
MISSION CONTROL CENTER
NASA

1
00:00:04,130 --> 00:00:02,450
hi welcome to the International Space

2
00:00:05,869 --> 00:00:04,140
Station flight control room

3
00:00:08,600 --> 00:00:05,879
I understand today we are talking with

4
00:00:10,400 --> 00:00:08,610
students from the Clarke Creek STEM

5
00:00:11,749 --> 00:00:10,410
Academy welcome students I have a

6
00:00:13,370 --> 00:00:11,759
special treat because I understand you

7
00:00:14,419 --> 00:00:13,380
guys have a lot of questions about

8
00:00:15,589 --> 00:00:14,429
living and working aboard the

9
00:00:17,720 --> 00:00:15,599
International Space Station

10
00:00:20,330 --> 00:00:17,730
and today's guest has certainly done

11
00:00:22,910 --> 00:00:20,340
that done that astronaut Mike Fossum he

12
00:00:24,529 --> 00:00:22,920
is a veteran of three space flights his

13
00:00:27,470 --> 00:00:24,539

most recent white he was a commander of

14
00:00:29,390 --> 00:00:27,480
expedition 29 welcome Mike and thank you

15
00:00:31,279 --> 00:00:29,400
for joining us today amiko it's great to

16
00:00:32,840 --> 00:00:31,289
be back in Mission Control and great to

17
00:00:35,810 --> 00:00:32,850
be talking to the students from Carr

18
00:00:38,479 --> 00:00:35,820
Creek and STEM Academy great so with

19
00:00:44,030 --> 00:00:38,489
that we're ready for your questions okay

20
00:00:46,970 --> 00:00:44,040
all right thank you your Boy Scout

21
00:00:51,110 --> 00:00:46,980
training helped you as an astronaut it's

22
00:00:53,060 --> 00:00:51,120
yes how a great question my Boy Scout

23
00:00:55,760 --> 00:00:53,070
training helped me learn how to work as

24
00:00:58,119 --> 00:00:55,770
a part of a team because in Scouting you

25
00:01:01,160 --> 00:00:58,129
know you work as a small groups of teams

26
00:01:03,139 --> 00:01:01,170
and and you do different things and it's

27
00:01:06,080 --> 00:01:03,149
in ways it's kind of the same thing here

28
00:01:08,149 --> 00:01:06,090
in indeed as I lived on the space

29
00:01:10,190 --> 00:01:08,159
station I slept in a sleeping bag for

30
00:01:11,990 --> 00:01:10,200
six months and so in some ways it was

31
00:01:14,539 --> 00:01:12,000
kind of like camping out for six months

32
00:01:16,249 --> 00:01:14,549
at a time you also learned self-reliance

33
00:01:18,109 --> 00:01:16,259
how to take care of yourself in a lot of

34
00:01:20,179 --> 00:01:18,119
different ways from preparing food to

35
00:01:38,620 --> 00:01:20,189
simple first aid and we certainly used

36
00:01:43,340 --> 00:01:40,670
learned how a lot of different things

37
00:01:44,990 --> 00:01:43,350
work as I was in Scouting in my youth

38
00:01:48,200 --> 00:01:45,000

and working towards being an Eagle Scout

39
00:01:50,389 --> 00:01:48,210
and and you know another part of it that

40
00:01:53,030 --> 00:01:50,399
we learned was taking the big trips as

41
00:01:55,490 --> 00:01:53,040
you get to be an older scout or you know

42
00:01:57,740 --> 00:01:55,500
older youth and different programs to to

43
00:02:00,709 --> 00:01:57,750
do big trips where you go on long trips

44
00:02:02,600 --> 00:02:00,719
a week or more into the mountains into

45
00:02:04,280 --> 00:02:02,610
the wilderness area canoeing on rivers

46
00:02:06,230 --> 00:02:04,290
and things and that gives you a

47
00:02:08,719 --> 00:02:06,240
different mindset as you escape the

48
00:02:10,520 --> 00:02:08,729
normal world that that you know which

49
00:02:11,990 --> 00:02:10,530
involves televisions and air

50
00:02:13,610 --> 00:02:12,000
conditioners and all those kind of

51
00:02:15,290 --> 00:02:13,620
things and living

52
00:02:17,600 --> 00:02:15,300
on your own resources in a different

53
00:02:20,720 --> 00:02:17,610
environment and whether that different

54
00:02:23,630 --> 00:02:20,730
environment is is a place in a deep

55
00:02:26,270 --> 00:02:23,640
forest or a place in outer space it's

56
00:02:28,100 --> 00:02:26,280
still an adaptation that you have to do

57
00:02:31,119 --> 00:02:28,110
is you learn to rely on each other and

58
00:02:35,119 --> 00:02:31,129
learn on your training to be successful

59
00:02:37,130 --> 00:02:35,129
right so you would recommend Boy Scouts

60
00:02:40,420 --> 00:02:37,140
and becoming an Eagle Scout as good

61
00:02:43,220 --> 00:02:40,430
preparation to become a NASA astronaut

62
00:02:46,069 --> 00:02:43,230
scouting was certainly a great path for

63
00:02:47,330 --> 00:02:46,079

me and it is for many other people in in

64
00:02:49,160 --> 00:02:47,340
a lot of different ways so sure I

65
00:02:50,930 --> 00:02:49,170
recommend the scouting program and the

66
00:02:53,390 --> 00:02:50,940
Girl Scouting program and the venture

67
00:02:54,830 --> 00:02:53,400
program for older students are good

68
00:02:56,770 --> 00:02:54,840
opportunities to learn different skills

69
00:03:07,089 --> 00:02:56,780
and learned that they're really critical

70
00:03:12,770 --> 00:03:11,030
yes I am thank you for asking I'm still

71
00:03:15,259 --> 00:03:12,780
an active astronaut and I'm still

72
