
MISSION CONTROL CENTER
NASA

1
00:00:05,430 --> 00:00:03,110
hi welcome to the international space

2
00:00:07,510 --> 00:00:05,440
station flight control room i understand

3
00:00:10,390 --> 00:00:07,520
today we are talking with students from

4
00:00:11,749 --> 00:00:10,400
the clark creek stem academy welcome

5
00:00:13,350 --> 00:00:11,759
students i have a special treat because

6
00:00:14,629 --> 00:00:13,360
i understand you guys have a lot of

7
00:00:16,230 --> 00:00:14,639
questions about living and working

8
00:00:18,230 --> 00:00:16,240
aboard the international space station

9
00:00:19,429 --> 00:00:18,240
and today's guest has certainly done

10
00:00:21,990 --> 00:00:19,439
that

11
00:00:23,990 --> 00:00:22,000
astronaut mike fossum he is a veteran of

12
00:00:25,349 --> 00:00:24,000
three space flights his most recent

13
00:00:27,990 --> 00:00:25,359

flight he was the commander of

14
00:00:29,830 --> 00:00:28,000
expedition 29 welcome mike and thank you

15
00:00:31,669 --> 00:00:29,840
for joining us today hi amiko it's great

16
00:00:33,430 --> 00:00:31,679
to be back in mission control and great

17
00:00:35,270 --> 00:00:33,440
to be talking to the students from clark

18
00:00:37,190 --> 00:00:35,280
creek stem academy

19
00:00:38,950 --> 00:00:37,200
great so uh with that we're ready for

20
00:00:42,830 --> 00:00:38,960
your questions

21
00:00:47,350 --> 00:00:45,910
has your boy scout training helped you

22
00:00:49,830 --> 00:00:47,360
as an astronaut

23
00:00:52,310 --> 00:00:49,840
if yes how

24
00:00:54,229 --> 00:00:52,320
a great question my boy scout training

25
00:00:55,270 --> 00:00:54,239
helped me learn how to work as a part of

26
00:00:57,110 --> 00:00:55,280
a team

27
00:00:59,670 --> 00:00:57,120
because in scouting you know you work as

28
00:01:01,910 --> 00:00:59,680
a small group of teams uh

29
00:01:04,149 --> 00:01:01,920
and and you do different things and it's

30
00:01:06,630 --> 00:01:04,159
in ways it's kind of the same thing here

31
00:01:08,710 --> 00:01:06,640
uh in indeed as i lived on the space

32
00:01:10,710 --> 00:01:08,720
station i slept in a sleeping bag for

33
00:01:12,550 --> 00:01:10,720
six months and so in some ways it was

34
00:01:13,670 --> 00:01:12,560
kind of like camping out for six months

35
00:01:15,429 --> 00:01:13,680
at a time

36
00:01:16,870 --> 00:01:15,439
you also learned self-reliance how to

37
00:01:18,630 --> 00:01:16,880
take care of yourself in a lot of

38
00:01:20,789 --> 00:01:18,640

different ways from preparing food to

39
00:01:26,870 --> 00:01:20,799
simple first aid and we certainly used

40
00:01:31,190 --> 00:01:29,910
okay go ahead okay

41
00:01:33,749 --> 00:01:31,200
um

42
00:01:35,510 --> 00:01:33,759
what skills did you learn as an eagle

43
00:01:39,749 --> 00:01:35,520
scout that helped you

44
00:01:41,429 --> 00:01:39,759
as a nasa scientist or as an engineer

45
00:01:43,990 --> 00:01:41,439
i learned how a lot of different things

46
00:01:46,310 --> 00:01:44,000
work as i was in scouting in my youth

47
00:01:47,350 --> 00:01:46,320
and working toward being an eagle scout

48
00:01:48,870 --> 00:01:47,360
and uh

49
00:01:51,030 --> 00:01:48,880
and you know another part of it that we

50
00:01:53,910 --> 00:01:51,040
learned was taking the big trips as you

51
00:01:56,069 --> 00:01:53,920
get to be an older scout uh or you know

52
00:01:58,149 --> 00:01:56,079
older youth in different programs too to

53
00:01:59,910 --> 00:01:58,159
do big trips where you'd go on long

54
00:02:01,910 --> 00:01:59,920
trips a week or more

55
00:02:04,230 --> 00:02:01,920
into the mountains into the wilderness

56
00:02:05,910 --> 00:02:04,240
area canoeing on rivers and things and

57
00:02:08,630 --> 00:02:05,920
that gives you a different mindset as

58
00:02:10,869 --> 00:02:08,640
you escape the normal world that that

59
00:02:12,550 --> 00:02:10,879
you know which involves televisions and

60
00:02:14,630 --> 00:02:12,560
air conditioners and all those kind of

61
00:02:17,190 --> 00:02:14,640
things and living more on your own

62
00:02:18,710 --> 00:02:17,200
resources in a different environment

63
00:02:19,990 --> 00:02:18,720

and whether that different environment

64
00:02:23,030 --> 00:02:20,000
is uh is a

65
00:02:25,350 --> 00:02:23,040
place in the in a deep forest or a place

66
00:02:27,190 --> 00:02:25,360
in outer space it's still an

67
00:02:29,350 --> 00:02:27,200
adaptation that you have to do as you

68
00:02:32,470 --> 00:02:29,360
learn to rely on each other and learn on

69
00:02:35,030 --> 00:02:32,480
your training to be successful

70
00:02:37,350 --> 00:02:35,040
great so you would recommend

71
00:02:40,309 --> 00:02:37,360
boy scouts and becoming an eagle scout

72
00:02:41,509 --> 00:02:40,319
as good preparation to become a nasa

73
00:02:43,750 --> 00:02:41,519
astronaut

74
00:02:46,150 --> 00:02:43,760
scouting was certainly a great path for

75
00:02:48,070 --> 00:02:46,160
me and it is for many other people

76
00:02:49,670 --> 00:02:48,080
in in a lot of different ways so sure i

77
00:02:51,509 --> 00:02:49,680
recommend the scouting program and the

78
00:02:53,990 --> 00:02:51,519
girl scouting program and the venture

79
00:02:55,750 --> 00:02:54,000
program for older students are a good

80
00:02:57,910 --> 00:02:55,760
opportunities to learn different skills

81
00:03:05,350 --> 00:02:57,920
and learn that they're really critical

82
00:03:10,149 --> 00:03:08,470
are you still eligible for space flight

83
00:03:12,149 --> 00:03:10,159
yes i am

