



1
00:00:05,430 --> 00:00:02,790
station this is houston are you ready

2
00:00:05,440 --> 00:00:09,270
we are ready for the event

3
00:00:16,150 --> 00:00:11,350
facebook this is mission control houston

4
00:00:19,510 --> 00:00:17,750
all right station this is mark

5
00:00:22,230 --> 00:00:19,520
zuckerberg at facebook can you hear me

6
00:00:28,790 --> 00:00:24,070
hey mark ready loud and clear it's a

7
00:00:31,669 --> 00:00:30,470
it's great to talk to you guys too i

8
00:00:33,270 --> 00:00:31,679
have to say when you're building

9
00:00:36,310 --> 00:00:33,280
products to try to connect everyone in

10
00:00:38,310 --> 00:00:36,320
the world um connecting folks who are

11
00:00:40,709 --> 00:00:38,320
out in space

12
00:00:41,990 --> 00:00:40,719
is about as extreme and cool as it gets

13
00:00:43,990 --> 00:00:42,000

so it's it's awesome to have the

14

00:00:47,190 --> 00:00:44,000

opportunity to talk to you guys today

15

00:00:50,790 --> 00:00:48,470

so it's our pleasure i think we should

16

00:00:53,430 --> 00:00:50,800

start by can you

17

00:00:55,110 --> 00:00:53,440

can you um introduce yourselves and your

18

00:00:58,709 --> 00:00:55,120

roles and how long you've been working

19

00:01:02,069 --> 00:01:00,709

yeah sure my name is tim copper i'm the

20

00:01:04,950 --> 00:01:02,079

commander of the international space

21

00:01:07,830 --> 00:01:04,960

station for expedition 47. tim peake and

22

00:01:10,149 --> 00:01:07,840

i arrived on the 15th of december and

23

00:01:12,630 --> 00:01:10,159

we've been working up here for about 169

24

00:01:13,590 --> 00:01:12,640

days what a great place to uh to work

25

00:01:15,910 --> 00:01:13,600

and live

26

00:01:18,390 --> 00:01:15,920

and uh tim peake is is uh one of our

27

00:01:20,149 --> 00:01:18,400

flight engineers jeff williams is a

28

00:01:22,789 --> 00:01:20,159

flight engineer as well just arrived a

29

00:01:24,950 --> 00:01:22,799

couple months ago and uh this is his

30

00:01:27,270 --> 00:01:24,960

fourth flight in space third time on the

31

00:01:29,830 --> 00:01:27,280

space station so a great person to have

32

00:01:32,149 --> 00:01:29,840

on board this is my second flight tim's

33

00:01:34,230 --> 00:01:32,159

first flight here and we have three

34

00:01:35,749 --> 00:01:34,240

cosmonauts on board two that are at the

35

00:01:38,069 --> 00:01:35,759

other end of station

36

00:01:41,830 --> 00:01:38,079

that make our compliment of a six-person

37

00:01:43,590 --> 00:01:42,789

nice

38

00:01:45,030 --> 00:01:43,600

so

39

00:01:47,109 --> 00:01:45,040

let's start with a couple of questions

40

00:01:49,190 --> 00:01:47,119

here about the science that you're doing

41

00:01:51,749 --> 00:01:49,200

on board the space station so what kind

42

00:01:55,910 --> 00:01:51,759

of research are you doing in space that

43

00:02:00,630 --> 00:01:58,149

that's a great question mark you know

44

00:02:01,910 --> 00:02:00,640

one of the main things that we do is try

45

00:02:04,069 --> 00:02:01,920

to understand

46

00:02:06,469 --> 00:02:04,079

the impacts of zero gravity on the human

47

00:02:08,869 --> 00:02:06,479

body a lot of negative impacts and so in

48

00:02:10,710 --> 00:02:08,879

large measure we're an experiment so we

49

00:02:13,430 --> 00:02:10,720

exercise a couple hours every day which

50

00:02:16,309 --> 00:02:13,440

is a mitigation for the loss of bone

51
00:02:18,070 --> 00:02:16,319
density and muscle mass we have our eyes

52
00:02:20,710 --> 00:02:18,080
scanned because there's issues with your

53
00:02:22,550 --> 00:02:20,720
eyes as a consequence of zero gravity

54
00:02:24,150 --> 00:02:22,560
and several other things that we do on

55
00:02:25,990 --> 00:02:24,160
board to try to make sure that when we

56
00:02:28,470 --> 00:02:26,000
go beyond low earth orbit we fully

57
00:02:30,630 --> 00:02:28,480
understand the implications of zero

58
00:02:32,710 --> 00:02:30,640
gravity on the human body but well

59
00:02:34,869 --> 00:02:32,720
beyond that we do lots of basic research

