and I'm days two and four I was

892
00:36:42,590 --> 00:36:40,530
inside you know doing the choreography

893
00:36:45,080 --> 00:36:42,600
for the for the next event on this

894
00:36:49,550 --> 00:36:45,090
mission of course we we do our

895
00:36:51,740 --> 00:36:49,560
spacewalks are days five seven nine and

896
00:36:54,920 --> 00:36:51,750
eleven so there's always a day in

897
00:36:56,750 --> 00:36:54,930
between still but we're not filling that

898
00:36:58,550 --> 00:36:56,760
with another team you know doing EVs so

899
00:37:00,350 --> 00:36:58,560
we all sort of get a day off in between

900
00:37:02,900 --> 00:37:00,360
instead of just half of the e VA team

901
00:37:05,210 --> 00:37:02,910
which will be nice something else new

902
00:37:07,490 --> 00:37:05,220
during rendezvous and docking and then

903
00:37:09,860 --> 00:37:07,500
again after undocking and fly around

904
00:37:11,570 --> 00:37:09,870
your crews gathering data for what's

905
00:37:14,390 --> 00:37:11,580
called the development test objective

906
00:37:17,120 --> 00:37:14,400
known as storm which stands for sensor

907
00:37:19,820 --> 00:37:17,130
test for Orion relative navigation risk

908
00:37:22,010 --> 00:37:19,830
mitigation I'm glad you knew that I fold

909
00:37:25,670 --> 00:37:22,020
I read words of the acronym yeah we just

910
00:37:27,940 --> 00:37:25,680
call it storm this will include a rear

911
00:37:29,860 --> 00:37:27,950
on de vous with the station

912
00:37:31,960 --> 00:37:29,870
the separation was I think we'd never

913
00:37:34,000 --> 00:37:31,970

seen before phillotson on what was this

914
00:37:36,700 --> 00:37:34,010
test is and what you folks will do to

915
00:37:38,680 --> 00:37:36,710
support it yeah I hope oh I'm certain

916
00:37:39,910 --> 00:37:38,690
Mark Kelly will be able to provide more

917
00:37:41,620 --> 00:37:39,920
information as the commander of the

918
00:37:43,530 --> 00:37:41,630
flight and helping with the you know

919
00:37:46,630 --> 00:37:43,540
performing the fly around itself but

920
00:37:48,580 --> 00:37:46,640
essentially what we will do is we will

921
00:37:53,170 --> 00:37:48,590
collect data on the original rendezvous

922
00:37:56,140 --> 00:37:53,180
so storm is a device that uses cameras

923
00:37:59,710 --> 00:37:56,150
essentially visual navigation systems to

924
00:38:03,040 --> 00:37:59,720
look at reflectors and objects on the

925
00:38:05,410 --> 00:38:03,050
space station as we approach to provide

926
00:38:08,980 --> 00:38:05,420
guidance and navigation information to

927
00:38:11,260 --> 00:38:08,990
the approaching vehicle so we have a

928
00:38:13,810 --> 00:38:11,270
laptop computer on the flight deck and

929
00:38:15,430 --> 00:38:13,820
it's actually my job to monitor the

930
00:38:18,420 --> 00:38:15,440
functions of the laptop computer and

931
00:38:20,950 --> 00:38:18,430
report the status to the ground and and

932
00:38:22,180 --> 00:38:20,960
understand whether or not it's operating

933
00:38:23,350 --> 00:38:22,190
in the way that we expect as we're

934
00:38:26,350 --> 00:38:23,360
approaching because what they're going

935
00:38:31,660 --> 00:38:26,360
to try to do is use the initial approach

936
00:38:34,180 --> 00:38:31,670
data to help calibrate their sensors so

937
00:38:36,370 --> 00:38:34,190
that they can relate visual images back

938
00:38:39,640 --> 00:38:36,380

to distance and position within the

939
00:38:41,260 --> 00:38:39,650
software and the hardware so and then

940
00:38:43,150 --> 00:38:41,270
when we undock we'll do the standard

941
00:38:45,820 --> 00:38:43,160
space station fly around so we'll undock

942
00:38:47,350 --> 00:38:45,830
will do one loop around one lap around

943
00:38:48,730 --> 00:38:47,360
when we get right back to where just

944
00:38:51,040 --> 00:38:48,740