84
00:03:13,990 --> 00:03:12,159
thank you for asking i'm still an active

85
00:03:16,470 --> 00:03:14,000
astronaut and i'm still training i'm

86
00:03:18,309 --> 00:03:16,480
back in line and and i hope to go again

87
00:03:20,710 --> 00:03:18,319
someday i've worked very hard to get to

88
00:03:23,110 --> 00:03:20,720

this place and and i think i got another

89
00:03:28,229 --> 00:03:23,120
flight left in me

90
00:03:34,309 --> 00:03:30,710
are there any plans to construct another

91
00:03:37,350 --> 00:03:34,319
kepler type telescope if so where and

92
00:03:43,190 --> 00:03:38,630
oh

93
00:03:44,789 --> 00:03:43,200
um

94
00:03:46,550 --> 00:03:44,799
we don't have any more missions to go

95
00:03:48,869 --> 00:03:46,560
repair or work on any of those

96
00:03:51,990 --> 00:03:48,879
telescopes there are some big telescopes

97
00:03:54,229 --> 00:03:52,000
if i'm catching the question correct

98
00:03:55,750 --> 00:03:54,239
the the the the human space flight

99
00:03:58,470 --> 00:03:55,760
program is kind of separate from our

100
00:04:00,229 --> 00:03:58,480
telescope programs these days

101
00:04:02,710 --> 00:04:00,239
the hubble space telescope is the most

102
00:04:05,190 --> 00:04:02,720
famous one of course and and we sent

103
00:04:07,750 --> 00:04:05,200
several space shuttle crews to visit the

104
00:04:09,830 --> 00:04:07,760
hubble space telescope to help do some

105
00:04:12,710 --> 00:04:09,840
maintenance and some repairs to that to

106
00:04:14,789 --> 00:04:12,720
extend its lifetime for for a long time

107
00:04:16,150 --> 00:04:14,799
and uh but those discoveries that it

108
00:04:17,990 --> 00:04:16,160
that are being made through the uh

109
00:04:19,909 --> 00:04:18,000
through the the hubble space telescope

110
00:04:22,550 --> 00:04:19,919
being the most famous and the other

111
00:04:24,790 --> 00:04:22,560
observatory scopes uh is a separate kind

112
00:04:26,230 --> 00:04:24,800
of program

113
00:04:29,030 --> 00:04:26,240

excellent question

114
00:04:31,030 --> 00:04:29,040
you have another one

115
00:04:33,030 --> 00:04:31,040
what is the status of your skeletal

116
00:04:36,710 --> 00:04:33,040
system since logging

117
00:04:40,870 --> 00:04:39,030
well believe it or not i came you know

118
00:04:43,030 --> 00:04:40,880
after my last flight with i lived in

119
00:04:45,510 --> 00:04:43,040
space about five and a half months and

120
00:04:47,430 --> 00:04:45,520
thanks to some really good medicine and

121
00:04:50,710 --> 00:04:47,440
really good exercise

122
00:04:53,189 --> 00:04:50,720
uh machines and and programs that we did

123
00:04:55,670 --> 00:04:53,199
in space i came home with a very very

124
00:04:59,030 --> 00:04:55,680
little change to my to my skeleton

125
00:05:01,430 --> 00:04:59,040
system as well as my musk my muscles so

126
00:05:03,189 --> 00:05:01,440
and and my cardiovascular system so my

127
00:05:05,749 --> 00:05:03,199
bones were healthy my muscles were

128
00:05:07,749 --> 00:05:05,759
healthy and my heart and lungs working

129
00:05:10,390 --> 00:05:07,759
together for the cardiovascular system

130
00:05:12,390 --> 00:05:10,400
also was came back in in great shape now

131
00:05:15,189 --> 00:05:12,400
i worked very hard i worked out six days

132
00:05:17,590 --> 00:05:15,199
a week on orbit and i worked hard during

133
00:05:19,029 --> 00:05:17,600
those workouts and and that's really

134
00:05:20,950 --> 00:05:19,039
exciting news and it's kind of new

135
00:05:23,430 --> 00:05:20,960
because we have some new exercise

136
00:05:25,189 --> 00:05:23,440
equipment up there that allows us to to

137
00:05:27,270 --> 00:05:25,199
get some really good exercise and put

138
00:05:28,870 --> 00:05:27,280

the stress on that skeleton so you

139
00:05:30,310 --> 00:05:28,880
maintain your bone strength and that's

140
00:05:32,550 --> 00:05:30,320
important someday

141
00:05:34,150 --> 00:05:32,560
when your head when you're on the way to

142
00:05:35,670 --> 00:05:34,160
mars back again and you want to come

143
00:05:37,270 --> 00:05:35,680
home healthy

144
00:05:39,510 --> 00:05:37,280
and that's a great question and also you

145
00:05:41,590 --> 00:05:39,520
know in addition to just

146
00:05:43,990 --> 00:05:41,600
exercise you know as we know even here

147
00:05:46,710 --> 00:05:44,000
on earth diet and exercise combined are

148
00:05:47,749 --> 00:05:46,720
very important and so one of a couple of

149
00:05:49,590 --> 00:05:47,759
research

150
00:05:51,270 --> 00:05:49,600
things that they're doing now is looking

151
00:05:52,469 --> 00:05:51,280
at nutrition as well to help mitigate

152
00:05:54,390 --> 00:05:52,479
those effects

153
00:05:56,150 --> 00:05:54,400
they've definitely found that the food

154
00:05:58,070 --> 00:05:56,160
we eat makes a big difference in our

155
00:06:00,070 --> 00:05:58,080
bone health also especially when we're

156
00:06:02,309 --> 00:06:00,080
up there and one big example that the

157
00:06:04,790 --> 00:06:02,319
nutrition people told me beforehand was

158
00:06:07,430 --> 00:06:04,800
be sure you eat eat fish a few times a

159
00:06:09,110 --> 00:06:07,440
week because the fish and the fish oils

160
00:06:10,550 --> 00:06:09,120
end up being really important for bone

161
00:06:11,830 --> 00:06:10,560
health and they don't completely

162
00:06:13,590 --> 00:06:11,840
understand why at least i don't

163
00:06:16,309 --> 00:06:13,600

understand why so i can't explain it to

164
00:06:19,350 --> 00:06:16,319
you but eating that good good diet with

