



NASA  
SILICON  
VALLEY  
LIVE

NASA  
SILICON  
VALLEY  
AMES RESEARCH CENTER

1  
00:00:00,000 --> 00:00:13,150

[Music]

2  
00:00:20,060 --> 00:00:17,330

hey what's up everybody you're watching

3  
00:00:22,670 --> 00:00:20,070

NASA in Silicon Valley live for a

4  
00:00:24,740 --> 00:00:22,680

November 8th 2018 and I am your host

5  
00:00:27,230 --> 00:00:24,750

Danielle Carmichael and if you don't

6  
00:00:29,150 --> 00:00:27,240

know NASA in Silicon Valley live is a

7  
00:00:31,460 --> 00:00:29,160

conversational show out of NASA's Ames

8  
00:00:34,009 --> 00:00:31,470

Research Center with all the various

9  
00:00:36,290 --> 00:00:34,019

scientists researchers engineers and

10  
00:00:38,360 --> 00:00:36,300

all-around cool folks here at NASA where

11  
00:00:40,040 --> 00:00:38,370

we talk about all of the nerdy NASA news

12  
00:00:43,340 --> 00:00:40,050

that you need to know about and I'm

13  
00:00:46,610 --> 00:00:43,350

joined by my friend and co-host Abbi hey

14

00:00:48,290 --> 00:00:46,620

hey everybody I am Abbi Taylor thanks

15

00:00:50,510 --> 00:00:48,300

for joining us again welcome back this

16

00:00:52,069 --> 00:00:50,520

week and I want to let everybody know

17

00:00:54,410 --> 00:00:52,079

where you can find us so we are

18

00:00:56,360 --> 00:00:54,420

simultaneously live on twitch YouTube

19

00:00:58,220 --> 00:00:56,370

and Facebook but if you want to

20

00:01:00,619 --> 00:00:58,230

participate in the chat you need to join

21

00:01:04,130 --> 00:01:00,629

us on Twitch so that's twitch.tv slash

22

00:01:06,139 --> 00:01:04,140

NASA but if you miss us live don't worry

23

00:01:08,420 --> 00:01:06,149

you will be on video on demand after the

24

00:01:10,340 --> 00:01:08,430

show including on NASA TV and if you

25

00:01:14,500 --> 00:01:10,350

prefer the audio version you can find us

26

00:01:17,240 --> 00:01:14,510

on your podcast service of choice so

27

00:01:19,580 --> 00:01:17,250

let's do it shall we do it yeah all

28

00:01:22,969 --> 00:01:19,590

right so did you know Danielle that

29

00:01:24,920 --> 00:01:22,979

today is national stem day yes I did

30

00:01:26,929 --> 00:01:24,930

it's actually one of my favorite days of

31

00:01:31,910 --> 00:01:26,939

the year you're a fan of stem are you

32

00:01:34,969 --> 00:01:31,920

not I know about national stem day it's

33

00:01:37,490 --> 00:01:34,979

a day that's meant to inspire kids and

34

00:01:39,679 --> 00:01:37,500

people of all ages really to explore

35

00:01:41,780 --> 00:01:39,689

their love of science and pursue their

36

00:01:44,840 --> 00:01:41,790

interests in science technology

37

00:01:46,940 --> 00:01:44,850

engineering and math stem so here at

38

00:01:50,149 --> 00:01:46,950

NASA as you might imagine we are huge

39

00:01:53,319 --> 00:01:50,159

fans of stem that's right whether our

40

00:01:55,580 --> 00:01:53,329

researchers are sitting humans to space

41

00:01:57,139 --> 00:01:55,590

developing new technologies to explore

42

00:01:59,510 --> 00:01:57,149

the solar system and beyond or

43

00:02:02,209 --> 00:01:59,520

transforming the way we fly they have a

44

00:02:04,280 --> 00:02:02,219

shared passion for stem absolutely so

45

00:02:05,990 --> 00:02:04,290

for today's show in celebration of

46

00:02:07,880 --> 00:02:06,000

national stem day we're going to

47

00:02:10,819 --> 00:02:07,890

introduce you to some of the amazing

48

00:02:12,949 --> 00:02:10,829

wonder women of NASA who work here at

49

00:02:15,050 --> 00:02:12,959

Ames Research Center they're all super

50

00:02:16,190 --> 00:02:15,060

huge fans of stem of course and they're

51  
00:02:18,470 --> 00:02:16,200  
going to talk to us about what they do

52  
00:02:19,610 --> 00:02:18,480  
at NASA how they got here and a whole

53  
00:02:22,290 --> 00:02:19,620  
lot more

54  
00:02:24,180 --> 00:02:22,300  
so I'm ready let's get this shirt off

55  
00:02:26,490 --> 00:02:24,190  
all right then

56  
00:02:27,840 --> 00:02:26,500  
before we go bring them in I want to

57  
00:02:29,610 --> 00:02:27,850  
remind everybody if you have a question

58  
00:02:31,230 --> 00:02:29,620  
please leave it in the chat and we'll