00:03:16,910 --> 00:03:15,269
training I'm back in line and and I hope

73
00:03:19,460 --> 00:03:16,920
to go again someday I've worked very

74
00:03:36,370 --> 00:03:19,470
hard to get to this place and and I

75
00:03:44,089 --> 00:03:41,650
oh the the Space Telescope's

76
00:03:45,890 --> 00:03:44,099
well we don't have any more missions to

77
00:03:48,259 --> 00:03:45,900
go repair or work on any of those

78
00:03:50,559 --> 00:03:48,269
telescopes there are some big telescopes

79
00:03:53,599 --> 00:03:50,569
if I'm catching the question correct

80
00:03:55,759 --> 00:03:53,609
they the the human spaceflight program

81
00:03:58,670 --> 00:03:55,769
is kind of separate from our telescope

82
00:04:00,349 --> 00:03:58,680
programs these days the Hubble Space

83
00:04:03,110 --> 00:04:00,359
Telescope is the most famous one of

84
00:04:05,000 --> 00:04:03,120
course and and we sent several Space

85
00:04:08,000 --> 00:04:05,010
Shuttle crews to visit the Hubble Space

86
00:04:09,800 --> 00:04:08,010
Telescope helped do some maintenance and

87
00:04:12,740 --> 00:04:09,810
some repairs to that to extend its

88
00:04:14,750 --> 00:04:12,750

lifetime for for a long time and but

89
00:04:16,640 --> 00:04:14,760
those discoveries that it that are being

90
00:04:17,990 --> 00:04:16,650
made through the through the the Hubble

91
00:04:21,289 --> 00:04:18,000
Space Telescope being the most famous

92
00:04:24,680 --> 00:04:21,299
and the other Observatory scopes is a

93
00:04:25,760 --> 00:04:24,690
separate kind of program excellent

94
00:04:29,510 --> 00:04:25,770
question

95
00:04:32,090 --> 00:04:29,520
we have another one what is the status

96
00:04:37,460 --> 00:04:32,100
of your skeletal system since Logging's

97
00:04:39,529 --> 00:04:37,470
so many spaces well believe it or not I

98
00:04:41,270 --> 00:04:39,539
came at you know after my last flight

99
00:04:43,909 --> 00:04:41,280
was I lived in space about five and a

100
00:04:46,839 --> 00:04:43,919
half months and thanks to some really

101
00:04:50,210 --> 00:04:46,849
good medicine and really good exercise

102
00:04:52,909 --> 00:04:50,220
machines and and programs that we did in

103
00:04:55,730 --> 00:04:52,919
space I came home with very very little

104
00:04:58,999 --> 00:04:55,740
change to my to my skeleton system as

105
00:05:01,400 --> 00:04:59,009
well as my musk my muscles so and my

106
00:05:03,920 --> 00:05:01,410
cardiovascular system so my bones were

107
00:05:05,900 --> 00:05:03,930
healthy my muscles were healthy and my

108
00:05:08,600 --> 00:05:05,910
heart and lungs working together for the

109
00:05:10,820 --> 00:05:08,610
cardiovascular system also was came back

110
00:05:12,800 --> 00:05:10,830
in great shape and I worked very hard I

111
00:05:15,589 --> 00:05:12,810
worked out six days a week on orbit and

112
00:05:17,659 --> 00:05:15,599
I worked hard during those workouts and

113
00:05:19,279 --> 00:05:17,669

and that that's really exciting news and

114
00:05:21,439 --> 00:05:19,289
it's kind of new because we have some

115
00:05:23,600 --> 00:05:21,449
new exercise equipment up there that

116
00:05:25,399 --> 00:05:23,610
allows us to to get some really good

117
00:05:27,469 --> 00:05:25,409
exercise and put the stress on that

118
00:05:29,029 --> 00:05:27,479
skeleton so you maintain your bone

119
00:05:31,730 --> 00:05:29,039
strength and that's important someday

120
00:05:33,409 --> 00:05:31,740
when your head you when you're on the

121
00:05:35,689 --> 00:05:33,419
way to Mars and back again and you want

122
00:05:37,370 --> 00:05:35,699
to come home healthy and that's a great

123
00:05:40,460 --> 00:05:37,380
question and also you know in addition

124
00:05:42,830 --> 00:05:40,470
to just exercise you know as we know

125
00:05:44,839 --> 00:05:42,840
even here on earth diet and exercise

126
00:05:47,600 --> 00:05:44,849
combined are very important and so one

127
00:05:49,189 --> 00:05:47,610
of a couple of research things that

128
00:05:50,870 --> 00:05:49,199
they're doing now is looking at

129
00:05:53,300 --> 00:05:50,880
nutrition as well to help mitigate those

130
00:05:55,370 --> 00:05:53,310
effects they've definitely found that

131
00:05:57,350 --> 00:05:55,380
the food we eat makes a big difference

132
00:05:59,450 --> 00:05:57,360
in our bone health also especially when

133
00:06:01,550 --> 00:05:59,460
we're up there and one big example that

134
00:06:04,040 --> 00:06:01,560
the nutrition people told me beforehand

135
00:06:05,990 --> 00:06:04,050
was be sure you eat eat fish a few times

136
00:06:08,330 --> 00:06:06,000
a week because the fish and the fish

137
00:06:09,860 --> 00:06:08,340
oils end up being really important for

138
00:06:11,240 --> 00:06:09,870

bone health and they don't completely

139
00:06:12,950 --> 00:06:11,250
understand why at least I don't

140
00:06:15,560 --> 00:06:12,960
understand why so I can't explain it to

141
00:06:17,540 --> 00:06:15,570
you but eating that good good diet with

142
00:06:20,029 --> 00:06:17,550