165
00:06:21,350 --> 00:06:19,360
with lots of good good meat vegetables

166
00:06:23,909 --> 00:06:21,360
fresh vegetables and fruits and stuff as

167
00:06:25,749 --> 00:06:23,919
well as the exercise all work together

168
00:06:27,749 --> 00:06:25,759
to make your body stronger here on earth

169
00:06:29,830 --> 00:06:27,759
too so and i did a lot of that before i

170
00:06:30,710 --> 00:06:29,840
flew to so i launched in pretty good

171
00:06:34,390 --> 00:06:30,720
shape

172
00:06:36,870 --> 00:06:34,400
which is important yep so you hear it at

173
00:06:39,029 --> 00:06:36,880
home you hear you hear it now eat your

174
00:06:41,670 --> 00:06:39,039
veggies mom was right

175
00:06:46,070 --> 00:06:44,070
if salmonella was found to be more

176
00:06:48,950 --> 00:06:46,080
aggressive or up

177
00:06:52,469 --> 00:06:48,960
regulated on the iss how might we be

178
00:06:54,550 --> 00:06:52,479
able to use this binding on planet earth

179
00:06:56,710 --> 00:06:54,560
well what they've what they're doing is

180
00:06:58,469 --> 00:06:56,720
working on a vaccine for salmonella and

181
00:07:01,270 --> 00:06:58,479
working on medicines associated with

182
00:07:03,029 --> 00:07:01,280
that that was a completely surprising

183
00:07:05,189 --> 00:07:03,039
finding that some of these

184
00:07:08,390 --> 00:07:05,199
bacteria and organisms

185
00:07:09,909 --> 00:07:08,400
become stronger in space and we don't

186
00:07:11,670 --> 00:07:09,919
know why

187
00:07:14,230 --> 00:07:11,680
we don't know for sure if it's their

188
00:07:16,390 --> 00:07:14,240

biologic processes are more efficient in

189
00:07:18,309 --> 00:07:16,400
a microgravity environment

190
00:07:19,990 --> 00:07:18,319
if maybe the radiation is somehow

191
00:07:22,230 --> 00:07:20,000
tweaking them up just like you might see

192
00:07:24,150 --> 00:07:22,240
in cartoons or bad movies

193
00:07:26,070 --> 00:07:24,160
we're not really sure but that gives us

194
00:07:28,550 --> 00:07:26,080
the opportunity to research these things

195
00:07:31,029 --> 00:07:28,560
in a new way in a new light that we did

196
00:07:32,629 --> 00:07:31,039
not expect to find and so

197
00:07:34,070 --> 00:07:32,639
there's a lot of exciting things that

198
00:07:36,710 --> 00:07:34,080
are just starting to

199
00:07:39,110 --> 00:07:36,720
to to come out along those lines so keep

200
00:07:42,790 --> 00:07:39,120
an eye on that

201
00:07:46,469 --> 00:07:44,550
the space shuttle seemed like an

202
00:07:48,710 --> 00:07:46,479
ultimate space vehicle it could land

203
00:07:51,430 --> 00:07:48,720
like an airplane and glide yet it also

204
00:07:53,510 --> 00:07:51,440
has rocket type capacity too why is it

205
00:07:55,589 --> 00:07:53,520
no longer in operation

206
00:07:58,150 --> 00:07:55,599
oh boy we could go on a long time about

207
00:08:00,629 --> 00:07:58,160
that i was fortunate to fly two times on

208
00:08:02,309 --> 00:08:00,639
the space shuttle and what an amazing

209
00:08:03,830 --> 00:08:02,319
flying machine it was because you're

210
00:08:06,150 --> 00:08:03,840
right it's the stuff that's right out of

211
00:08:09,270 --> 00:08:06,160
science fiction and it really was a

212
00:08:11,029 --> 00:08:09,280
beautiful amazing flying machine

213
00:08:13,270 --> 00:08:11,039

i think the reason we're not flying it

214
00:08:14,710 --> 00:08:13,280
is because as beautiful and as amazing

215
00:08:17,189 --> 00:08:14,720
as it was

216
00:08:18,950 --> 00:08:17,199
it did have some design flaws some

217
00:08:21,270 --> 00:08:18,960
things that were weaknesses and the just

218
00:08:22,790 --> 00:08:21,280
the basic way that it was was built and

219
00:08:24,390 --> 00:08:22,800
the way it was launched and there were

220
00:08:25,189 --> 00:08:24,400
some weaknesses particularly with the

221
00:08:29,350 --> 00:08:25,199
heat

222
00:08:31,830 --> 00:08:29,360
and we recognize that loss here just

223
00:08:35,190 --> 00:08:31,840
this week as we remembered the 10 year

224
00:08:37,589 --> 00:08:35,200
anniversary of the loss of space shuttle

225
00:08:39,589 --> 00:08:37,599
columbia that had a damage to the heat

226
00:08:41,269 --> 00:08:39,599
shield that ended up

227
00:08:43,990 --> 00:08:41,279
destroying the shuttle and killing the

228
00:08:45,750 --> 00:08:44,000
seven astronauts and at that time as we

229
00:08:46,870 --> 00:08:45,760
recovered from that ass from that

230
00:08:49,509 --> 00:08:46,880
accident

231
00:08:52,710 --> 00:08:49,519
we realized that the these design

232
00:08:54,630 --> 00:08:52,720
weaknesses were just uh really uh they

233
00:08:57,670 --> 00:08:54,640
were really significant and we needed to

234
00:09:00,310 --> 00:08:57,680
move on to the next generation of of

235
00:09:02,949 --> 00:09:00,320
spacecraft so they made the decision to

236
00:09:05,110 --> 00:09:02,959
stop flying the space shuttles

237
00:09:07,269 --> 00:09:05,120
at the point where we finished building

238
00:09:09,110 --> 00:09:07,279

the space station and we hit that point

239
00:09:10,790 --> 00:09:09,120
a year and a half ago while i was on the

240
00:09:14,389 --> 00:09:10,800
space station we saw space shuttle

241
00:09:16,389 --> 00:09:14,399
atlantis come up for sts-135 and that

242
00:09:18,470 --> 00:09:16,399
was the last shuttle flight

243
00:09:20,630 --> 00:09:18,480
it was sad to see it go for all of us

244
00:09:22,310 --> 00:09:20,640
especially the flu honor and the tens of

245
00:09:23,990 --> 00:09:22,320
thousands of people across the country