60
00:02:37,750 --> 00:02:34,879
up here as well because when you remove

61
00:02:40,070 --> 00:02:37,760
the zero the gravity component to a lot

62
00:02:41,830 --> 00:02:40,080
of physical phenomena you learn a lot of

63
00:02:44,470 --> 00:02:41,840

things so we have physical science

64

00:02:47,670 --> 00:02:44,480

experiments that range from combustion

65

00:02:50,470 --> 00:02:47,680

to uh to fluid flow to microbiology and

66

00:02:52,869 --> 00:02:50,480

so we're learning a ton and we expect

67

00:02:58,149 --> 00:02:52,879

that to pay dividends long term in terms

68

00:03:02,470 --> 00:03:00,390

all right so i'm curious to hear about

69

00:03:04,229 --> 00:03:02,480

what kind of technology you guys are

70

00:03:05,670 --> 00:03:04,239

working on that's going to help us

71

00:03:07,509 --> 00:03:05,680

travel to mars

72

00:03:08,869 --> 00:03:07,519

beyond of course all the communication

73

00:03:11,110 --> 00:03:08,879

technology that we're working on to be

74

00:03:15,430 --> 00:03:11,120

able to connect with you guys

75

00:03:20,309 --> 00:03:17,910

well i think in general the iss program

76

00:03:22,710 --> 00:03:20,319

is a big achievement in terms of the

77

00:03:25,270 --> 00:03:22,720

path to future exploration i mean just

78

00:03:26,869 --> 00:03:25,280

building and running and maintaining

79

00:03:28,630 --> 00:03:26,879

logistically

80

00:03:30,309 --> 00:03:28,640

learning how to operate it day to day

81

00:03:31,830 --> 00:03:30,319

and for the long term for years to come

82

00:03:33,830 --> 00:03:31,840

all that's going to support future

83

00:03:35,270 --> 00:03:33,840

exploration no matter where we go of

84

00:03:37,030 --> 00:03:35,280

course

85

00:03:38,789 --> 00:03:37,040

an example that's been in the news here

86

00:03:41,670 --> 00:03:38,799

recently especially in the last couple

87

00:03:43,750 --> 00:03:41,680

of weeks is the the beam module uh the

88

00:03:45,589 --> 00:03:43,760

inflatable module which we're we've got

89

00:03:47,030 --> 00:03:45,599

inflated now and we're going to outfit

90

00:03:48,789 --> 00:03:47,040

it instrument it

91

00:03:50,229 --> 00:03:48,799

it's a new technology which will of

92

00:03:53,910 --> 00:03:50,239

course allow

93

00:03:56,149 --> 00:03:53,920

greater volumes to to be launched

94

00:03:57,429 --> 00:03:56,159

with fewer launches

95

00:03:59,750 --> 00:03:57,439

and of course it's going to take a lot

96

00:04:01,750 --> 00:03:59,760

of volume to send a crew

97

00:04:07,030 --> 00:04:01,760

away from earth no matter where the

98

00:04:09,990 --> 00:04:08,710

all right so let's take some questions

99

00:04:11,270 --> 00:04:10,000

from the thread and by the way it's

100

00:04:13,750 --> 00:04:11,280

awesome to see the microphone just

101
00:04:15,270 --> 00:04:13,760
flying around over there that is not

102
00:04:17,909 --> 00:04:15,280
something that i'm used to

103
00:04:19,430 --> 00:04:17,919
even in our virtual reality lab where we

104
00:04:21,749 --> 00:04:19,440
can make stuff like that we just haven't

105
00:04:23,830 --> 00:04:21,759
yet um so let's go to the thread so we

106
00:04:25,909 --> 00:04:23,840
got a question from hakeem which is

107
00:04:28,310 --> 00:04:25,919
obviously astronauts trained extensively

108
00:04:29,990 --> 00:04:28,320
for this kind of a mission but is there

109
00:04:32,950 --> 00:04:30,000
anything in particular that you weren't

110
00:04:37,909 --> 00:04:32,960
expecting or that surprised you

111
00:04:41,990 --> 00:04:39,749
yeah that's a good question and for

112
00:04:44,150 --> 00:04:42,000
myself as a you know a rookie astronaut

113
00:04:46,390 --> 00:04:44,160

on my first flight there were so many

114

00:04:48,390 --> 00:04:46,400

new experiences you know the training is

115

00:04:50,390 --> 00:04:48,400

phenomenal and we have a wonderful

116

00:04:52,629 --> 00:04:50,400

training team all around the world in

117

00:04:54,870 --> 00:04:52,639

all of our international partner sites

118