59  
00:02:33,990 --> 00:02:31,240  
try to get to those with each of our

60  
00:02:36,240 --> 00:02:34,000  
groups of researchers so you want to

61  
00:02:39,090 --> 00:02:36,250  
invite our first guest yeah let's get

62  
00:02:42,540 --> 00:02:39,100  
started so let's go ahead and welcome

63  
00:03:05,250 --> 00:02:42,550

our first guest Yasmin Ali and Laura

64

00:03:07,290 --> 00:03:05,260

come on why don't we introduce you to

65

00:03:08,370 --> 00:03:07,300

everybody watching let's let's go down

66

00:03:10,440 --> 00:03:08,380

the line if you could tell us your name

67

00:03:12,990 --> 00:03:10,450

and just quickly what do you do here at

68

00:03:14,970 --> 00:03:13,000

NASA I'm Laura Aki and I'm an

69

00:03:15,930 --> 00:03:14,980

atmospheric chemist so I study the

70

00:03:19,110 --> 00:03:15,940

composition of the Earth's atmosphere

71

00:03:21,000 --> 00:03:19,120

very cool very cool okay so my name is

72

00:03:23,370 --> 00:03:21,010

Ali one-nighters nuna and I'm an

73

00:03:29,130 --> 00:03:23,380

aerospace and systems engineer a rocket

74

00:03:30,900 --> 00:03:29,140

scientist I'm awesome at Sherazi I'm a

75

00:03:33,840 --> 00:03:30,910

mechanical engineer who's turned into a

76

00:03:36,030 --> 00:03:33,850

biologist I'm a scientist in the space

77

00:03:37,890 --> 00:03:36,040

Biosciences research division and

78

00:03:39,449 --> 00:03:37,900

currently I'm the mission scientist for

79

00:03:45,660 --> 00:03:39,459

rodent research for the space biology

80

00:03:48,060 --> 00:03:45,670

program that's pretty cool so let's get

81

00:03:51,750 --> 00:03:48,070

things started so tell me about yourself

82

00:03:54,120 --> 00:03:51,760

like how did you know you wanted to you

83

00:03:55,860 --> 00:03:54,130

know work on rodents or you know work on

84

00:03:59,250 --> 00:03:55,870

payloads that flew that flight of the

85

00:04:00,990 --> 00:03:59,260

fly in space well it's a bit of a story

86

00:04:02,880 --> 00:04:01,000

I've always had a knack for engineering

87

00:04:05,160 --> 00:04:02,890

since I was a little child I always

88

00:04:08,310 --> 00:04:05,170

watch my dad fixing things around the

89

00:04:10,229 --> 00:04:08,320

house I remember at age 8 or 9 or 10 I

90

00:04:22,200 --> 00:04:10,239

picked up a soldering iron and try to

91

00:04:24,780 --> 00:04:22,210

fix it was doing that and then I liked

92

00:04:26,550 --> 00:04:24,790

growing up so I always you know woke up

93

00:04:29,080 --> 00:04:26,560

in the mall of the night watched all the

94

00:04:32,830 --> 00:04:29,090

shuttle launches on landing

95

00:04:34,510 --> 00:04:32,840

and I grew up in Iran so at the time

96

00:04:37,270 --> 00:04:34,520

there was no space program there still

97

00:04:39,970 --> 00:04:37,280

isn't a space program in Iran so for a

98

00:04:42,400 --> 00:04:39,980

long time this was not something like I

99

00:04:45,100 --> 00:04:42,410

thought I could achieve I was fortunate

100

00:04:48,310 --> 00:04:45,110

enough that I emigrated to the US when I

101  
00:04:51,160 --> 00:04:48,320  
was 16 and slowly I worked through all

102  
00:04:53,530 --> 00:04:51,170  
the challenges and I'm here today yeah

103  
00:05:04,180 --> 00:04:53,540  
that's pretty cool so you know I

104  
00:05:06,640 --> 00:05:04,190  
actually think we have a photo of so I

105  
00:05:09,310 --> 00:05:06,650  
do biomechanics I do or three like

106  
00:05:12,220 --> 00:05:09,320  
biomechanics mainly bone biomechanics

107  
00:05:13,720 --> 00:05:12,230  
and my grandma this is a picture of my

108  
00:05:19,210 --> 00:05:13,730  
grandmother at my high school graduation

109  
00:05:21,130 --> 00:05:19,220  
in Connecticut so I got inspired and I

110  
00:05:23,260 --> 00:05:21,140  
got interested in bone biomechanics

111  
00:05:25,210 --> 00:05:23,270  
because I grew up watching my

112  
00:05:27,280 --> 00:05:25,220  
grandmother having a hard time walking

113  
00:05:29,560 --> 00:05:27,290

sitting down going up the stairs and

114

00:05:31,840 --> 00:05:29,570

then it was always something that we as

115

00:05:34,240 --> 00:05:31,850

a family had to keep in mind that you