246
00:09:25,269 --> 00:09:24,000
that worked on the space shuttle program

247
00:09:27,670 --> 00:09:25,279
through the years

248
00:09:29,350 --> 00:09:27,680
but it was time to uh to go ahead and

249
00:09:31,990 --> 00:09:29,360
move forward with a new vehicle that

250
00:09:33,509 --> 00:09:32,000
would be a little safer

251
00:09:35,190 --> 00:09:33,519
no vehicle will have the kind of

252
00:09:37,110 --> 00:09:35,200
capability that the shuttle had though

253
00:09:40,550 --> 00:09:37,120
with a huge cargo bay

254
00:09:43,350 --> 00:09:40,560
and uh landing uh like a like a like an

255
00:09:45,509 --> 00:09:43,360
aircraft on a runway what a remarkable

256
00:09:47,350 --> 00:09:45,519
capability that was i'm i'm excited and

257
00:09:49,430 --> 00:09:47,360
proud to have been part of it but i look

258
00:09:50,630 --> 00:09:49,440
forward to the to the next vehicles that

259
00:09:52,790 --> 00:09:50,640
are coming

260
00:09:54,230 --> 00:09:52,800
coming along in the years ahead too

261
00:09:56,790 --> 00:09:54,240
because we've got a lot of exciting

262
00:10:00,070 --> 00:09:56,800
times ahead we do and i think also you

263
00:10:02,069 --> 00:10:00,080

know not only we're wanting to

264
00:10:03,910 --> 00:10:02,079
expand so we're wanting to go further

265
00:10:05,030 --> 00:10:03,920
and beyond low earth orbit and so it is

266
00:10:06,310 --> 00:10:05,040
going to take something else to get

267
00:10:08,389 --> 00:10:06,320
absolutely

268
00:10:10,069 --> 00:10:08,399
the space shuttle as cool as it was

269
00:10:11,590 --> 00:10:10,079
would never go to the moon because at

270
00:10:13,750 --> 00:10:11,600
the moon you don't need wings and you

271
00:10:15,670 --> 00:10:13,760
don't need tires

272
00:10:17,509 --> 00:10:15,680
and even mars that has a tiny bit of

273
00:10:19,190 --> 00:10:17,519
atmosphere you would not have landing

274
00:10:21,430 --> 00:10:19,200
systems like the shuttle so you need to

275
00:10:24,230 --> 00:10:21,440
use more of a capsule type of vehicle

276
00:10:26,069 --> 00:10:24,240
and a or a lander type of vehicle so

277
00:10:28,710 --> 00:10:26,079
the the shuttle was great for helping us

278
00:10:31,509 --> 00:10:28,720
build this magnificent space station and

279
00:10:34,230 --> 00:10:31,519
its work is done and so now we have to

280
00:10:36,230 --> 00:10:34,240
visit them in museums

281
00:10:38,310 --> 00:10:36,240
next question okay

282
00:10:40,389 --> 00:10:38,320
what type of manages needs to be

283
00:10:42,230 --> 00:10:40,399
performed on the iss

284
00:10:43,910 --> 00:10:42,240
we have to maintain lots of different

285
00:10:45,269 --> 00:10:43,920
things inside and just like you do at

286
00:10:47,430 --> 00:10:45,279
home we have to do some little house

287
00:10:49,350 --> 00:10:47,440
cleaning about once a week we get out

288
00:10:50,949 --> 00:10:49,360

the vacuum cleaner and we clean well we

289
00:10:53,509 --> 00:10:50,959
don't really have carpets but we clean

290
00:10:54,949 --> 00:10:53,519
the walls and even vacuum the computers

291
00:10:57,509 --> 00:10:54,959
and the air like you have the air

292
00:10:59,190 --> 00:10:57,519
conditioners at home well in space those

293
00:11:00,949 --> 00:10:59,200
are even more important because they

294
00:11:03,350 --> 00:11:00,959
collect all of the dust gets caught in

295
00:11:05,110 --> 00:11:03,360
air conditioner filters and so we have

296
00:11:07,590 --> 00:11:05,120
we have to vacuum those up and keep the

297
00:11:09,509 --> 00:11:07,600
place clean

298
00:11:11,110 --> 00:11:09,519
as well as there's other things

299
00:11:12,470 --> 00:11:11,120
associated with just living and working

300
00:11:13,990 --> 00:11:12,480
up there

301
00:11:15,509 --> 00:11:14,000
just like you might have to do at the

302
00:11:18,069 --> 00:11:15,519
house where something breaks and it's

303
00:11:20,230 --> 00:11:18,079
time to change out the garbage disposal

304
00:11:21,829 --> 00:11:20,240
or work on a leak in the plum

305
00:11:23,430 --> 00:11:21,839
the plumbing someplace and things like

306
00:11:26,790 --> 00:11:23,440
that so we're doing those kind of things

307
00:11:28,389 --> 00:11:26,800
as normal maintenance and preventative

308
00:11:29,590 --> 00:11:28,399
maintenance they call it too we'll go

309
00:11:31,829 --> 00:11:29,600
through and we'll make sure that all the

310
00:11:33,590 --> 00:11:31,839
bolts are tight on the treadmill

311
00:11:36,310 --> 00:11:33,600
so that as we're pounding away on a

312
00:11:37,910 --> 00:11:36,320
treadmill in space we're not shaking

313
00:11:39,190 --> 00:11:37,920

anything loose and then causing some

314
00:11:40,550 --> 00:11:39,200
damage

315
00:11:42,230 --> 00:11:40,560
every once in a while we have to go

316
00:11:44,230 --> 00:11:42,240
outside and do some maintenance on

317
00:11:45,430 --> 00:11:44,240
things we've changed out batteries that

318
00:11:47,590 --> 00:11:45,440
are part of our

319
00:11:48,790 --> 00:11:47,600
our solar array electrical system

320
00:11:50,550 --> 00:11:48,800
outside

321
00:11:52,389 --> 00:11:50,560
we've gone out to fix a

322
00:11:54,470 --> 00:11:52,399
an ammonia leak that was part of the

323
00:11:56,790 --> 00:11:54,480
cooling system outside

324
00:11:59,030 --> 00:11:56,800
sunny williams and aki

325
00:12:01,110 --> 00:11:59,040
hoshide went outside and did some work

326
00:12:02,949 --> 00:12:01,120
on that system a few months back

327
00:12:06,629 --> 00:12:02,959
so it's uh it's

328
00:12:08,470 --> 00:12:06,639