00:04:57,189 --> 00:04:54,880

um but it's the real experience of you

119

00:04:59,510 --> 00:04:57,199

know launching in a sawyer's rocket and

120

00:05:01,830 --> 00:04:59,520

seeing that first orbit of planet earth

121

00:05:04,390 --> 00:05:01,840

going through sunset seeing a moon rise

122

00:05:06,150 --> 00:05:04,400

seeing a sunrise um it's just you can't

123

00:05:08,790 --> 00:05:06,160

put into words how beautiful the planet

124

00:05:11,270 --> 00:05:08,800

is from up here and also having the the

125

00:05:12,710 --> 00:05:11,280

privilege of seeing it change over the

126

00:05:14,870 --> 00:05:12,720

nearly six months that we've been up

127

00:05:17,029 --> 00:05:14,880

here now already and seeing the northern

128

00:05:19,350 --> 00:05:17,039

hemisphere going from winter to summer

129

00:05:21,590 --> 00:05:19,360

seeing thunderstorms at nighttime

130

00:05:23,990 --> 00:05:21,600

the aurora i mean it's just absolutely

131

00:05:25,590 --> 00:05:24,000

incredible so i think it's all of those

132

00:05:30,469 --> 00:05:25,600

kind of elements that the training

133

00:05:33,670 --> 00:05:31,590

you know i have to say i think it's

134

00:05:35,990 --> 00:05:33,680

amazing how precise everything that you

135

00:05:37,909 --> 00:05:36,000

guys do has to be so just getting ready

136

00:05:39,430 --> 00:05:37,919

for this live today which by the way is

137

00:05:41,749 --> 00:05:39,440

the first live that we've ever done to

138

00:05:43,510 --> 00:05:41,759

outer space so that that is awesome um

139

00:05:45,430 --> 00:05:43,520

you know normally at facebook sometimes

140

00:05:47,990 --> 00:05:45,440

we run a few minutes early or a few

141

00:05:50,230 --> 00:05:48,000

minutes late and i know our team asked

142

00:05:51,590 --> 00:05:50,240

ground control mission control

143

00:05:53,670 --> 00:05:51,600

you know if it was cool if we started a

144

00:05:55,990 --> 00:05:53,680

little late and they responded like yeah

145

00:05:58,390 --> 00:05:56,000

sometimes we start as much as 10 seconds

146

00:05:59,990 --> 00:05:58,400

late in our events and um and i just

147

00:06:02,710 --> 00:06:00,000

thought that that was the funniest thing

148

00:06:04,390 --> 00:06:02,720

um but it's amazing how precise you guys

149

00:06:06,950 --> 00:06:04,400

uh need need to be in everything that

150

00:06:08,230 --> 00:06:06,960

you do to make things run run safely

151
00:06:09,029 --> 00:06:08,240
um

152
00:06:12,710 --> 00:06:09,039
so

153
00:06:14,710 --> 00:06:12,720
next question that we should we should

154
00:06:16,950 --> 00:06:14,720
go to we on the thread

155
00:06:19,270 --> 00:06:16,960
martha has written in

156
00:06:21,110 --> 00:06:19,280
my second grade students in florida

157
00:06:22,790 --> 00:06:21,120
which is a teacher want to know

158
00:06:24,390 --> 00:06:22,800
how do you talk to each other if you're

159
00:06:28,469 --> 00:06:24,400
all from different countries and speak

160
00:06:32,390 --> 00:06:29,430
we know

161
00:06:36,469 --> 00:06:32,400
we do speak different languages up here

162
00:06:38,710 --> 00:06:36,479
tim speaks british oh we speak american

163
00:06:41,749 --> 00:06:38,720

no but seriously we have three russian

164

00:06:43,830 --> 00:06:41,759

cosmonauts on board and uh we've had a

165

00:06:45,430 --> 00:06:43,840

whole host of different international

166

00:06:47,830 --> 00:06:45,440

astronauts up here

167

00:06:50,950 --> 00:06:47,840

japanese

168

00:06:52,870 --> 00:06:50,960

germans all kinds of european astronauts

169

00:06:55,270 --> 00:06:52,880

and as a consequence you know we have to

170

00:06:56,790 --> 00:06:55,280

be able to communicate but typically

171

00:06:58,070 --> 00:06:56,800

when we do our training

172

00:07:00,390 --> 00:06:58,080

if it's uh

173

00:07:02,150 --> 00:07:00,400

german or japanese or canadian or

174

00:07:04,870 --> 00:07:02,160

american training we speak english when

175

00:07:07,589 --> 00:07:04,880

we go to russia we speak in russian and

176