with lots of good good meat and

143
00:06:22,580 --> 00:06:20,039
vegetables fresh vegetables and fruits

144
00:06:24,560 --> 00:06:22,590
and stuff as well as the exercise all

145
00:06:26,450 --> 00:06:24,570
work together to make your body stronger

146
00:06:28,850 --> 00:06:26,460
here on earth - - and I did a lot of

147
00:06:31,159 --> 00:06:28,860
that before I flew - so I launched in

148
00:06:33,379 --> 00:06:31,169
pretty good shape and that came home in

149
00:06:35,480 --> 00:06:33,389
good shape - which is important yep so

150
00:06:38,779 --> 00:06:35,490
you hear it at home here you hear now

151
00:06:40,090 --> 00:06:38,789
eat your veggies mom was right next

152
00:06:43,220 --> 00:06:40,100
question

153
00:06:47,600 --> 00:06:43,230
if salmonella was found to be more

154
00:06:51,110 --> 00:06:47,610
aggressive or up regulated on ISS how

155
00:06:54,050 --> 00:06:51,120
might we be able to use is binding

156
00:06:55,970 --> 00:06:54,060
well what they've what they're doing is

157
00:06:57,920 --> 00:06:55,980
working on a vaccine for salmonella and

158
00:07:00,650 --> 00:06:57,930
working on medicines associated with

159
00:07:03,140 --> 00:07:00,660
that that was a completely surprising

160
00:07:07,130 --> 00:07:03,150
finding that some of these bacteria and

161
00:07:10,220 --> 00:07:07,140
organisms become stronger in space and

162
00:07:12,380 --> 00:07:10,230
we don't know why we don't know for sure

163
00:07:14,450 --> 00:07:12,390

if it says they're biologic processes

164
00:07:17,330 --> 00:07:14,460
are more efficient in a microgravity

165
00:07:19,070 --> 00:07:17,340
environment if maybe the radiation is

166
00:07:20,960 --> 00:07:19,080
somehow tweaking them up just like you

167
00:07:23,600 --> 00:07:20,970
might see in the cartoons or bad movies

168
00:07:25,400 --> 00:07:23,610
we're not really sure but that gives us

169
00:07:28,010 --> 00:07:25,410
the opportunity to research these things

170
00:07:31,010 --> 00:07:28,020
in a new way in a new light that we did

171
00:07:32,420 --> 00:07:31,020
not expect to find and so there's a lot

172
00:07:35,360 --> 00:07:32,430
of exciting things that are just

173
00:07:41,740 --> 00:07:35,370
starting to to come out along those

174
00:07:45,910 --> 00:07:43,990
the space shuttle seemed like an

175
00:07:48,010 --> 00:07:45,920
ultimate space vehicle it could land

176
00:07:51,010 --> 00:07:48,020
like an airplane and glide yet it also

177
00:07:54,100 --> 00:07:51,020
has a rocky type capacity - why is it no

178
00:07:55,570 --> 00:07:54,110
longer in operation oh boy we could go

179
00:07:58,030 --> 00:07:55,580
on a long time about that I was

180
00:07:58,480 --> 00:07:58,040
fortunate to fly two times on the space

181
00:08:00,940 --> 00:07:58,490
shuttle

182
00:08:02,620 --> 00:08:00,950
and I want an amazing flying machine it

183
00:08:04,150 --> 00:08:02,630
was because you're right it's the stuff

184
00:08:06,820 --> 00:08:04,160
that's right out of science fiction and

185
00:08:10,000 --> 00:08:06,830
it really was a beautiful amazing flying

186
00:08:12,250 --> 00:08:10,010
machine I think the reason we're not

187
00:08:15,010 --> 00:08:12,260
flying it is because as beautiful and as

188
00:08:17,170 --> 00:08:15,020

amazing as it was it did have some

189
00:08:19,120 --> 00:08:17,180
design flaws some things that were

190
00:08:21,250 --> 00:08:19,130
weaknesses in the just the basic way

191
00:08:22,960 --> 00:08:21,260
that it was was built in the way it was

192
00:08:25,150 --> 00:08:22,970
launched and there were some weaknesses

193
00:08:27,910 --> 00:08:25,160
particularly with the heat heat shield

194
00:08:29,710 --> 00:08:27,920
system and that we recognize that that

195
00:08:32,080 --> 00:08:29,720
loss here just this week as we

196
00:08:35,350 --> 00:08:32,090
remembered the ten-year anniversary of

197
00:08:37,750 --> 00:08:35,360
the loss of space shuttle Columbia that

198
00:08:40,270 --> 00:08:37,760
had a damage to the heat shield that

199
00:08:42,520 --> 00:08:40,280
ended up destroying the shuttle and

200
00:08:44,590 --> 00:08:42,530
killing the seven astronauts and at that

201
00:08:47,110 --> 00:08:44,600
time as we recovered from that asset

202
00:08:50,290 --> 00:08:47,120
from that accident we realized that

203
00:08:53,380 --> 00:08:50,300
there these design weaknesses were just

204
00:08:55,420 --> 00:08:53,390
really there were really significant and

205
00:08:58,930 --> 00:08:55,430
we needed to move on to the next

206
00:09:00,850 --> 00:08:58,940
generation of spacecraft so they made

207
00:09:03,790 --> 00:09:00,860
the decision to stop flying the space

208
00:09:05,829 --> 00:09:03,800
shuttles at the point where we finished

209
00:09:07,990 --> 00:09:05,839
building the space station and we hit

210
00:09:09,880 --> 00:09:08,000
that point a year and a half ago while I

211
00:09:13,240 --> 00:09:09,890
was on the space station we saw a space

212
00:09:16,090 --> 00:09:13,250
shuttle Atlantis come up for sts-135 and

213
00:09:17,740 --> 00:09:16,100