uh it's always uh busy and active times

329
00:12:10,629 --> 00:12:08,480
it is and a lot of this maintenance work

330
00:12:12,550 --> 00:12:10,639
you know it is essential because it's

331
00:12:14,949 --> 00:12:12,560
what enables us

332
00:12:16,790 --> 00:12:14,959
essentially to conduct all the research

333
00:12:19,670 --> 00:12:16,800
that we're doing which is the main

334
00:12:20,949 --> 00:12:19,680
reason for going up there um using that

335
00:12:22,710 --> 00:12:20,959
international space station it is a

336
00:12:24,069 --> 00:12:22,720
laboratory and it's you know it's

337
00:12:26,790 --> 00:12:24,079
something you have to do but it's all

338
00:12:28,870 --> 00:12:26,800

part of what enables us to con continue

339
00:12:31,750 --> 00:12:28,880
that research part of it's also a test

340
00:12:33,670 --> 00:12:31,760
bed as we have systems that

341
00:12:35,269 --> 00:12:33,680
for instance that remove carbon dioxide

342
00:12:37,190 --> 00:12:35,279
from the air because we don't get fresh

343
00:12:38,949 --> 00:12:37,200
air from outside we have to remove that

344
00:12:40,629 --> 00:12:38,959
carbon dioxide that we're breathing out

345
00:12:42,790 --> 00:12:40,639
all the time has to be removed from the

346
00:12:44,150 --> 00:12:42,800
air and that system has caused us some

347
00:12:45,509 --> 00:12:44,160
trouble through the ears and so the

348
00:12:48,310 --> 00:12:45,519
engineers on the ground are trying to

349
00:12:50,150 --> 00:12:48,320
figure out what causes it to fail and

350
00:12:52,470 --> 00:12:50,160
they're working on the next generation

351
00:12:54,389 --> 00:12:52,480
carbon dioxide removal equipment that

352
00:12:56,550 --> 00:12:54,399
won't take as much maintenance

353
00:12:57,910 --> 00:12:56,560
and again on the way to mars someday or

354
00:12:59,590 --> 00:12:57,920
another planet

355
00:13:01,269 --> 00:12:59,600
it's going to be important for you guys

356
00:13:03,750 --> 00:13:01,279
to have a system that you don't have to

357
00:13:05,269 --> 00:13:03,760
call home for for spare parts because

358
00:13:06,710 --> 00:13:05,279
you can't call home

359
00:13:08,710 --> 00:13:06,720
that's right or we can't deliver the

360
00:13:11,829 --> 00:13:08,720
spare parts to you

361
00:13:13,829 --> 00:13:11,839
that's a great question next one

362
00:13:15,190 --> 00:13:13,839
uh what was your favorite space walk in

363
00:13:17,750 --> 00:13:15,200

life

364
00:13:19,190 --> 00:13:17,760
oh my that's that's hard that's really

365
00:13:21,829 --> 00:13:19,200
hard i think

366
00:13:23,829 --> 00:13:21,839
probably my favorite one was was my last

367
00:13:26,470 --> 00:13:23,839
one i did a space walk in

368
00:13:28,069 --> 00:13:26,480
july of 2011 just over a year and a half

369
00:13:30,629 --> 00:13:28,079
ago and that was while space shuttle

370
00:13:33,350 --> 00:13:30,639
atlantis was docked to the space station

371
00:13:35,590 --> 00:13:33,360
it was so cool to we took a broken pump

372
00:13:37,750 --> 00:13:35,600
module from the space station and we put

373
00:13:39,269 --> 00:13:37,760
it in the cargo bay of the shuttle and

374
00:13:42,150 --> 00:13:39,279
we moved the

375
00:13:43,829 --> 00:13:42,160
a new uh science experiment that came up

376
00:13:45,430 --> 00:13:43,839
in the shuttles cargo bay up to the

377
00:13:47,670 --> 00:13:45,440
station where they've been doing that

378
00:13:49,509 --> 00:13:47,680
that work up there and it was so cool

379
00:13:51,910 --> 00:13:49,519
for me that was my seventh spacewalk

380
00:13:53,910 --> 00:13:51,920
i've been outside almost around 48 hours

381
00:13:55,670 --> 00:13:53,920
working outside and it was really

382
00:13:58,310 --> 00:13:55,680
so cool to me to i'd worked as an

383
00:13:59,990 --> 00:13:58,320
engineer on spacewalk procedures and

384
00:14:02,389 --> 00:14:00,000
tools and things

385
00:14:04,870 --> 00:14:02,399
when i was an engineer working at nasa

386
00:14:06,470 --> 00:14:04,880
uh then as an as a astronaut i helped

387
00:14:08,949 --> 00:14:06,480
build the space station and it was

388
00:14:10,629 --> 00:14:08,959

really neat for me on my last flight

389
00:14:13,189 --> 00:14:10,639
while the shuttle was there for its very

390
00:14:15,509 --> 00:14:13,199
last flight to be outside and be in the

391
00:14:17,590 --> 00:14:15,519
cargo bay of space shuttle atlantis

392
00:14:19,269 --> 00:14:17,600
uh and kind of a way of paying tribute

393
00:14:21,189 --> 00:14:19,279
to that uh you know amazing flying

394
00:14:23,110 --> 00:14:21,199
machine one more time and

395
00:14:24,949 --> 00:14:23,120
and uh just kind of got a lot of work

396
00:14:27,030 --> 00:14:24,959
done but i also took a few minutes to

397
00:14:29,670 --> 00:14:27,040
enjoy the experience of of the

398
00:14:32,629 --> 00:14:29,680
incredible view of the earth and the

399
00:14:34,310 --> 00:14:32,639
stars from not looking through big thick

400
00:14:36,710 --> 00:14:34,320
glass windows but through a little

401
00:14:38,470 --> 00:14:36,720
skinny fishbowl of a helmet

402
00:14:39,509 --> 00:14:38,480
and if you ever watched fossum when he

403
00:14:40,949 --> 00:14:39,519
was uh

404
00:14:43,030 --> 00:14:40,959
working aboard the international space

405
00:14:44,230 --> 00:14:43,040
station or any time he end during any of

406
00:14:46,069 --> 00:14:44,240
his space flights i think it would be

407
00:14:47,990 --> 00:14:46,079
very difficult to determine which one he

408
00:14:50,230 --> 00:14:48,000