00:07:10,870 --> 00:07:07,599

so we all speak russian to varying

177

00:07:12,469 --> 00:07:10,880

degrees of skill level our russian

178

00:07:14,629 --> 00:07:12,479

cosmonaut friends

179

00:07:16,870 --> 00:07:14,639

speak english very well and so when we

180

00:07:19,110 --> 00:07:16,880

get together typically on board you know

181

00:07:21,589 --> 00:07:19,120

we'll speak either russian or english or

182

00:07:23,510 --> 00:07:21,599

maybe a ruthless a combination of both

183

00:07:25,430 --> 00:07:23,520

but uh it's very important for us to

184

00:07:26,469 --> 00:07:25,440

communicate and in fact that's probably

185

00:07:28,950 --> 00:07:26,479

the biggest

186

00:07:30,710 --> 00:07:28,960

uh aspect of our job up here is to make

187

00:07:32,550 --> 00:07:30,720

sure that everybody is on board and

188

00:07:34,469 --> 00:07:32,560

synchronized just like you said it's

189

00:07:36,390 --> 00:07:34,479

important to be on time and to have

190

00:07:38,070 --> 00:07:36,400

things done well but that's all done

191

00:07:40,390 --> 00:07:38,080

through effective communication and

192

00:07:42,309 --> 00:07:40,400

that's really done by us knowing each

193

00:07:44,629 --> 00:07:42,319

other's languages at least russian and

194

00:07:49,029 --> 00:07:44,639

english well enough that we can train in

195

00:07:53,350 --> 00:07:51,270

very impressive so in addition to being

196

00:07:55,110 --> 00:07:53,360

top scientists and in great shape and

197

00:07:57,589 --> 00:07:55,120

very precise operationally you also need

198

00:07:59,430 --> 00:07:57,599

to be linguists so so let's go to

199

00:08:01,589 --> 00:07:59,440

another question on on the thread which

200

00:08:10,150 --> 00:08:01,599

is a little more fun is do food and

201
00:08:13,430 --> 00:08:11,909
most astronauts that have been up here

202
00:08:16,150 --> 00:08:13,440
over the years will say that their

203
00:08:18,710 --> 00:08:16,160
tastes change a little bit um i think it

204
00:08:20,869 --> 00:08:18,720
has to do mostly with uh we kind of get

205
00:08:23,110 --> 00:08:20,879
a fullness in the head uh due to the

206
00:08:27,110 --> 00:08:23,120
environment we have a fluid shift of our

207
00:08:28,469 --> 00:08:27,120
body because the gravity is not pulling

208
00:08:30,629 --> 00:08:28,479
down

209
00:08:32,870 --> 00:08:30,639
so that sometimes results in a

210
00:08:34,310 --> 00:08:32,880
stuffiness or whatnot so maybe our

211
00:08:36,709 --> 00:08:34,320
tastes

212
00:08:37,509 --> 00:08:36,719
are attenuated a little bit

213
00:08:40,630 --> 00:08:37,519

so

214

00:08:43,029 --> 00:08:40,640

most of us like to have spicier food up

215

00:08:46,710 --> 00:08:44,949

the food can taste a little bland so

216

00:08:47,990 --> 00:08:46,720

we'll we'll spice it up a little bit on

217

00:08:49,990 --> 00:08:48,000

our own

218

00:08:51,750 --> 00:08:50,000

so i would say food does taste a little

219

00:08:53,829 --> 00:08:51,760

bit different we by the way have a wide

220

00:08:55,829 --> 00:08:53,839

variety of food on board

221

00:08:57,910 --> 00:08:55,839

from all different countries

222

00:09:00,389 --> 00:08:57,920

from the partner countries represented

223

00:09:04,550 --> 00:09:00,399

in all the partners so the food up here

224

00:09:04,560 --> 00:09:12,949

and is astronaut ice cream a real thing

225

00:09:16,870 --> 00:09:14,949

we know that the ashford ice cream that

226

00:09:19,269 --> 00:09:16,880

you buy in the gift store that powdery

227

00:09:22,230 --> 00:09:19,279

stuff yeah that's not real but we've had

228

00:09:23,990 --> 00:09:22,240

ice cream on board when spacex came up

229

00:09:25,829 --> 00:09:24,000

they delivered a bunch of ice cream and

230

00:09:27,509 --> 00:09:25,839

a freezer so that's been quite the treat

231

00:09:29,590 --> 00:09:27,519

i think we're down to our last few bars

232

00:09:31,590 --> 00:09:29,600

we're trying to ration it so that's the

233

00:09:34,630 --> 00:09:31,600

real ice cream and that's quite a treat

234