116

00:05:35,950 --> 00:05:34,250

know where we going is it close enough

117

00:05:38,170 --> 00:05:35,960

to stairs where we're gonna park and all

118

00:05:39,850 --> 00:05:38,180

that yeah and then I think when I was 14

119

00:05:42,750 --> 00:05:39,860

there was a summer that my grandmother

120

00:05:46,090 --> 00:05:42,760

had a knee replacement surgery and

121

00:05:48,430 --> 00:05:46,100

within days she was able to walk and I

122

00:05:51,730 --> 00:05:48,440

was with her in the hospital during her

123

00:05:53,800 --> 00:05:51,740

physical therapy and all that and it was

124

00:05:55,210 --> 00:05:53,810

just a miracle you know to me it was you

125

00:05:56,950 --> 00:05:55,220

know for 14 years I've watched this

126

00:05:58,690 --> 00:05:56,960

person having a hard time walking and

127

00:06:00,220 --> 00:05:58,700

that every time the surgeons and the

128

00:06:01,930 --> 00:06:00,230

doctors were coming I would always study

129

00:06:07,240 --> 00:06:01,940

those brochures on the implants and all

130

00:06:09,490 --> 00:06:07,250

that stuff that people throw away those

131

00:06:11,200 --> 00:06:09,500

people in that room for those five six

132

00:06:13,990 --> 00:06:11,210

hours that's where they want to yeah

133

00:06:15,850 --> 00:06:14,000

dude yeah a life changing yes I got

134

00:06:19,630 --> 00:06:15,860

interested in bone mechanics

135

00:06:21,280 --> 00:06:19,640

and I started as a mechanical engineer I

136

00:06:22,990 --> 00:06:21,290

you know did a lot of bio

137

00:06:26,560 --> 00:06:23,000

instrumentation biomedical engineering

138

00:06:28,450 --> 00:06:26,570

and then when I was picking programs for

139

00:06:31,360 --> 00:06:28,460

grad school was very specific on what I

140

00:06:32,920 --> 00:06:31,370

wanted to do so I looked for the very

141

00:06:36,340 --> 00:06:32,930

specific program that was doing bone

142

00:06:37,810 --> 00:06:36,350

mechanics and then it just happened that

143

00:06:38,749 --> 00:06:37,820

it was sponsored by the human research

144

00:06:41,869 --> 00:06:38,759

program at

145

00:06:43,730 --> 00:06:41,879

NASA Johnson Oh so I got to do through

146

00:06:46,629 --> 00:06:43,740

the mechanics looking at bone loss

147

00:06:49,010 --> 00:06:46,639

recovery countermeasures in astronauts

148

00:06:51,739 --> 00:06:49,020

which was best of both worlds it was a

149

00:06:53,899 --> 00:06:51,749

NASA project but also working on

150

00:06:55,339 --> 00:06:53,909

orthopedic mechanics that is cool it's

151

00:07:00,439 --> 00:06:55,349

pretty cool so it's almost like that was

152

00:07:05,659 --> 00:07:00,449

your destiny I chose you don't have to

153

00:07:07,249 --> 00:07:05,669

know from the very beginning it doesn't

154

00:07:09,110 --> 00:07:07,259

have to be something big it's just

155

00:07:10,549 --> 00:07:09,120

everything around you that you have to

156

00:07:17,629 --> 00:07:10,559

look at and get more the way that

157

00:07:19,159 --> 00:07:17,639

inspired by ya like what did what did

158

00:07:21,950 --> 00:07:19,169

you know you wanted to be an aerospace

159

00:07:25,219 --> 00:07:21,960

engineer or as you like to say a rocket

160

00:07:27,559 --> 00:07:25,229

scientists yes that happens when I was

161

00:07:30,619 --> 00:07:27,569

like seven years old well I was very

162

00:07:32,089 --> 00:07:30,629

young yeah when I was actually I'm from

163

00:07:34,089 --> 00:07:32,099

Mexico so when I was growing up in

164

00:07:48,619 --> 00:07:34,099

Mexico my mother used to buy

165

00:07:50,480 --> 00:07:48,629

encyclopedias okay that's right and so

166

00:07:52,969 --> 00:07:50,490

they have cool pictures and things and

167

00:07:54,679 --> 00:07:52,979

so when I will come from school I will

168

00:07:57,709 --> 00:07:54,689

read them and that was like my

169

00:07:59,959 --> 00:07:57,719

entertainment right okay and and through

170

00:08:02,540 --> 00:07:59,969

one of those books I saw a picture of

171

00:08:04,489 --> 00:08:02,550

the Space Shuttle and you know how I was

172

00:08:08,269 --> 00:08:04,499

gonna transport humans into space right

173

00:08:10,070 --> 00:08:08,279