that was the last shuttle flight it was

214
00:09:19,840 --> 00:09:17,750
sad to see it go for all of us

215
00:09:21,430 --> 00:09:19,850
especially that flew honor and the tens

216
00:09:23,020 --> 00:09:21,440
of thousands of people across the

217
00:09:25,690 --> 00:09:23,030
country that worked on the space shuttle

218
00:09:27,370 --> 00:09:25,700
program through the years but if it was

219
00:09:29,170 --> 00:09:27,380
time to to go ahead and move forward

220
00:09:30,040 --> 00:09:29,180
with a new vehicle that would be a

221
00:09:32,950 --> 00:09:30,050
little safer

222
00:09:34,630 --> 00:09:32,960
I know vehicle will have the kind of

223
00:09:38,410 --> 00:09:34,640
capability that the shuttle had though

224
00:09:41,920 --> 00:09:38,420
with a huge cargo bay and landing like a

225
00:09:44,020 --> 00:09:41,930
like a like an aircraft on a runway what

226
00:09:45,880 --> 00:09:44,030
a remarkable capability that was I'm

227
00:09:48,250 --> 00:09:45,890
excited and proud to have been part of

228
00:09:50,860 --> 00:09:48,260
it but I look forward to the to the next

229
00:09:52,870 --> 00:09:50,870
vehicles that are coming coming along in

230
00:09:55,210 --> 00:09:52,880
the years ahead too because we've got a

231
00:09:57,699 --> 00:09:55,220
lot of exciting times ahead we do

232
00:10:00,910 --> 00:09:57,709
and think also you know not only we're

233
00:10:03,040 --> 00:10:00,920
wanting to expand so we're wanting to go

234
00:10:04,809 --> 00:10:03,050
further and beyond low-earth orbit and

235
00:10:07,150 --> 00:10:04,819
so it is going to take something else so

236
00:10:08,829 --> 00:10:07,160
lutely we're the Space Shuttle as cool

237
00:10:10,629 --> 00:10:08,839
as it was would never go to the moon

238
00:10:13,990 --> 00:10:10,639

because at the moon you don't need wings

239
00:10:15,790 --> 00:10:14,000
and you don't need tires and even Mars

240
00:10:17,769 --> 00:10:15,800
that has a tiny bit of atmosphere you

241
00:10:19,179 --> 00:10:17,779
would not have landing systems like the

242
00:10:22,090 --> 00:10:19,189
shuttle so you need to use more of a

243
00:10:24,910 --> 00:10:22,100
capsule type of vehicle and a lander

244
00:10:26,829 --> 00:10:24,920
type of vehicle so the shuttle was great

245
00:10:29,259 --> 00:10:26,839
for helping us build this magnificent

246
00:10:32,939 --> 00:10:29,269
Space Station and it's work is done and

247
00:10:41,079 --> 00:10:32,949
so now you have to visit them in museums

248
00:10:43,119 --> 00:10:41,089
next question we have to maintain lots

249
00:10:44,379 --> 00:10:43,129
of different things inside just like you

250
00:10:46,780 --> 00:10:44,389
do at home we have to do some little

251
00:10:48,730 --> 00:10:46,790
housecleaning about once a week we get

252
00:10:50,079 --> 00:10:48,740
out the vacuum cleaner and we clean well

253
00:10:52,300 --> 00:10:50,089
we don't really have carpets but we

254
00:10:54,220 --> 00:10:52,310
clean the walls and even vacuum the

255
00:10:56,650 --> 00:10:54,230
computers and the air like you have the

256
00:10:58,059 --> 00:10:56,660
air conditioners at home well in space

257
00:11:00,280 --> 00:10:58,069
those are even more important because

258
00:11:02,439 --> 00:11:00,290
they collect all of the dust gets caught

259
00:11:04,210 --> 00:11:02,449
in the air conditioner filters and so we

260
00:11:08,170 --> 00:11:04,220
have got we have to vacuum those up and

261
00:11:09,970 --> 00:11:08,180
keep the place clean as well as there's

262
00:11:12,790 --> 00:11:09,980
other things associated with just living

263
00:11:14,379 --> 00:11:12,800

and working up there just like you might

264
00:11:15,999 --> 00:11:14,389
have to do at the house where something

265
00:11:18,759 --> 00:11:16,009
breaks and it's time to change out the

266
00:11:20,920 --> 00:11:18,769
garbage disposal or work on a leak in

267
00:11:22,240 --> 00:11:20,930
the plumb the plumbing someplace and

268
00:11:25,079 --> 00:11:22,250
things like that so we're doing those

269
00:11:27,429 --> 00:11:25,089
kind of things as normal maintenance and

270
00:11:28,540 --> 00:11:27,439
preventative maintenance they call it -

271
00:11:30,100 --> 00:11:28,550
we'll go through and we'll make sure

272
00:11:32,590 --> 00:11:30,110
that all the bolts are tight on the

273
00:11:34,929 --> 00:11:32,600
treadmill so that as we're pounding away

274
00:11:37,179 --> 00:11:34,939
in a treadmill in space we're not

275
00:11:39,639 --> 00:11:37,189
shaking anything loose and then causing

276
00:11:40,960 --> 00:11:39,649
some damage every once in a while we

277
00:11:42,970 --> 00:11:40,970
have to go outside and do some

278
00:11:45,369 --> 00:11:42,980
maintenance on things we've changed out

279
00:11:48,429 --> 00:11:45,379
batteries that are part of our solar

280
00:11:51,490 --> 00:11:48,439
array electrical system outside we've

281
00:11:54,129 --> 00:11:51,500
gone out to fix an ammonia leak that was

282
00:11:57,369 --> 00:11:54,139
part of the cooling system outside sunny

283