00:09:36,790 --> 00:09:35,670

awesome

235

00:09:39,509 --> 00:09:36,800

all right so i want to make sure that we

236

00:09:41,110 --> 00:09:39,519

get back to our our live community um

237

00:09:43,269 --> 00:09:41,120

because this is their you know the first

238

00:09:46,150 --> 00:09:43,279

chance that we've had to stream live to

239

00:09:48,710 --> 00:09:46,160

space um so rob has a question uh which

240

00:09:50,389 --> 00:09:48,720

is what advice can you give aspiring

241

00:09:52,550 --> 00:09:50,399

explorers like me

242

00:09:54,790 --> 00:09:52,560

regarding how you got to be where you

243

00:09:58,949 --> 00:09:54,800

are today on board the international

244

00:10:02,310 --> 00:10:00,550

you know that's a question we get asked

245

00:10:04,470 --> 00:10:02,320

quite a lot and if you look at the

246

00:10:06,470 --> 00:10:04,480

astronaut core not just in one country

247

00:10:08,550 --> 00:10:06,480

but all over the world we all come from

248

00:10:10,389 --> 00:10:08,560

so many different backgrounds some

249

00:10:12,949 --> 00:10:10,399

people have come from scientific from

250

00:10:15,509 --> 00:10:12,959

engineering from aviation medical

251
00:10:17,430 --> 00:10:15,519
doctors maybe teachers the one thing

252
00:10:20,150 --> 00:10:17,440
that we share in common is that we're

253
00:10:22,470 --> 00:10:20,160
very passionate about what we do

254
00:10:24,310 --> 00:10:22,480
and we've worked as hard as we can to

255
00:10:26,389 --> 00:10:24,320
get where we are so to any young people

256
00:10:28,069 --> 00:10:26,399
who are aspiring to become an astronaut

257
00:10:30,710 --> 00:10:28,079
to become explorers or just to go into

258
00:10:32,150 --> 00:10:30,720
the space industry i would say just you

259
00:10:33,110 --> 00:10:32,160
know focus on what it is that you're

260
00:10:34,710 --> 00:10:33,120
good at

261
00:10:36,069 --> 00:10:34,720
and what you enjoy because if you enjoy

262
00:10:37,110 --> 00:10:36,079
something that's what you tend to be

263
00:10:39,269 --> 00:10:37,120

best at

264

00:10:40,790 --> 00:10:39,279

work hard at it be passionate about it

265

00:10:44,710 --> 00:10:40,800

and you know you'll get where you'll get

266

00:10:48,069 --> 00:10:46,150

yeah i agree i think it's a lot of the

267

00:10:49,030 --> 00:10:48,079

same stuff for becoming an entrepreneur

268

00:10:50,710 --> 00:10:49,040

as well

269

00:10:52,389 --> 00:10:50,720

uh so you know one question that i have

270

00:10:54,630 --> 00:10:52,399

is i've heard that you guys use social

271

00:10:57,030 --> 00:10:54,640

networking and social technology quite a

272

00:11:00,069 --> 00:10:57,040

bit to communicate with people uh back

273

00:11:02,310 --> 00:11:00,079

down on earth and i'm curious to to hear

274

00:11:04,389 --> 00:11:02,320

how that goes um you know how how the

275

00:11:05,910 --> 00:11:04,399

internet connection works and uh

276

00:11:07,750 --> 00:11:05,920

basically do you have any feedback for

277

00:11:12,630 --> 00:11:07,760

me on on how we can make the service

278

00:11:18,069 --> 00:11:16,069

you know social media is uh is a really

279

00:11:20,630 --> 00:11:18,079

nice way to reach your friends and

280

00:11:22,310 --> 00:11:20,640

family from up here and uh

281

00:11:24,710 --> 00:11:22,320

you know our internet connection is

282

00:11:26,949 --> 00:11:24,720

actually a relatively new thing and so

283

00:11:28,870 --> 00:11:26,959

uh we're very happy to have that because

284

00:11:32,069 --> 00:11:28,880

you know the whole world has become so

285

00:11:33,990 --> 00:11:32,079

connected that it's it really feels uh

286

00:11:35,829 --> 00:11:34,000

feels good that we can sort of be

287

00:11:38,389 --> 00:11:35,839

connected it's not quite the same speed

288

00:11:40,790 --> 00:11:38,399

bandwidth that that folks have done on

289

00:11:42,630 --> 00:11:40,800

the ground but it's it's good enough and

290

00:11:45,269 --> 00:11:42,640

allows us to keep in touch

291

00:11:47,190 --> 00:11:45,279