was was his favorite was it space

409
00:14:51,509 --> 00:14:50,240
walk-in or fixing the plumbing because

410
00:14:53,110 --> 00:14:51,519
he always looked like he was having a

411
00:14:57,430 --> 00:14:53,120
great time up there that's a great

412
00:15:04,069 --> 00:14:59,509
how were you able to communicate with

413
00:15:08,870 --> 00:15:06,150

you bet communicating with my family is

414
00:15:11,590 --> 00:15:08,880
really important i was we threw kind of

415
00:15:13,750 --> 00:15:11,600
a link up with through computer systems

416
00:15:16,150 --> 00:15:13,760
and data systems we can use a we can

417
00:15:17,750 --> 00:15:16,160
call people on a telephone and so i

418
00:15:19,110 --> 00:15:17,760
would talk to my wife

419
00:15:20,870 --> 00:15:19,120
almost every single day i'd have the

420
00:15:23,509 --> 00:15:20,880
chance to talk to my wife

421
00:15:24,870 --> 00:15:23,519
we have four four children and some of

422
00:15:26,230 --> 00:15:24,880
them are out of the house and so i

423
00:15:28,389 --> 00:15:26,240
didn't get to talk to each one of my

424
00:15:30,069 --> 00:15:28,399
kids every single day but i tried to

425
00:15:32,150 --> 00:15:30,079
talk to him every week or so and then

426
00:15:33,269 --> 00:15:32,160
every weekend i had a little video

427
00:15:35,189 --> 00:15:33,279
conference

428
00:15:38,069 --> 00:15:35,199
about at least 15 minutes and usually

429
00:15:40,389 --> 00:15:38,079
longer with my wife and and one or more

430
00:15:42,870 --> 00:15:40,399
of my kids with her and so that's how we

431
00:15:44,629 --> 00:15:42,880
we kept in touch we also had email and

432
00:15:46,389 --> 00:15:44,639
it's not quick email like you're used to

433
00:15:48,150 --> 00:15:46,399
now we certainly couldn't text message

434
00:15:50,470 --> 00:15:48,160
or anything that quickly

435
00:15:55,990 --> 00:15:50,480
but uh but we we did send emails and

436
00:16:01,430 --> 00:15:57,990
what is the most promising research

437
00:16:04,150 --> 00:16:01,440
being conducted on the iss

438
00:16:06,230 --> 00:16:04,160

oh cool that that that one i have to

439
00:16:08,389 --> 00:16:06,240
think about for just a second i think

440
00:16:11,829 --> 00:16:08,399
the the health things that we were

441
00:16:13,110 --> 00:16:11,839
working on with bone health we lose bone

442
00:16:15,910 --> 00:16:13,120
in space

443
00:16:18,230 --> 00:16:15,920
10 times faster than an osteoporotic 80

444
00:16:20,790 --> 00:16:18,240
year old woman which is pretty pretty

445
00:16:22,230 --> 00:16:20,800
fast and so if we don't take these

446
00:16:24,470 --> 00:16:22,240
countermeasures and so i think it's

447
00:16:26,870 --> 00:16:24,480
really exciting to know that with

448
00:16:28,470 --> 00:16:26,880
with you know really with good exercise

449
00:16:31,670 --> 00:16:28,480
and with some of the medications and i

450
00:16:34,069 --> 00:16:31,680
was a guinea pig for a medicine

451
00:16:35,670 --> 00:16:34,079
that you can really stop this you can

452
00:16:37,749 --> 00:16:35,680
halt this and control it and that that

453
00:16:39,990 --> 00:16:37,759
kind of thing's exciting a lot of the

454
00:16:41,910 --> 00:16:40,000
other research that was going on

455
00:16:43,990 --> 00:16:41,920
uh had to do with the material science

456
00:16:45,509 --> 00:16:44,000
where we were loading samples in a

457
00:16:47,430 --> 00:16:45,519
furnace and then while we're sleeping

458
00:16:49,509 --> 00:16:47,440
overnight the ground is turning on that

459
00:16:52,230 --> 00:16:49,519
furnace and getting it so hot it melts

460
00:16:53,829 --> 00:16:52,240
the the metal samples in there and then

461
00:16:55,430 --> 00:16:53,839
cools them down in a certain way as

462
00:16:58,069 --> 00:16:55,440
they're learning how to build

463
00:16:59,670 --> 00:16:58,079

uh different compounds because they as

464
00:17:01,910 --> 00:16:59,680
they they don't get the same kind of

465
00:17:03,749 --> 00:17:01,920
mixing you get in gravity

466
00:17:06,470 --> 00:17:03,759
there was also a really cool fluid

467
00:17:09,429 --> 00:17:06,480
dynamics experiment it was like a fluid

468
00:17:11,590 --> 00:17:09,439
that had microscopic strands of plastic

469
00:17:13,510 --> 00:17:11,600
in it they call them a polymer and they

470
00:17:15,029 --> 00:17:13,520
were doing a dynamic test and that i

471
00:17:17,110 --> 00:17:15,039
could see in a lot of the science we

472
00:17:19,669 --> 00:17:17,120
don't really get to see it happening but

473
00:17:21,669 --> 00:17:19,679
this one i was helping settle all up and

474
00:17:23,189 --> 00:17:21,679
i'd get the sample in this test chamber

475
00:17:26,230 --> 00:17:23,199
and then it would start to spin this

476
00:17:28,150 --> 00:17:26,240
little blob about the size of a bean

477
00:17:30,710 --> 00:17:28,160
inside there and they would be twisting

478
00:17:32,789 --> 00:17:30,720
those microscopic plastic fibers and

479
00:17:36,150 --> 00:17:32,799
then they stretched it now this that

480
00:17:37,909 --> 00:17:36,160
would form a really thin strand and in

481
00:17:39,669 --> 00:17:37,919
gravity that's strange just

482
00:17:41,669 --> 00:17:39,679
like silly putty but

483
00:17:43,990 --> 00:17:41,679
then and in gravity it would just

484
00:17:45,590 --> 00:17:44,000
collapse but in in the microgravity

485
00:17:47,990 --> 00:17:45,600
environment up there they would pull

486
00:17:50,710 --> 00:17:48,000
this strand out two feet long and they'd

487
00:17:52,710 --> 00:17:50,720
be able to measure the tension the pull