00:11:59,470 --> 00:11:57,379
Williams and Aki hoshide I went outside

284
00:12:03,179 --> 00:11:59,480
and did some work on that system a few

285
00:12:07,090 --> 00:12:03,189
months back so it's a it's it's always

286
00:12:09,040 --> 00:12:07,100
busy and active times it is and a lot of

287
00:12:11,430 --> 00:12:09,050
this maintenance work you know is is

288
00:12:14,380 --> 00:12:11,440

essential because it's what enables us

289
00:12:15,970 --> 00:12:14,390
essentially to conduct all the research

290
00:12:18,970 --> 00:12:15,980
that we're doing which is the main

291
00:12:20,350 --> 00:12:18,980
reason for going up there using that

292
00:12:22,120 --> 00:12:20,360
International Space Station it is a

293
00:12:23,470 --> 00:12:22,130
laboratory and it's you know it's

294
00:12:26,259 --> 00:12:23,480
something you have to do but it's all

295
00:12:28,389 --> 00:12:26,269
part of what enables us to can continue

296
00:12:31,660 --> 00:12:28,399
that research part of its also a testbed

297
00:12:33,490 --> 00:12:31,670
as we have systems that for instance

298
00:12:35,079 --> 00:12:33,500
that remove carbon dioxide from the air

299
00:12:37,030 --> 00:12:35,089
because we don't get fresh air from

300
00:12:38,620 --> 00:12:37,040
outside we have to remove that carbon

301
00:12:40,480 --> 00:12:38,630
dioxide that we're breathing out all the

302
00:12:42,460 --> 00:12:40,490
time has to be removed from the air and

303
00:12:44,019 --> 00:12:42,470
that system has caused us some trouble

304
00:12:45,250 --> 00:12:44,029
through the years and so the engineers

305
00:12:47,980 --> 00:12:45,260
on the ground are trying to figure out

306
00:12:49,990 --> 00:12:47,990
what causes it to fail and they're

307
00:12:52,150 --> 00:12:50,000
working on the next generation carbon

308
00:12:54,340 --> 00:12:52,160
dioxide removal equipment that won't

309
00:12:56,259 --> 00:12:54,350
take as much maintenance and again on

310
00:12:58,480 --> 00:12:56,269
the way to Mars someday or another

311
00:13:00,100 --> 00:12:58,490
planet it's gonna be important for you

312
00:13:02,199 --> 00:13:00,110
guys to have a system that you don't

313
00:13:05,050 --> 00:13:02,209

have to call home for for spare parts

314
00:13:08,190 --> 00:13:05,060
because you can't call home that's right

315
00:13:17,470 --> 00:13:08,200
we can't deliver the spare parts to you

316
00:13:20,800 --> 00:13:17,480
oh that's that's hard that's really hard

317
00:13:23,769 --> 00:13:20,810
I think probably my favorite one was was

318
00:13:26,380 --> 00:13:23,779
my last one I did a spacewalk in July of

319
00:13:28,240 --> 00:13:26,390
2011 just over a year and a half ago and

320
00:13:30,639 --> 00:13:28,250
that was wild space shuttle Atlantis was

321
00:13:33,370 --> 00:13:30,649
docked to the space station it was so

322
00:13:35,530 --> 00:13:33,380
cool - we took a broken pump module from

323
00:13:38,370 --> 00:13:35,540
the space station and we put it in the

324
00:13:41,740 --> 00:13:38,380
cargo bay the shuttle and we moved the a

325
00:13:43,720 --> 00:13:41,750
new science experiment that came up in

326
00:13:45,280 --> 00:13:43,730
the shuttle cargo bay up to the station

327
00:13:47,650 --> 00:13:45,290
where they've been doing that that work

328
00:13:49,360 --> 00:13:47,660
up there and it was so cool for me that

329
00:13:51,579 --> 00:13:49,370
was my seventh spacewalk I've been

330
00:13:54,069 --> 00:13:51,589
outside almost around 48 hours working

331
00:13:56,590 --> 00:13:54,079
outside and it was really so cool to me

332
00:13:59,710 --> 00:13:56,600
- I'd worked as an engineer on spacewalk

333
00:14:02,470 --> 00:13:59,720
procedures and tools and things when I

334
00:14:04,960 --> 00:14:02,480
was an engineer working at NASA then as

335
00:14:06,819 --> 00:14:04,970
a astronaut I helped build the space

336
00:14:09,250 --> 00:14:06,829
station and it was really neat for me on

337
00:14:11,560 --> 00:14:09,260
my last flight while the shuttle was

338
00:14:13,600 --> 00:14:11,570

there for its very last flight to be

339
00:14:16,449 --> 00:14:13,610
outside and be in the cargo bay of space

340
00:14:18,280 --> 00:14:16,459
shuttle Atlantis and kind of a way of

341
00:14:20,480 --> 00:14:18,290
paying tribute to that you know amazing

342
00:14:22,490 --> 00:14:20,490
flying machine one more time and

343
00:14:24,350 --> 00:14:22,500
and just kind of it got a lot of work

344
00:14:27,020 --> 00:14:24,360
done but I also took a few minutes to

345
00:14:30,980 --> 00:14:27,030
enjoy the experience of the incredible

346
00:14:32,750 --> 00:14:30,990
view of the earth and the stars from not

347
00:14:35,090 --> 00:14:32,760
looking through big thick glass windows

348
00:14:37,460 --> 00:14:35,100
but through a little skinny fishbowl of

349
00:14:39,800 --> 00:14:37,470
a helmet and if you ever watched Fossum

350
00:14:41,300 --> 00:14:39,810
when he was working aboard the

351
00:14:43,250 --> 00:14:41,310
International Space Station or anytime

352
00:14:44,390 --> 00:14:43,260