with uh with friends and family but you

292

00:11:49,829 --> 00:11:47,200

know social media for us for me

293

00:11:51,110 --> 00:11:49,839

personally i can say is is great because

294

00:11:53,670 --> 00:11:51,120

it's one way that i can share the

295

00:11:55,829 --> 00:11:53,680

photographs that i take and and a few

296

00:11:57,910 --> 00:11:55,839

thoughts that i have up here because one

297

00:12:00,310 --> 00:11:57,920

thing about life up here it's so unique

298

00:12:03,030 --> 00:12:00,320

and uh it is such an opportunity and a

299

00:12:04,470 --> 00:12:03,040

blessing for us to be up here that um be

300

00:12:06,310 --> 00:12:04,480

able to share it with other people

301
00:12:08,949 --> 00:12:06,320
especially a wide audience i mean a huge

302
00:12:12,470 --> 00:12:08,959
audience frankly with social media is uh

303
00:12:14,629 --> 00:12:12,480
it's just a tremendous benefit so um you

304
00:12:16,310 --> 00:12:14,639
know for myself i just i enjoy being

305
00:12:22,150 --> 00:12:16,320
able to share pictures and you know a

306
00:12:26,629 --> 00:12:23,990
yeah well i love following the photos as

307
00:12:29,670 --> 00:12:26,639
well myself so what do you guys do for

308
00:12:31,910 --> 00:12:29,680
fun when you're when you're out in um

309
00:12:33,509 --> 00:12:31,920
in a zero gravity environment i mean

310
00:12:35,829 --> 00:12:33,519
what's the most fun thing that you've

311
00:12:39,910 --> 00:12:35,839
found to do that that uh you didn't

312
00:12:44,069 --> 00:12:41,910
well we do a lot of things that are fun

313
00:12:45,829 --> 00:12:44,079

actually we none of us get tired of

314

00:12:47,190 --> 00:12:45,839

viewing the earth from up here so we

315

00:12:49,990 --> 00:12:47,200

spent a lot of time in the window

316

00:12:50,790 --> 00:12:50,000

studying all the details of the earth

317

00:12:52,389 --> 00:12:50,800

tim

318

00:12:55,190 --> 00:12:52,399

talked about the different seasons and

319

00:12:56,949 --> 00:12:55,200

stuff that goes by and um you know the

320

00:12:59,350 --> 00:12:56,959

different lighting conditions and the

321

00:13:02,150 --> 00:12:59,360

weather patterns and uh you know all the

322

00:13:04,470 --> 00:13:02,160

uh the geography and the geology

323

00:13:06,310 --> 00:13:04,480

um in the ocean currents and and

324

00:13:08,470 --> 00:13:06,320

thunderstorms seeing lightning ripple

325

00:13:09,910 --> 00:13:08,480

across a weather system

326

00:13:11,750 --> 00:13:09,920

that's a lot of fun so we spent a lot of

327

00:13:12,790 --> 00:13:11,760

time in the window of course

328

00:13:15,509 --> 00:13:12,800

you've you've talked about the

329

00:13:16,389 --> 00:13:15,519

microphone we all

330

00:13:18,150 --> 00:13:16,399

can

331

00:13:20,069 --> 00:13:18,160

from time to time especially around a

332

00:13:22,389 --> 00:13:20,079

dinner table play with our food in

333

00:13:23,350 --> 00:13:22,399

unique ways so we all get to be kids

334

00:13:25,110 --> 00:13:23,360

again

335

00:13:26,790 --> 00:13:25,120

and those kinds of uh

336

00:13:28,710 --> 00:13:26,800

doing those kinds of things it's fun to

337

00:13:30,790 --> 00:13:28,720

play with water and weightlessness and

338

00:13:32,870 --> 00:13:30,800

you know take a bubble of water and do

339

00:13:34,790 --> 00:13:32,880

different things with it so just the

340

00:13:36,870 --> 00:13:34,800

weightless environment and the view i

341

00:13:42,870 --> 00:13:36,880

think are the two main

342

00:13:53,110 --> 00:13:44,790

should just fly around and flip around

343

00:13:57,350 --> 00:13:54,550

there you go

344

00:13:58,790 --> 00:13:57,360

that's what i was looking for all right

345

00:14:01,189 --> 00:13:58,800

so

346

00:14:02,949 --> 00:14:01,199

going back to a science question for a

347

00:14:04,470 --> 00:14:02,959

bit um

348

00:14:05,590 --> 00:14:04,480

thank you guys for doing that by the way

349

00:14:09,509 --> 00:14:05,600

i think it would not have been a

350

00:14:11,990 --> 00:14:09,519