so I was captivated and I I've read

174

00:08:11,809 --> 00:08:10,080

about it and then I read about the

175

00:08:13,339 --> 00:08:11,819

description of the person that it was

176

00:08:16,429 --> 00:08:13,349

actually fueling that which was the

177

00:08:18,110 --> 00:08:16,439

aerospace engineer and I thought I was

178

00:08:20,149 --> 00:08:18,120

like I want to do this job I want to

179

00:08:22,570 --> 00:08:20,159

take you know humans in space build

180

00:08:25,279 --> 00:08:22,580

these school machines mm-hmm and so I

181

00:08:26,389 --> 00:08:25,289

because of that I went to my family and

182

00:08:33,079 --> 00:08:26,399

I said I want to be in their space

183

00:08:37,610 --> 00:08:33,089

engineer you know where did I get that

184

00:08:39,379 --> 00:08:37,620

name from you know right now - I came to

185

00:08:42,170 --> 00:08:39,389

United States and I was able to actually

186

00:08:44,680 --> 00:08:42,180

you know get that the Greek go to school

187

00:08:47,269 --> 00:08:44,690

and you know be able to you know get my

188

00:08:49,850 --> 00:08:47,279

aerospace engineering degree mm-hmm

189

00:08:51,490 --> 00:08:49,860

but otherwise in Mexico was like you

190

00:08:56,770 --> 00:08:51,500

know where did you get that

191

00:09:08,920 --> 00:08:56,780

the grief room right so that's the

192

00:09:15,910 --> 00:09:08,930

opposite yes we also have a photo that

193

00:09:17,680 --> 00:09:15,920

brought up on screen yeah so these are

194

00:09:20,650 --> 00:09:17,690

the two last astronauts who flew the

195

00:09:24,550 --> 00:09:20,660

last space shuttle he was a special

196

00:09:26,680 --> 00:09:24,560

because you know I actually I was

197

00:09:29,620 --> 00:09:26,690

working with the astronauts at a time

198

00:09:31,450 --> 00:09:29,630

that they were in space with the spheres

199

00:09:33,850 --> 00:09:31,460

program so I was an engineer with this

200

00:09:37,480 --> 00:09:33,860

program at that time and so we had a 12

201  
00:09:40,480 --> 00:09:37,490  
hour mission ops and then on my break I

202  
00:09:42,910 --> 00:09:40,490  
went and me these two last astronauts

203  
00:09:44,560 --> 00:09:42,920  
who flew the very last one and so for me

204  
00:09:46,270 --> 00:09:44,570  
it was like a combination right like a

205  
00:09:50,110 --> 00:09:46,280  
milestone like I cannot believe I'm here

206  
00:09:52,330 --> 00:09:50,120  
but yeah so yes super cool that's pretty

207  
00:09:53,020 --> 00:09:52,340  
cool nice all right well what about

208  
00:09:56,170 --> 00:09:53,030  
Laura

209  
00:09:58,240 --> 00:09:56,180  
well how did when and how did you know

210  
00:10:00,280 --> 00:09:58,250  
you wanted to be what you are today well

211  
00:10:02,110 --> 00:10:00,290  
in high school I had two really great

212  
00:10:08,560 --> 00:10:02,120  
chemistry classes and we got to make

213  
00:10:11,080 --> 00:10:08,570

stinky things and that had me hooked

214

00:10:13,810 --> 00:10:11,090

pretty much from tenth grade excellent

215

00:10:15,490 --> 00:10:13,820

so everything here everything since then

216

00:10:18,490 --> 00:10:15,500

on is all the fault of my high school

217

00:10:19,840 --> 00:10:18,500

chemistry teacher and then when I was

218

00:10:21,250 --> 00:10:19,850

you know so I figured I go to college

219

00:10:21,580 --> 00:10:21,260

that was kind of always the thing in our

220

00:10:23,970 --> 00:10:21,590

family

221

00:10:27,280 --> 00:10:23,980

get your keep increasing your education

222

00:10:29,530 --> 00:10:27,290

so I was looking for colleges found

223

00:10:32,050 --> 00:10:29,540

college then after college wanted to do

224

00:10:33,820 --> 00:10:32,060

something with chemistry but a

225

00:10:36,070 --> 00:10:33,830

bachelor's in chemistry isn't really

226

00:10:37,210 --> 00:10:36,080

enough to to do chemistry research so I

227

00:10:39,130 --> 00:10:37,220

was looking around at the graduate

228

00:10:40,540 --> 00:10:39,140

programs trying to figure out what kind

229

00:10:42,070 --> 00:10:40,550

of chemistry I wanted to do and I knew I

230

00:10:44,350 --> 00:10:42,080

wanted to do something that would help

231