he in doing any of his space flights I

353
00:14:46,250 --> 00:14:44,400
think it would be very difficult to

354
00:14:48,920 --> 00:14:46,260
determine which one he was was his

355
00:14:50,300 --> 00:14:48,930
favorite was it space walking or fixing

356
00:14:51,860 --> 00:14:50,310
the plumbing because he always looked

357
00:15:03,710 --> 00:14:51,870
like he was having a great time up there

358
00:15:05,570 --> 00:15:03,720
that's a great question next one you

359
00:15:08,300 --> 00:15:05,580
been communicating with my family is

360
00:15:10,520 --> 00:15:08,310
really important I was we through kind

361
00:15:12,650 --> 00:15:10,530
of a link up with through computer

362
00:15:15,470 --> 00:15:12,660
systems and data systems we can use it

363
00:15:17,750 --> 00:15:15,480

we can call people on a telephone and so

364
00:15:19,130 --> 00:15:17,760
I would talk to my wife almost every

365
00:15:21,890 --> 00:15:19,140
single day I'd have the chance to talk

366
00:15:23,780 --> 00:15:21,900
to my wife we have four four children

367
00:15:25,460 --> 00:15:23,790
and some of them are out of the house

368
00:15:27,770 --> 00:15:25,470
and so I didn't get to talk to each one

369
00:15:29,480 --> 00:15:27,780
of my kids every single day but I tried

370
00:15:31,460 --> 00:15:29,490
to talk to him every week or so and then

371
00:15:34,370 --> 00:15:31,470
every weekend I had a little video

372
00:15:37,280 --> 00:15:34,380
conference about at least 15 minutes and

373
00:15:39,170 --> 00:15:37,290
usually longer with my wife and and one

374
00:15:41,240 --> 00:15:39,180
or more of my kids with her and so

375
00:15:43,520 --> 00:15:41,250
that's how we kept in touch we also had

376
00:15:44,720 --> 00:15:43,530
email and it's not quick email like

377
00:15:46,280 --> 00:15:44,730
you're used to now and we certainly

378
00:15:49,880 --> 00:15:46,290
couldn't text message or anything that

379
00:15:55,870 --> 00:15:49,890
quickly but but we did send emails and

380
00:16:04,879 --> 00:16:02,840
promising research oh cool that that one

381
00:16:07,699 --> 00:16:04,889
I have to think about for just a second

382
00:16:10,579 --> 00:16:07,709
I think the the health things that we

383
00:16:14,150 --> 00:16:10,589
were working on with bone health we lose

384
00:16:16,699 --> 00:16:14,160
bone in space ten times faster than an

385
00:16:19,759 --> 00:16:16,709
osteoporotic eighty year old woman which

386
00:16:21,259 --> 00:16:19,769
is pretty pretty fast and so if we don't

387
00:16:22,970 --> 00:16:21,269
take these countermeasures and so I

388
00:16:25,460 --> 00:16:22,980

think it's really exciting to know that

389
00:16:27,019 --> 00:16:25,470
with with you know really with good

390
00:16:29,300 --> 00:16:27,029
exercise and with some of the

391
00:16:32,689 --> 00:16:29,310
medications and I was a guinea pig for

392
00:16:34,670 --> 00:16:32,699
it a medicine that you can really stop

393
00:16:36,410 --> 00:16:34,680
this you can halt this and control it

394
00:16:38,210 --> 00:16:36,420
and that that kind of things exciting a

395
00:16:41,389 --> 00:16:38,220
lot of the other research that was going

396
00:16:43,400 --> 00:16:41,399
on I had to do with material science

397
00:16:44,720 --> 00:16:43,410
where we were loading samples in a

398
00:16:46,819 --> 00:16:44,730
furnace and then while we're sleeping

399
00:16:48,889 --> 00:16:46,829
overnight the ground is turning on that

400
00:16:51,319 --> 00:16:48,899
furnace and getting it so hot it melts

401
00:16:53,300 --> 00:16:51,329
the metal samples in there and then

402
00:16:55,670 --> 00:16:53,310
cools them down in a certain way as

403
00:16:58,340 --> 00:16:55,680
they're learning how to build different

404
00:16:59,990 --> 00:16:58,350
compounds but as they as they they don't

405
00:17:02,329 --> 00:17:00,000
get the same kind of mixing you get in

406
00:17:05,059 --> 00:17:02,339
gravity there was also a really cool

407
00:17:08,210 --> 00:17:05,069
fluid dynamics experiment it was like a

408
00:17:10,189 --> 00:17:08,220
fluid that had microscopic strands of

409
00:17:12,740 --> 00:17:10,199
plastic in it they call him a polymer

410
00:17:13,939 --> 00:17:12,750
and they were doing a dynamic test ran

411
00:17:15,500 --> 00:17:13,949
that I could see and a lot of the

412
00:17:18,559 --> 00:17:15,510
science we don't really get to see it

413
00:17:20,179 --> 00:17:18,569

happening but this one I was helping set

414
00:17:21,980 --> 00:17:20,189
it all up and I get the sample in this

415
00:17:24,590 --> 00:17:21,990
test chamber and then it would start to

416
00:17:27,020 --> 00:17:24,600
spin this little blob about the size of

417
00:17:29,150 --> 00:17:27,030
a bean inside there and they would be

418
00:17:31,610 --> 00:17:29,160
twisting those microscopic plastic

419
00:17:33,620 --> 00:17:31,620
fibers and then they stretched it now

420
00:17:36,740 --> 00:17:33,630
this they would form a really thin

421
00:17:39,650 --> 00:17:36,750
strand and in gravity that strand just

422
00:17:42,110 --> 00:17:39,660