complete first live to space without uh

351
00:14:14,629 --> 00:14:12,000
some astronauts uh flipping around in in

352
00:14:16,150 --> 00:14:14,639
zero gravity um so going back to science

353
00:14:18,790 --> 00:14:16,160
for a second and you were talking about

354
00:14:21,269 --> 00:14:18,800
how a lot of this is experimenting on

355
00:14:23,509 --> 00:14:21,279
the human body to see what

356
00:14:25,509 --> 00:14:23,519
what it can take in space what's the

357
00:14:27,350 --> 00:14:25,519
longest period that any astronaut has

358
00:14:28,790 --> 00:14:27,360
remained in space

359
00:14:30,629 --> 00:14:28,800
and what are the experiments that are

360
00:14:33,030 --> 00:14:30,639
being conducted

361
00:14:38,790 --> 00:14:33,040
geared towards future

362
00:14:42,550 --> 00:14:40,629
we know i don't have the the data on the

363
00:14:44,790 --> 00:14:42,560

records i know that

364

00:14:47,430 --> 00:14:44,800

you know scott kelly and misha kornienko

365

00:14:49,509 --> 00:14:47,440

just got back after you know very close

366

00:14:51,269 --> 00:14:49,519

to a year their cosmonauts have spent

367

00:14:53,829 --> 00:14:51,279

even more time in space

368

00:14:55,829 --> 00:14:53,839

uh cumulatively i think you know the

369

00:14:57,910 --> 00:14:55,839

records will continue to be broken you

370

00:15:01,269 --> 00:14:57,920

know cumulatively like jeff this being

371

00:15:03,750 --> 00:15:01,279

his third long duration space flight so

372

00:15:05,829 --> 00:15:03,760

you know a number of days overall

373

00:15:08,230 --> 00:15:05,839

is extremely high

374

00:15:10,150 --> 00:15:08,240

it's i mean it's really impressive that

375

00:15:12,389 --> 00:15:10,160

the human body can

376

00:15:14,470 --> 00:15:12,399

endure such long periods in space

377

00:15:16,069 --> 00:15:14,480

especially repeatedly but a lot of the

378

00:15:17,110 --> 00:15:16,079

experience the experiments we're doing

379

00:15:19,590 --> 00:15:17,120

up here

380

00:15:20,949 --> 00:15:19,600

really directly relate to those long

381

00:15:23,110 --> 00:15:20,959

duration missions that will take us

382

00:15:25,509 --> 00:15:23,120

beyond low earth orbit because we have

383

00:15:26,389 --> 00:15:25,519

to make sure that we maintain our bone

384

00:15:28,550 --> 00:15:26,399

density

385

00:15:31,110 --> 00:15:28,560

and muscle mass that our eyes are in in

386

00:15:34,230 --> 00:15:31,120

good shape and those are three areas

387

00:15:35,829 --> 00:15:34,240

that we're very very proactive in and we

388

00:15:38,310 --> 00:15:35,839

have to be right because we're up here

389

00:15:40,069 --> 00:15:38,320

for half a year at a time we just had an

390

00:15:42,389 --> 00:15:40,079

astronaut and a cosmonaut here for close

391

00:15:44,230 --> 00:15:42,399

to a year and so those are the kinds of

392

00:15:46,550 --> 00:15:44,240

experiments that they're really going to

393

00:15:49,110 --> 00:15:46,560

lend themselves just understanding what

394

00:15:51,030 --> 00:15:49,120

it takes to to go much farther and so

395

00:15:52,949 --> 00:15:51,040

it's going to be a step-by-step process

396

00:15:55,590 --> 00:15:52,959

and you know science is not necessarily

397

00:15:57,030 --> 00:15:55,600

a linear process where you you learn

398

00:15:58,870 --> 00:15:57,040

things

399

00:16:01,269 --> 00:15:58,880

in a very linear fashion it's going to

400

00:16:02,629 --> 00:16:01,279

be breakthroughs it's going to be a lot

401
00:16:04,470 --> 00:16:02,639
of

402
00:16:06,550 --> 00:16:04,480
time spent trying to understand these

403
00:16:08,629 --> 00:16:06,560
phenomena and eventually we'll get there

404
00:16:09,990 --> 00:16:08,639
i think we've made so many strides as a

405
00:16:15,829 --> 00:16:10,000
consequence of the international space

406
00:16:19,030 --> 00:16:16,949
all right

407
00:16:21,189 --> 00:16:19,040
um i think we probably have time for one

408
00:16:23,269 --> 00:16:21,199
more question and you know facebook

409
00:16:25,590 --> 00:16:23,279
being a technology company what i'm