about where we started from for the

945
00:38:54,880 --> 00:38:51,050
undock then we'll go up around and

946
00:38:58,410 --> 00:38:54,890
depart out to something like two hundred

947
00:39:02,350 --> 00:38:58,420
and fifty thousand feet or maybe further

948
00:39:04,540 --> 00:39:02,360
but it's quite a ways out on the back

949
00:39:07,090 --> 00:39:04,550
side of the space station and then we'll

950
00:39:08,890 --> 00:39:07,100
begin a second approach back into a

951
00:39:11,520 --> 00:39:08,900
station I think to within about six

952
00:39:14,920 --> 00:39:11,530
hundred feet is the closest we'll get

953
00:39:17,920 --> 00:39:14,930
and on the way back in they will again

954
00:39:20,050 --> 00:39:17,930
collect data on the approach this time

955
00:39:21,760 --> 00:39:20,060
hopefully having already done some

956
00:39:23,290 --> 00:39:21,770
calibrations with the with the

957
00:39:25,750 --> 00:39:23,300
instruments because the initial approach

958
00:39:27,610 --> 00:39:25,760
but also this is again just data

959
00:39:30,040 --> 00:39:27,620
collection and calibration of their

960
00:39:31,660 --> 00:39:30,050
images further so that you know in the

961
00:39:33,040 --> 00:39:31,670
future if they do additional tests or

962
00:39:35,380 --> 00:39:33,050
it's actually used for you know

963
00:39:38,620 --> 00:39:35,390

operationally for the sole navigational

964
00:39:40,900 --> 00:39:38,630
inputs the device and hardware would be

965
00:39:43,479 --> 00:39:40,910
ready to go and this was with an eye

966
00:39:46,900 --> 00:39:43,489
future vehicles it is it is it be a

967
00:39:47,620 --> 00:39:46,910
future rendezvous system for you know

968
00:39:51,190 --> 00:39:47,630
whatever

969
00:39:52,779 --> 00:39:51,200
wants to utilize that system sts-134 is

970
00:39:55,749 --> 00:39:52,789
the last scheduled flight of Endeavour

971
00:39:58,150 --> 00:39:55,759
still gathering data on new for new that

972
00:40:01,239 --> 00:39:58,160
it is yeah yeah

973
00:40:03,249 --> 00:40:01,249
what do you thoughts about this shuttles

974
00:40:05,259 --> 00:40:03,259
place in the history of human

975
00:40:07,349 --> 00:40:05,269
spaceflight and and work that's been

976
00:40:10,900 --> 00:40:07,359
done in the shuttle program

977
00:40:13,479 --> 00:40:10,910
you mean endeavour or shuttle overall I

978
00:40:14,920 --> 00:40:13,489
mean I mean you know all the vehicles

979
00:40:18,519 --> 00:40:14,930
are special and unique and they've all

980
00:40:20,170 --> 00:40:18,529
flown there you know really just a small

981
00:40:22,329 --> 00:40:20,180
complement of what they were designed

982
00:40:24,400 --> 00:40:22,339
for maybe not in years but certainly

983
00:40:26,410 --> 00:40:24,410
flight life they were all designed for

984
00:40:28,900 --> 00:40:26,420
100 missions and we're seeing you know

985
00:40:32,859 --> 00:40:28,910
mid 30 missions out of I think each

986
00:40:34,779 --> 00:40:32,869
vehicle you know my only experience on a

987
00:40:37,059 --> 00:40:34,789
space craft previous to this was

988
00:40:39,160 --> 00:40:37,069

Atlantis and it was a great space

989
00:40:40,660 --> 00:40:39,170
shuttle it did its job and we flew it

990
00:40:42,460 --> 00:40:40,670
back I'm sure endeavour will perform

991
00:40:45,789 --> 00:40:42,470
just the same way and they've all done

992
00:40:47,950 --> 00:40:45,799
very unique things just you know just as

993
00:40:50,289 --> 00:40:47,960
the shuttle program itself has done

994
00:40:53,739 --> 00:40:50,299
special and unique things for us in

995
00:40:56,109 --> 00:40:53,749
history so you know my own my own

996
00:40:58,209 --> 00:40:56,119
feeling is that yes indeed it's it's

997
00:41:01,089 --> 00:40:58,219
time if we're going to change our focus

998
00:41:02,950 --> 00:41:01,099
from low-earth orbit the shuttle has

999