like silly putty but steadily thin and

423
00:17:44,240 --> 00:17:42,120
in gravity it would just collapse but in

424
00:17:46,460 --> 00:17:44,250
in the microgravity environment up there

425
00:17:48,350 --> 00:17:46,470
they would pull this strand out two feet

426
00:17:51,620 --> 00:17:48,360
long and they'd be able to measure the

427
00:17:53,780 --> 00:17:51,630
tension the pull in there and by doing

428
00:17:56,690 --> 00:17:53,790
that they understand the basic physics

429
00:17:59,570 --> 00:17:56,700
of this kind of a special fluid that's

430
00:18:01,520 --> 00:17:59,580
important for them petrochemical and

431
00:18:03,440 --> 00:18:01,530
plastic industries that use these kind

432
00:18:05,570 --> 00:18:03,450
of fluids and their production processes

433
00:18:07,490 --> 00:18:05,580
and so they wanted to know more about

434
00:18:08,060 --> 00:18:07,500
exactly how this stuff works and so

435
00:18:10,250 --> 00:18:08,070
that's fun

436
00:18:12,290 --> 00:18:10,260
mental science I'm not sure what it'll

437
00:18:14,930 --> 00:18:12,300
be used for but the research team on the

438
00:18:16,310 --> 00:18:14,940

ground was really excited about the the

439
00:18:18,710 --> 00:18:16,320
science that we were able to accomplish

440
00:18:20,150 --> 00:18:18,720
so it was cool to be part of that if you

441
00:18:21,080 --> 00:18:20,160
look up any of your materials and look

442
00:18:23,120 --> 00:18:21,090
at polymers

443
00:18:26,840 --> 00:18:23,130
oh yeah there's lots of stuff on the

444
00:18:35,540 --> 00:18:26,850
website absolutely ok question do we

445
00:18:38,060 --> 00:18:35,550
have any more well that's a tricky

446
00:18:40,520 --> 00:18:38,070
question the shuttle had so many

447
00:18:42,920 --> 00:18:40,530
capabilities no one spacecraft is going

448
00:18:45,350 --> 00:18:42,930
to replace the Space Shuttle right now

449
00:18:47,570 --> 00:18:45,360
when I when I traveled to and from the

450
00:18:49,490 --> 00:18:47,580
space station I traveled on a Russian

451
00:18:51,620 --> 00:18:49,500
Soyuz rocket launching out of a country

452
00:18:54,380 --> 00:18:51,630
called Kazakhstan on a place called

453
00:18:56,660 --> 00:18:54,390
Baikonur cosmodrome we launched from the

454
00:18:58,880 --> 00:18:56,670
same launch pad that Yuri Gagarin the

455
00:19:01,730 --> 00:18:58,890
first human in space launched from over

456
00:19:05,120 --> 00:19:01,740
50 years ago so it was pretty cool to be

457
00:19:08,000 --> 00:19:05,130
part of that historical program and be

458
00:19:09,590 --> 00:19:08,010
another person in there we've had

459
00:19:12,440 --> 00:19:09,600
several different vehicles that are

460
00:19:15,530 --> 00:19:12,450
providing cargo to the space station

461
00:19:18,020 --> 00:19:15,540
Jeff Japan has a cargo vehicle to your

462
00:19:20,570 --> 00:19:18,030
European Space Agency has a cargo

463
00:19:23,030 --> 00:19:20,580

vehicle a private American company

464
00:19:24,610 --> 00:19:23,040
called space exploration has a cargo

465
00:19:28,370 --> 00:19:24,620
vehicle that's been there twice now

466
00:19:30,410 --> 00:19:28,380
other and other companies have have

467
00:19:33,080 --> 00:19:30,420
cargo ships that are really close to

468
00:19:34,490 --> 00:19:33,090
flying a company called orbital has one

469
00:19:36,500 --> 00:19:34,500
that's very close to flying and then

470
00:19:38,930 --> 00:19:36,510
hopefully in the next few months they'll

471
00:19:41,630 --> 00:19:38,940
get up there these guys are several of

472
00:19:43,910 --> 00:19:41,640
them are also working on human vehicles

473
00:19:46,540 --> 00:19:43,920
using kind of their cargo ship is the

474
00:19:49,220 --> 00:19:46,550
first step and then developing that into

475
00:19:51,650 --> 00:19:49,230
into a ship that could take people up

476
00:19:55,490 --> 00:19:51,660
there again it won't replace the shuttle

477
00:19:57,920 --> 00:19:55,500
with a great big majestic spaceship with

478
00:19:59,960 --> 00:19:57,930
seven people at a time but we're working

479
00:20:03,680 --> 00:19:59,970
on those things and inside NASA we're

480
00:20:07,130 --> 00:20:03,690
working on other spacecraft that can go

481
00:20:08,560 --> 00:20:07,140
beyond the 200 miles that we'd go to to

482
00:20:12,050 --> 00:20:08,570
the space station so we're working

483
00:20:14,810 --> 00:20:12,060
private companies are working on options

484
00:20:17,270 --> 00:20:14,820
to provide ways for people to get to and

485
00:20:19,550 --> 00:20:17,280
from low-earth orbit as we call it the

486
00:20:21,260 --> 00:20:19,560
space station is that that 200 to 250

487
00:20:23,000 --> 00:20:21,270
miles in altitude

488
00:20:24,770 --> 00:20:23,010

but the moon is a lot further away and

489
00:20:27,590 --> 00:20:24,780
Mars is much further than that so we're

490
00:20:29,660 --> 00:20:27,600
working on another vehicle within NASA

491
00:20:32,180 --> 00:20:29,670
more that that will be able to go

492
00:20:35,170 --> 00:20:32,190
further and support the the exploration

493