00:10:45,550 --> 00:10:44,360

the planet yeah I wasn't quite sure what

232

00:10:47,980 --> 00:10:45,560

that meant whether that was gonna be

233

00:10:49,630 --> 00:10:47,990

cleaning up Superfund sites or what but

234

00:10:53,290 --> 00:10:49,640

it was some things you know something to

235

00:10:55,210 --> 00:10:53,300

make the world better cleaner yeah and I

236

00:10:58,180 --> 00:10:55,220

was walking through the physics building

237

00:11:00,070 --> 00:10:58,190

at my college one day and I saw a flyer

238

00:11:02,050 --> 00:11:00,080

for an internship program for that

239

00:11:09,890 --> 00:11:02,060

summer and it was like two days till the

240

00:11:15,570 --> 00:11:12,660

got selected and I spent the summer at

241

00:11:19,620 --> 00:11:15,580

NASA Goddard ok was where I learned all

242

00:11:21,420 --> 00:11:19,630

about that ozone hole and how there was

243

00:11:22,950 --> 00:11:21,430

concern that the space shuttle engine

244

00:11:24,390 --> 00:11:22,960

exhaust might also lead to ozone

245

00:11:26,940 --> 00:11:24,400

depletion and I got to work for that guy

246

00:11:28,920 --> 00:11:26,950

who did that like it was really cool and

247

00:11:29,880 --> 00:11:28,930

so then at the end of the summer I said

248

00:11:30,780 --> 00:11:29,890

ok what do I do next

249

00:11:32,640 --> 00:11:30,790

and he said well you got to go to

250

00:11:33,840 --> 00:11:32,650

graduate school and I said ok where and

251

00:11:35,160 --> 00:11:33,850

he said well I met this woman at a

252

00:11:36,240 --> 00:11:35,170

conference and she's you know she's

253

00:11:38,340 --> 00:11:36,250

teaching at this school and you should

254

00:11:40,140 --> 00:11:38,350

go there so I went there and then after

255

00:11:41,190 --> 00:11:40,150

having had just ten weeks of studying

256

00:11:43,320 --> 00:11:41,200

chemistry of the atmosphere

257

00:11:45,750 --> 00:11:43,330

I was pretty hooked then I went and

258

00:11:47,340 --> 00:11:45,760

spent was at five years I guess getting

259

00:11:49,950 --> 00:11:47,350

the degree and then moving on from there

260

00:11:52,260 --> 00:11:49,960

so it was it your destiny as well I

261

00:12:04,380 --> 00:11:52,270

think it might have been speaking of

262

00:12:06,150 --> 00:12:04,390

that we have a photo yes Rachel I always

263

00:12:07,920 --> 00:12:06,160

wanted curly hair my hair was a little

264

00:12:10,350 --> 00:12:07,930

too straight for the Farrah Fawcett era

265

00:12:11,700 --> 00:12:10,360

that I grew up ok so that was the summer

266

00:12:25,290 --> 00:12:11,710

I decided to give it a little chemical

267

00:12:27,840 --> 00:12:25,300

help so what does all of this mean for

268

00:12:29,490 --> 00:12:27,850

you today right like what what is a day

269

00:12:32,100 --> 00:12:29,500

in the life of Laura the atmospheric

270

00:12:33,510 --> 00:12:32,110

chemistry tell us what you do well I

271

00:12:36,770 --> 00:12:33,520

don't catch anything on fire on a good

272

00:12:39,720 --> 00:12:36,780

day those are the bad days actually ok

273

00:12:41,490 --> 00:12:39,730

to do though is make measurements from

274

00:12:43,650 --> 00:12:41,500

aircraft that tell us about the

275

00:12:45,840 --> 00:12:43,660

composition of the Earth's atmosphere so

276

00:12:48,600 --> 00:12:45,850

I work with a team I lead a team of five

277

00:12:50,130 --> 00:12:48,610

or six of us who calibrate instruments

278

00:12:52,140 --> 00:12:50,140

put them on aircraft and then analyze

279

00:12:54,540 --> 00:12:52,150

the data and then give the data to folks

280

00:12:56,180 --> 00:12:54,550

who collect data by satellite and then

281

00:12:58,170 --> 00:12:56,190

they use our sort of ground truth data

282

00:13:01,260 --> 00:12:58,180

to make sure that the satellites are

283

00:13:04,980 --> 00:13:01,270

returning properly yeah information ok

284

00:13:06,090 --> 00:13:04,990

your data closer to home right so some

285

00:13:08,400 --> 00:13:06,100

of my days are spent

286

00:13:09,870 --> 00:13:08,410

counting satellite orbits to figure out

287

00:13:10,840 --> 00:13:09,880

when we're gonna be over California at

288