410
00:16:27,110 --> 00:16:25,600
really interested in is you know how all

411
00:16:29,110 --> 00:16:27,120
this works right scientifically and

412
00:16:31,189 --> 00:16:29,120
technologically so i'm really curious to

413
00:16:32,870 --> 00:16:31,199

hear what is your your favorite or what

414

00:16:34,949 --> 00:16:32,880

do you find to be the most interesting

415

00:16:36,710 --> 00:16:34,959

uh piece of technology involved in

416

00:16:39,110 --> 00:16:36,720

getting to space and operating the space

417

00:16:40,470 --> 00:16:39,120

station and and all of what you guys do

418

00:16:42,069 --> 00:16:40,480

um especially something that the

419

00:16:46,790 --> 00:16:42,079

audience is watching right now might not

420

00:16:50,150 --> 00:16:48,710

uh wow you know that's an interesting

421

00:16:52,790 --> 00:16:50,160

question because actually some of the

422

00:16:55,350 --> 00:16:52,800

most exciting uh parts of this mission

423

00:16:57,430 --> 00:16:55,360

have been the very basic technology for

424

00:16:59,590 --> 00:16:57,440

example the sawyers rocket which hasn't

425

00:17:01,269 --> 00:16:59,600

changed much since the 60s but i can

426
00:17:03,189 --> 00:17:01,279
tell you that was a fairly exciting way

427
00:17:04,549 --> 00:17:03,199
to enter earth's orbit

428
00:17:06,069 --> 00:17:04,559
but of course the space station is

429
00:17:08,150 --> 00:17:06,079
constantly being updated using

430
00:17:10,710 --> 00:17:08,160
cutting-edge technology

431
00:17:12,309 --> 00:17:10,720
and we had the opportunity uh recently

432
00:17:14,069 --> 00:17:12,319
to actually use virtual reality

433
00:17:16,309 --> 00:17:14,079
technology around the space station

434
00:17:18,230 --> 00:17:16,319
which is quite incredible to put this

435
00:17:20,230 --> 00:17:18,240
you know this headset on and to actually

436
00:17:22,390 --> 00:17:20,240
um you see waypoints around the space

437
00:17:24,710 --> 00:17:22,400
station that remain where you put uh you

438
00:17:26,710 --> 00:17:24,720

can use view procedures for example i

439

00:17:28,549 --> 00:17:26,720

have 3d mapping of the space station

440

00:17:30,870 --> 00:17:28,559

have ground mission control being able

441

00:17:33,430 --> 00:17:30,880

to point things out to you so that

442

00:17:35,270 --> 00:17:33,440

really has got a large potential for

443

00:17:41,350 --> 00:17:35,280

future operations i think on board and

444

00:17:44,789 --> 00:17:42,950

all right well

445

00:17:46,710 --> 00:17:44,799

i just want to take a moment to thank

446

00:17:48,870 --> 00:17:46,720

you guys this has been an incredible

447

00:17:50,710 --> 00:17:48,880

experience um it's the first facebook

448

00:17:51,990 --> 00:17:50,720

live we've ever done with people from

449

00:17:53,270 --> 00:17:52,000

from outer space

450

00:17:56,230 --> 00:17:53,280

in outer space

451
00:17:58,630 --> 00:17:56,240
um and it's amazing that this worked uh

452
00:18:00,549 --> 00:17:58,640
and so it's it's a testament to all of

453
00:18:02,390 --> 00:18:00,559
the technology and work that folks at

454
00:18:05,110 --> 00:18:02,400
nasa are doing and everything that you

455
00:18:07,190 --> 00:18:05,120
guys are doing um to make it so we can

456
00:18:09,669 --> 00:18:07,200
really push the frontiers of

457
00:18:13,350 --> 00:18:09,679
what humanity understands and and can

458
00:18:15,430 --> 00:18:13,360
explore so um you know from someone here

459
00:18:17,430 --> 00:18:15,440
on earth uh thank you for all of the

460
00:18:19,669 --> 00:18:17,440
work that you're doing uh it's really

461
00:18:22,710 --> 00:18:19,679
important and i hope the rest of the

462
00:18:23,750 --> 00:18:22,720
trip goes well and safely and that you

463
00:18:25,270 --> 00:18:23,760

you

464

00:18:26,549 --> 00:18:25,280

learn a lot of good stuff from the

465

00:18:29,669 --> 00:18:26,559

experiments that you're doing thank you

466

00:18:30,950 --> 00:18:29,679

so much

467

00:18:36,470 --> 00:18:30,960

thank you mark it's been a pleasure