488
00:17:54,789 --> 00:17:52,720

in there and by doing that they

489
00:17:57,430 --> 00:17:54,799
understand the basic physics of this

490
00:17:59,110 --> 00:17:57,440
kind of of a special fluid that's

491
00:18:01,190 --> 00:17:59,120
important for them

492
00:18:02,789 --> 00:18:01,200
petrochemical and plastic industries

493
00:18:04,549 --> 00:18:02,799
that use these kind of fluids in their

494
00:18:06,470 --> 00:18:04,559
production processes

495
00:18:08,070 --> 00:18:06,480
and so they wanted to know more about

496
00:18:10,390 --> 00:18:08,080
exactly how this stuff works and so

497
00:18:12,390 --> 00:18:10,400
that's fundamental science i'm not sure

498
00:18:13,990 --> 00:18:12,400
what it'll be used for but the research

499
00:18:15,110 --> 00:18:14,000
team on the ground was really excited

500
00:18:16,549 --> 00:18:15,120
about the

501
00:18:18,070 --> 00:18:16,559
the the science that we were able to

502
00:18:19,029 --> 00:18:18,080
accomplish so it was cool to be part of

503
00:18:20,549 --> 00:18:19,039
that

504
00:18:22,070 --> 00:18:20,559
if you look up any of your materials and

505
00:18:25,510 --> 00:18:22,080
look at polymers

506
00:18:26,549 --> 00:18:25,520
oh yeah there's lots of stuff on the web

507
00:18:29,909 --> 00:18:26,559
absolutely

508
00:18:37,190 --> 00:18:34,870
what what spacecraft replace the shuttle

509
00:18:38,150 --> 00:18:37,200
well that's a tricky question the

510
00:18:40,150 --> 00:18:38,160
shuttle

511
00:18:42,310 --> 00:18:40,160
had so many capabilities no one

512
00:18:45,110 --> 00:18:42,320
spacecraft is going to replace the space

513
00:18:47,510 --> 00:18:45,120

shuttle right now when i when i traveled

514
00:18:49,590 --> 00:18:47,520
to and from the space station i traveled

515
00:18:51,669 --> 00:18:49,600
on a russian soyuz rocket launching out

516
00:18:54,230 --> 00:18:51,679
of a country called kazakhstan on a

517
00:18:56,310 --> 00:18:54,240
place called baikonur cosmodrome we

518
00:18:58,549 --> 00:18:56,320
launched from the same launch pad that

519
00:19:01,110 --> 00:18:58,559
eureka guerin the first human in space

520
00:19:02,950 --> 00:19:01,120
launched from over 50 years ago

521
00:19:06,630 --> 00:19:02,960
so it was pretty cool to be part of that

522
00:19:08,150 --> 00:19:06,640
historical uh program and be another a

523
00:19:09,830 --> 00:19:08,160
person in there

524
00:19:12,470 --> 00:19:09,840
we've had several different vehicles

525
00:19:14,230 --> 00:19:12,480
that are providing cargo to the space

526
00:19:16,549 --> 00:19:14,240
station

527
00:19:18,630 --> 00:19:16,559
japan has a cargo vehicle the europe

528
00:19:21,110 --> 00:19:18,640
european space agency has a cargo

529
00:19:23,590 --> 00:19:21,120
vehicle a private american company

530
00:19:25,990 --> 00:19:23,600
called space exploration has a cargo

531
00:19:28,710 --> 00:19:26,000
vehicle that's been there twice now uh

532
00:19:30,710 --> 00:19:28,720
other other companies have

533
00:19:33,430 --> 00:19:30,720
have cargo ships that are really close

534
00:19:35,590 --> 00:19:33,440
to flying a company called orbital has

535
00:19:37,029 --> 00:19:35,600
one that's very close to flying and then

536
00:19:39,430 --> 00:19:37,039
hopefully in the next few months they'll

537
00:19:41,190 --> 00:19:39,440
get up there these guys are several of

538
00:19:43,909 --> 00:19:41,200

them are also working on

539
00:19:45,750 --> 00:19:43,919
human vehicles using kind of their cargo

540
00:19:47,990 --> 00:19:45,760
ship as the first step and then

541
00:19:49,830 --> 00:19:48,000
developing that into

542
00:19:52,310 --> 00:19:49,840
into a ship that could take people up

543
00:19:55,110 --> 00:19:52,320
there again it won't replace the shuttle

544
00:19:57,830 --> 00:19:55,120
with a great big majestic uh

545
00:19:59,430 --> 00:19:57,840
spaceship with seven people at a time

546
00:20:01,990 --> 00:19:59,440
but we're working on those things and

547
00:20:05,590 --> 00:20:02,000
inside nasa we're working on

548
00:20:07,750 --> 00:20:05,600
other spacecraft that can go beyond

549
00:20:10,149 --> 00:20:07,760
the 200 miles that we'd go to to the

550
00:20:12,149 --> 00:20:10,159
space station so we're working private

551
00:20:14,149 --> 00:20:12,159
companies are working on on

552
00:20:16,310 --> 00:20:14,159
options to provide

553
00:20:18,070 --> 00:20:16,320
ways for people to get to and from low

554
00:20:20,870 --> 00:20:18,080
earth orbit as we call it the space

555
00:20:23,110 --> 00:20:20,880
station is that that 200 to 250 miles in

556
00:20:24,950 --> 00:20:23,120
altitude but the moon is a lot further

557
00:20:26,630 --> 00:20:24,960
away and mars is much further than that

558
00:20:29,430 --> 00:20:26,640
so we're working on

559
00:20:31,029 --> 00:20:29,440
another vehicle within nasa more that

560
00:20:33,190 --> 00:20:31,039
that will be able to go further and

561
00:20:36,630 --> 00:20:33,200
support the the exploration goals that

562
00:20:40,149 --> 00:20:39,029
and amico this is nasa the digital

563
00:20:41,669 --> 00:20:40,159

learning network just want to let you

564
00:20:43,909 --> 00:20:41,679
know we have about two minutes left so

565
00:20:46,549 --> 00:20:43,919
maybe one or possibly two questions okay

566
00:20:51,110 --> 00:20:46,559
okay good job we're ready

567
00:20:52,630 --> 00:20:51,120
go ahead how do did you earn the nasa

568
00:20:58,390 --> 00:20:52,640
except

569
00:20:59,909 --> 00:20:58,400
great question it's i'm proud to have