00:13:12,040 --> 00:13:10,850

the right time of day

289

00:13:15,249 --> 00:13:12,050

and some of my days are spent

290

00:13:15,639 --> 00:13:15,259

calibrating instruments and throwing

291

00:13:21,910 --> 00:13:15,649

wrenches

292

00:13:23,139 --> 00:13:21,920

I mean carefully tuning so the days are

293

00:13:25,210 --> 00:13:23,149

all pretty different actually but they

294

00:13:27,160 --> 00:13:25,220

kind of go on like a two-week cycle of

295

00:13:29,170 --> 00:13:27,170

preparing for a mission and then flying

296

00:13:31,360 --> 00:13:29,180

and then analyzing the data so I hope

297

00:13:34,720 --> 00:13:31,370

some of those days you actually get to

298

00:13:37,329 --> 00:13:34,730

fly ahead you fly I have twice been up

299

00:13:41,439 --> 00:13:37,339

to collect data and I've only thrown up

300

00:13:43,449 --> 00:13:41,449

once know the landing back here at

301

00:13:44,980 --> 00:13:43,459

Moffett Field is kind of tough actually

302

00:13:47,829 --> 00:13:44,990

because the air space is so congested

303

00:13:49,689 --> 00:13:47,839

with SFO the San Francisco International

304

00:13:51,280 --> 00:13:49,699

Airport and then San Jose Airport and

305

00:13:53,230 --> 00:13:51,290

then there's a couple smaller airports

306

00:13:55,210 --> 00:13:53,240

and so when the aircraft that we use for

307

00:13:56,379 --> 00:13:55,220

collecting data wants to get to Moffett

308

00:13:58,240 --> 00:13:56,389

Field they have to come in through a

309

00:13:59,889 --> 00:13:58,250

really tiny sort of channel and they

310

00:14:00,730 --> 00:13:59,899

make a really hard turn and they come

311

00:14:15,490 --> 00:14:00,740

down really fast

312

00:14:17,559 --> 00:14:15,500

and it kind of messed with me what's the

313

00:14:20,439 --> 00:14:17,569

name of your project or your plane or so

314

00:14:22,509 --> 00:14:20,449

the project is called Ajax okay alpha

315

00:14:24,519 --> 00:14:22,519

jet atmospheric experiment well it's

316

00:14:29,800 --> 00:14:24,529

pretty cool and we met actually a couple

317

00:14:31,389 --> 00:14:29,810

members of her team remember Caroline

318

00:14:33,400 --> 00:14:31,399

and Emma came in in their full flight

319

00:14:43,720 --> 00:14:33,410

suits and that's where at altitudes like

320

00:14:45,220 --> 00:14:43,730

that but whatever maybe yes so you can

321

00:14:47,189 --> 00:14:45,230

see the plane in the back there and so

322

00:14:49,720 --> 00:14:47,199

this is three of us from the team

323

00:14:51,999 --> 00:14:49,730

deciding the last-minute changes you can

324

00:14:53,949 --> 00:14:52,009

see the the blue instrument cart there

325

00:14:57,309 --> 00:14:53,959

under the wing and you can see the

326

00:14:58,780 --> 00:14:57,319

little GPS on the top of the cone there

327

00:15:00,850 --> 00:14:58,790

so we're getting everything ready and

328

00:15:01,900 --> 00:15:00,860

synchronized we need to synchronize all

329

00:15:04,449 --> 00:15:01,910

the instruments to get them all warmed

330

00:15:06,040 --> 00:15:04,459

up before flight and I'm guessing that

331

00:15:07,660 --> 00:15:06,050

at the point this picture was taken I

332

00:15:10,210 --> 00:15:07,670

was probably cursing the weather because

333

00:15:11,920 --> 00:15:10,220

if you look at the sky you'll see that

334

00:15:14,800 --> 00:15:11,930

the satellites were not gonna see very

335

00:15:16,420 --> 00:15:14,810

much so I'm guessing I was probably

336

00:15:17,769 --> 00:15:16,430

trying to decide if we need to go to a

337

00:15:19,240 --> 00:15:17,779

different location right instead of

338

00:15:21,040 --> 00:15:19,250

going offshore maybe we would be

339

00:15:22,299 --> 00:15:21,050

changing the plan to go into the Central

340

00:15:23,160 --> 00:15:22,309

Valley if it was clear there do you

341

00:15:25,019 --> 00:15:23,170

always play around cattle

342

00:15:28,410 --> 00:15:25,029

yeah California Nevada we've got about a

343

00:15:31,139 --> 00:15:28,420

two hour duration okay yeah cool pretty

344

00:15:34,049 --> 00:15:31,149

cool mr. sting oh hey we better move on

345

00:15:40,169 --> 00:15:34,059

and learn about a rather guess so what's