00:20:38,510 --> 00:20:35,180
goals that NASA has for the years ahead

494
00:20:39,740 --> 00:20:38,520
and amiko this is NASA the Digital

495
00:20:41,360 --> 00:20:39,750
Learning Network just wanna let you know

496
00:20:53,560 --> 00:20:41,370
we have about two minutes left so maybe

497
00:20:59,750 --> 00:20:56,270
oh that's a great question it's I'm

498
00:21:01,730 --> 00:20:59,760
proud to have been awarded that it's one

499
00:21:03,320 --> 00:21:01,740
of the awards that that are available

500
00:21:05,810 --> 00:21:03,330
for people that are just working hard

501
00:21:07,610 --> 00:21:05,820
and doing their job and and and kind of

502
00:21:10,220 --> 00:21:07,620
standing out I was fortunate to be

503
00:21:12,200 --> 00:21:10,230
recognized for my contributions and lots

504
00:21:14,120 --> 00:21:12,210
of you know great people not just

505
00:21:16,400 --> 00:21:14,130
astronauts but other they great people

506
00:21:18,800 --> 00:21:16,410
that work at NASA you know get that

507
00:21:20,720 --> 00:21:18,810
award so it's a it's a great great honor

508
00:21:23,870 --> 00:21:20,730
for me and and to share that honor with

509
00:21:35,980 --> 00:21:23,880
lots of other people okay I think we can

510
00:21:43,280 --> 00:21:40,730
okay well I worked on the x-38 and and

511
00:21:44,930 --> 00:21:43,290
through the Space Station program as

512
00:21:46,820 --> 00:21:44,940
this partnership is evolved we've had

513
00:21:47,990 --> 00:21:46,830

lots of different countries and partner

514
00:21:50,570 --> 00:21:48,000
nations that are bringing different

515
00:21:52,880 --> 00:21:50,580
capabilities and one of the things an

516
00:21:56,360 --> 00:21:52,890
idea that we worked on here and it at

517
00:21:59,570 --> 00:21:56,370
NASA was called the x-38 as a crew

518
00:22:01,250 --> 00:21:59,580
escape vehicle and it was something we

519
00:22:03,170 --> 00:22:01,260
tried out in one a ways with it and then

520
00:22:05,960 --> 00:22:03,180
decided to move off in in different

521
00:22:08,120 --> 00:22:05,970
directions and since then we were using

522
00:22:10,580 --> 00:22:08,130
the Russian Soyuz spacecraft to be our

523
00:22:13,340 --> 00:22:10,590
emergency escape vehicle it's our ride

524
00:22:15,080 --> 00:22:13,350
up and I'll ride down and we could use

525
00:22:17,270 --> 00:22:15,090
it we could jump in there and leave at

526
00:22:18,890 --> 00:22:17,280
any moment if there's a big problem on

527
00:22:20,420 --> 00:22:18,900
the space station we could leave at any

528
00:22:23,240 --> 00:22:20,430
moment that's important we have to have

529
00:22:24,620 --> 00:22:23,250
a way out at the same time we're working

530
00:22:27,560 --> 00:22:24,630
on like I said some of these other

531
00:22:30,080 --> 00:22:27,570
companies are working on another are

532
00:22:31,970 --> 00:22:30,090
other options that we could use on the

533
00:22:34,220 --> 00:22:31,980
space station besides just using the

534
00:22:35,810 --> 00:22:34,230
Russian Soyuz spacecraft so we're we're

535
00:22:37,820 --> 00:22:35,820
earning as we go we're trying out some

536
00:22:40,549 --> 00:22:37,830
ideas some of them are working out some

537
00:22:42,100 --> 00:22:40,559
of them we we decide to step away from

538
00:22:44,720 --> 00:22:42,110

and try something else

539
00:22:46,370 --> 00:22:44,730
hey you guys have had a bunch of great

540
00:22:47,990 --> 00:22:46,380
questions today I think they're out of

541
00:22:50,120 --> 00:22:48,000
time and they're gonna pull the plug on

542
00:22:51,980 --> 00:22:50,130
us but thank you very much your

543
00:22:53,720 --> 00:22:51,990
questions are great I can tell you've

544
00:22:56,060 --> 00:22:53,730
been doing your homework which is half

545
00:22:58,669 --> 00:22:56,070
the battle you've been studying you've

546
00:23:00,890 --> 00:22:58,679
been studying and getting and asking

547
00:23:02,299 --> 00:23:00,900
some really solid questions that show

548
00:23:05,060 --> 00:23:02,309
that you're getting a lot of good

549
00:23:07,220 --> 00:23:05,070
understanding of our business here and I

550
00:23:09,500 --> 00:23:07,230
hope you can see where you might fit

551
00:23:11,659 --> 00:23:09,510
into this business in the years ahead

552
00:23:14,600 --> 00:23:11,669
NASA is an exciting place to work the

553
00:23:16,580 --> 00:23:14,610
human spaceflight business is is just

554
00:23:18,380 --> 00:23:16,590
one of the greatest challenges and and

555
00:23:20,990 --> 00:23:18,390
most exciting things that I can imagine

556
00:23:22,610 --> 00:23:21,000
doing I'm excited to have been here and

557
00:23:24,500 --> 00:23:22,620
I know amico and all the other people

558
00:23:26,960 --> 00:23:24,510
that work at Johnson Space Center are

559
00:23:29,000 --> 00:23:26,970
excited to be here continuing to operate

560
00:23:30,590 --> 00:23:29,010
the Space Station from this room that

561
00:23:33,740 --> 00:23:30,600
we're sitting in right now in Mission

562
00:23:35,539 --> 00:23:33,750
Control and and getting ready to to help