570
00:21:01,750 --> 00:20:59,919
been awarded that

571
00:21:03,190 --> 00:21:01,760
it's one of the awards that uh they're

572
00:21:05,909 --> 00:21:03,200
available for people that are just

573
00:21:07,430 --> 00:21:05,919
working hard and doing their job and and

574
00:21:09,350 --> 00:21:07,440
and kind of standing out i'm i was

575
00:21:11,590 --> 00:21:09,360
fortunate to be recognized for my

576
00:21:14,070 --> 00:21:11,600
contributions and lots of you know great

577
00:21:16,549 --> 00:21:14,080
people not just astronauts but other the

578
00:21:18,950 --> 00:21:16,559
great people that work at nasa you know

579
00:21:20,870 --> 00:21:18,960
get that award so it's a it's a great

580
00:21:23,750 --> 00:21:20,880
great honor for me and and to share that

581
00:21:27,029 --> 00:21:23,760
honor with lots of other people

582
00:21:29,029 --> 00:21:27,039
okay i think we can squeeze in one more

583
00:21:31,990 --> 00:21:29,039
why did you find it necessary to

584
00:21:33,669 --> 00:21:32,000
construct a replacement protocol for the

585
00:21:35,590 --> 00:21:33,679
source

586
00:21:38,870 --> 00:21:35,600
as an emergency

587
00:21:41,110 --> 00:21:38,880
escape vehicle okay well i worked on the

588
00:21:41,830 --> 00:21:41,120

x-38

589
00:21:43,909 --> 00:21:41,840
and

590
00:21:45,510 --> 00:21:43,919
through the space station program as

591
00:21:47,350 --> 00:21:45,520
this partnership has evolved we've had

592
00:21:48,710 --> 00:21:47,360
lots of different countries and partner

593
00:21:51,190 --> 00:21:48,720
nations that are bringing different

594
00:21:53,510 --> 00:21:51,200
capabilities and one of the things an

595
00:21:55,909 --> 00:21:53,520
idea that we worked on here in it at

596
00:21:59,510 --> 00:21:55,919
nasa was called the x-38

597
00:22:00,870 --> 00:21:59,520
as a crew escape vehicle uh and uh it

598
00:22:02,630 --> 00:22:00,880
was something we tried out and went

599
00:22:05,350 --> 00:22:02,640
aways with it and then decided to move

600
00:22:07,590 --> 00:22:05,360
off in in different directions and since

601
00:22:09,990 --> 00:22:07,600
then we were using the russian soyuz

602
00:22:12,710 --> 00:22:10,000
spacecraft to be our emergency escape

603
00:22:14,710 --> 00:22:12,720
vehicle it's our ride up and our ride

604
00:22:16,230 --> 00:22:14,720
down and we could use it we could jump

605
00:22:18,230 --> 00:22:16,240
in there and leave at any moment if

606
00:22:19,830 --> 00:22:18,240
there's a big problem on the space

607
00:22:21,270 --> 00:22:19,840
station we could leave at any moment and

608
00:22:22,549 --> 00:22:21,280
that's important we have to have a way

609
00:22:24,390 --> 00:22:22,559
out

610
00:22:26,310 --> 00:22:24,400
at the same time we're working on like i

611
00:22:29,270 --> 00:22:26,320
said some of these other companies uh

612
00:22:31,350 --> 00:22:29,280
are working on another are other options

613
00:22:33,190 --> 00:22:31,360

that we could use on the space station

614
00:22:35,190 --> 00:22:33,200
besides just using the russian soyuz

615
00:22:37,110 --> 00:22:35,200
spacecraft so we're we're learning as we

616
00:22:39,590 --> 00:22:37,120
go we're trying out some ideas some of

617
00:22:41,669 --> 00:22:39,600
them are working out some of them

618
00:22:43,430 --> 00:22:41,679
we we decide to step away from and try

619
00:22:45,350 --> 00:22:43,440
something else

620
00:22:47,029 --> 00:22:45,360
hey you guys have had a bunch of great

621
00:22:48,549 --> 00:22:47,039
questions today i think they're out of

622
00:22:50,710 --> 00:22:48,559
time and they're gonna pull the plug on

623
00:22:52,549 --> 00:22:50,720
us but uh thank you very much your

624
00:22:54,310 --> 00:22:52,559
questions are great i can tell you've

625
00:22:56,630 --> 00:22:54,320
been doing your homework which is half

626
00:22:59,270 --> 00:22:56,640
the battle you've been studying you've

627
00:23:01,430 --> 00:22:59,280
been studying and getting and asking

628
00:23:02,870 --> 00:23:01,440
some really solid questions that show

629
00:23:05,830 --> 00:23:02,880
that you're you're getting a lot of good

630
00:23:07,830 --> 00:23:05,840
understanding of our business here and i

631
00:23:10,310 --> 00:23:07,840
hope you can see where you might fit

632
00:23:12,149 --> 00:23:10,320
into this business in the years ahead

633
00:23:14,630 --> 00:23:12,159
nasa is an exciting place to work the

634
00:23:16,710 --> 00:23:14,640
human space flight business is uh

635
00:23:18,710 --> 00:23:16,720
is just one of the greatest challenges

636
00:23:21,190 --> 00:23:18,720
and and most exciting things that i can

637
00:23:22,789 --> 00:23:21,200
imagine doing i'm excited to have been

638
00:23:24,950 --> 00:23:22,799

here and i know amico and all the other

639
00:23:27,430 --> 00:23:24,960
people that work at johnson space center

640
00:23:29,350 --> 00:23:27,440
are excited to be here continuing to

641
00:23:30,789 --> 00:23:29,360
operate the space station from this room

642
00:23:32,230 --> 00:23:30,799
that we're sitting in right now in

643
00:23:34,390 --> 00:23:32,240
mission control

644
00:23:36,070 --> 00:23:34,400
and uh and getting ready to to help

645
00:23:39,510 --> 00:23:36,080
operate the the other vehicles in the

646
00:23:42,390 --> 00:23:39,520
future and get ready for you guys

647
00:23:44,230 --> 00:23:42,400
thanks it was great talking to you guys

648
00:23:46,789 --> 00:23:44,240
thank you so much

649
00:23:48,549 --> 00:23:46,799
thank you you bet thank you very much