346

00:15:42,509 --> 00:15:40,179

a day of the life of oh very much like

347

00:15:44,340 --> 00:15:42,519

hers you know like I I do different

348

00:15:46,919 --> 00:15:44,350

things it's not always the same very

349

00:15:49,379 --> 00:15:46,929

yes very different it varies from day to

350

00:15:52,979 --> 00:15:49,389

day it's never the same thing and we

351

00:15:55,139 --> 00:15:52,989

build satellites so small cube sets

352

00:15:59,579 --> 00:15:55,149

you have baking of snow sets actually

353

00:16:00,329 --> 00:15:59,589

uh-huh you brought one one for you thank

354

00:16:08,929 --> 00:16:00,339

you thank you

355

00:16:12,419 --> 00:16:08,939

so as you can see right this one is a

356

00:16:12,749 --> 00:16:12,429

one and a half you that's what we call

357

00:16:14,819 --> 00:16:12,759

them

358

00:16:17,159 --> 00:16:14,829

it's ten and they go by 10 centimeters

359

00:16:21,449 --> 00:16:17,169

so tell me something ivy so movie one

360

00:16:23,939 --> 00:16:21,459

this one is 15 centimeters so is 1/2 and

361

00:16:25,650 --> 00:16:23,949

this is a satellite it is sadly actually

362

00:16:34,400 --> 00:16:25,660

this is just a miniature it's no

363

00:16:37,499 --> 00:16:34,410

actually the size so as you can imagine

364

00:16:39,900 --> 00:16:37,509

it's almost like a watch that you have

365

00:16:43,769 --> 00:16:39,910

to build that it takes a lot of

366

00:16:46,169 --> 00:16:43,779

precision and tries and we start with

367

00:16:48,989 --> 00:16:46,179

the different instrumentations and we

368

00:16:51,090 --> 00:16:48,999

build up right and as you can see this

369

00:16:54,119 --> 00:16:51,100

one right here is called the notes and

370

00:16:57,179 --> 00:16:54,129

we flew it we build it and flew it from

371

00:17:00,059 --> 00:16:57,189

deployed from the space station in 2016

372

00:17:03,119 --> 00:17:00,069

and this is just one size we the one

373

00:17:06,480 --> 00:17:03,129

that I just finished it was a 6u but it

374

00:17:09,509 --> 00:17:06,490

was a long six year okay and it was 60

375

00:17:11,909 --> 00:17:09,519

well actually it was 74 centimeters so

376

00:17:14,939 --> 00:17:11,919

it's more than six years and he had a

377

00:17:17,399 --> 00:17:14,949

lot of instrumentation we have like no

378

00:17:19,819 --> 00:17:17,409

our radio we had a NOAA radio that is

379

00:17:24,950 --> 00:17:19,829

going to talk to the east and ghost

380

00:17:29,630 --> 00:17:27,950

ya know I try to develop these radios so

381

00:17:31,640 --> 00:17:29,640

they asked us to fly it so we're flying

382

00:17:34,420 --> 00:17:31,650

it for them and then we have a lunar

383

00:17:37,130 --> 00:17:34,430

radio which is the first of its kind is

384

00:17:40,100 --> 00:17:37,140

if it works we can actually talk from

385

00:17:42,830 --> 00:17:40,110

Earth to this to the moon distance with

386

00:17:45,590 --> 00:17:42,840

no real aid so which is yeah which is

387

00:17:46,790 --> 00:17:45,600

something you know that a lot of people

388

00:17:48,170 --> 00:17:46,800

are interested because since we're going

389

00:17:51,040 --> 00:17:48,180

to the moon we want to build that

390

00:17:52,580 --> 00:17:51,050

infrastructure and then we also have

391

00:18:00,920 --> 00:17:52,590

Wi-Fi

392

00:18:04,850 --> 00:18:00,930

communicate from the satellite to the

393

00:18:07,390 --> 00:18:04,860

ground and get video or data right we

394

00:18:09,860 --> 00:18:07,400

actually have a radio that you can use

395

00:18:11,960 --> 00:18:09,870

and then we also have wireless sensors

396

00:18:13,660 --> 00:18:11,970

so they're like do you think wireless

397

00:18:18,410 --> 00:18:13,670

sensors and I think she and some rather

398

00:18:20,420 --> 00:18:18,420

and I'm going to show you so this is how

399

00:18:21,980 --> 00:18:20,430

we started I just want to show you guys

400

00:18:25,370 --> 00:18:21,990

this is how we started the first

401  
00:18:28,370 --> 00:18:25,380  
wireless sensor this is what we ended up

402  
00:18:30,050 --> 00:18:28,380  
building event so these tiny ones are

403  
00:18:32,630 --> 00:18:30,060  
the ones that we put in our satellites