00:41:04,410 --> 00:41:02,960
done its job in building the Space

1000
00:41:11,049 --> 00:41:04,420
Station

1001
00:41:14,319 --> 00:41:11,059
it would be desirable to have a plan

1002
00:41:16,299 --> 00:41:14,329
that was overlapping or some capability

1003
00:41:17,709 --> 00:41:16,309
that was overlapping with with the space

1004
00:41:20,499 --> 00:41:17,719
shuttle it doesn't look like we're going

1005
00:41:23,410 --> 00:41:20,509
to be there with us

1006
00:41:26,469 --> 00:41:23,420
you know us or you know NASA based

1007
00:41:29,499 --> 00:41:26,479
program but I suspect that we will get

1008
00:41:32,069 --> 00:41:29,509
there in a matter of time may not even

1009
00:41:35,650 --> 00:41:32,079
be you know in my career it may not

1010
00:41:36,819 --> 00:41:35,660
suing it'll be in my lifetime but you

1011
00:41:39,339 --> 00:41:36,829
know I don't think we're gonna stop

1012
00:41:41,380 --> 00:41:39,349
exploring or flying in space because

1013
00:41:43,719 --> 00:41:41,390

we're retiring space shuttles certainly

1014
00:41:45,819 --> 00:41:43,729
done a great job up till now you're

1015
00:41:47,319 --> 00:41:45,829
gonna be flying this mission right

1016
00:41:49,900 --> 00:41:47,329
around a couple of significant

1017
00:41:52,269 --> 00:41:49,910
anniversaries you got the on April 12th

1018
00:41:53,720 --> 00:41:52,279
the 50th anniversary of the first human

1019
00:41:55,220 --> 00:41:53,730
spaceflight and the 30

1020
00:41:57,500 --> 00:41:55,230
anniversary of the first shuttle flight

1021
00:41:59,150 --> 00:41:57,510
and then it early May the 50th

1022
00:42:02,150 --> 00:41:59,160
anniversary of the first American

1023
00:42:04,580 --> 00:42:02,160
surveys flight what are your thoughts

1024
00:42:06,920 --> 00:42:04,590
about you being in space right around

1025
00:42:09,500 --> 00:42:06,930
the time that what else things are being

1026
00:42:14,570 --> 00:42:09,510
commemorated you know maybe it's fitting

1027
00:42:16,910 --> 00:42:14,580
if if 134 you know remains as the final

1028
00:42:18,920 --> 00:42:16,920
space shuttle flight maybe that's the

1029
00:42:20,540 --> 00:42:18,930
appropriate time to fly it as when we're

1030
00:42:22,849 --> 00:42:20,550
marking the anniversary of all these

1031
00:42:26,120 --> 00:42:22,859
other great beginnings in space flight

1032
00:42:27,560 --> 00:42:26,130
will mark a great end which will

1033
00:42:31,130 --> 00:42:27,570
hopefully lead to another great

1034
00:42:34,550 --> 00:42:31,140
beginning you know I I don't think we're

1035
00:42:35,780 --> 00:42:34,560
gonna stop exploring we just I don't

1036
00:42:37,849 --> 00:42:35,790
think humans are capable of not

1037
00:42:39,320 --> 00:42:37,859
exploring especially outer space they

1038
00:42:41,230 --> 00:42:39,330

look up into the Stars every night and

1039
00:42:43,490 --> 00:42:41,240
wonder what's up there

1040
00:42:46,150 --> 00:42:43,500
things have changed an awful lot in the

1041
00:42:49,340 --> 00:42:46,160
50 years since Gagarin and Shepard flew

1042
00:42:50,690 --> 00:42:49,350
look 50 years in the future and tell me

1043
00:42:53,900 --> 00:42:50,700
where you think we're gonna be then I

1044
00:42:56,570 --> 00:42:53,910
think we'll be on Mars or at least have

1045
00:42:58,520 --> 00:42:56,580
gone to Mars and I hope that we will

1046
00:43:00,109 --> 00:42:58,530
have the capability for sustained

1047
00:43:03,290 --> 00:43:00,119
presence on the moon and that we will be

1048
00:43:05,030 --> 00:43:03,300
utilizing the resources that we think

1049
00:43:07,340 --> 00:43:05,040
are there that we know are there and

1050
00:43:09,430 --> 00:43:07,350
those that we have no idea are there but

1051
00:43:12,710 --> 00:43:09,440
they're just waiting for us to go and

1052
00:43:14,960 --> 00:43:12,720
you know take advantage of them and and