404  
00:18:35,060 --> 00:18:32,640  
right and so we can put them anywhere in

405  
00:18:38,030 --> 00:18:35,070  
inside the satellite and and it will

406  
00:18:39,950 --> 00:18:38,040  
communicate to a coordinator oh and it

407  
00:18:42,220 --> 00:18:39,960  
will be able to give us data whatever

408  
00:18:46,820 --> 00:18:42,230  
sensor we have in here so we can have a

409  
00:18:48,440 --> 00:18:46,830  
temperature pressure materials we also

410  
00:18:51,620 --> 00:18:48,450  
have some of the satellites that are

411  
00:18:53,840 --> 00:18:51,630  
work we have TPS material at the bottom

412  
00:18:55,880 --> 00:18:53,850  
so we can actually if we want we can

413  
00:18:57,800 --> 00:18:55,890

embed some instrumentation into the

414

00:19:00,410 --> 00:18:57,810

material and then learn how one is

415

00:19:02,270 --> 00:19:00,420

burning coming through the entry you

416

00:19:04,370 --> 00:19:02,280

know it burns right and something that

417

00:19:06,380 --> 00:19:04,380

was a protection down there like yeah

418

00:19:09,190 --> 00:19:06,390

check the instruments for burning up we

419

00:19:12,650 --> 00:19:09,200

won't know how fast it's burning

420

00:19:14,300 --> 00:19:12,660

oh yes the material right and so that's

421

00:19:15,680 --> 00:19:14,310

what we use and then these were here

422

00:19:17,960 --> 00:19:15,690

bread it because this is actually the

423

00:19:19,370 --> 00:19:17,970

radio that we use for the satellite so

424

00:19:22,610 --> 00:19:19,380

we can actually communicate with the

425

00:19:25,670 --> 00:19:22,620

satellite via or computers email and we

426

00:19:27,680 --> 00:19:25,680

can also use our phones so we can

427

00:19:29,900 --> 00:19:27,690

actually sync a man or receive commands

428

00:19:33,020 --> 00:19:29,910

from the sander it's crazy through these

429

00:19:34,880 --> 00:19:33,030

you know so and that's just you know

430

00:19:41,290 --> 00:19:34,890

just one there's all the stuff that I've

431

00:19:47,540 --> 00:19:44,480

yes it gets deployed we can actually saw

432

00:19:50,210 --> 00:19:47,550

who we were filming the space station

433

00:19:51,980 --> 00:19:50,220

and then we're giving the data and it's

434

00:19:54,230 --> 00:19:51,990

actually compressing it on board and

435

00:19:56,900 --> 00:19:54,240

then we when we get it here we actually

436

00:19:59,870 --> 00:19:56,910

put it together and so we even them in

437

00:20:04,340 --> 00:19:59,880

media you know something interesting so

438

00:20:10,160 --> 00:20:04,350

that's Dan live you're building yes

439

00:20:11,570 --> 00:20:10,170

satellite well looks like Laura dime

440

00:20:20,030 --> 00:20:11,580

they're pretty excited what about you

441

00:20:21,890 --> 00:20:20,040

guys so again as everyone else mentioned

442

00:20:23,510 --> 00:20:21,900

it really depends what you're working on

443

00:20:26,660 --> 00:20:23,520

and what phase of the mission you're in

444

00:20:28,600 --> 00:20:26,670

so I wear two hats one that I don't wear

445

00:20:31,160 --> 00:20:28,610

very often these days is my research had

446

00:20:32,930 --> 00:20:31,170

my second had that I wear all the time

447

00:20:35,690 --> 00:20:32,940

almost these days is my mission

448

00:20:39,110 --> 00:20:35,700

scientist hat so the International Space

449

00:20:41,510 --> 00:20:39,120

Station ISS was built as a laboratory it

450

00:20:44,330 --> 00:20:41,520

took us over a decade to build it but

451  
00:20:47,540 --> 00:20:44,340  
now it's it's full capacity and we're

452  
00:20:49,010 --> 00:20:47,550  
using as a laboratory off the earth so

453  
00:20:51,470 --> 00:20:49,020  
that we can use the results that we get

454  
00:20:53,330 --> 00:20:51,480  
for the people who are on earth so I

455  
00:20:55,250 --> 00:20:53,340  
worked with one of the few model

456  
00:20:58,370 --> 00:20:55,260  
organisms that are on this station I

457  
00:21:01,100 --> 00:20:58,380  
work with rodents and then so we use

458  
00:21:03,260 --> 00:21:01,110  
rodents as like a translational model

459  
00:21:08,630 --> 00:21:03,270  
because we can collect more data and

460  
00:21:10,580 --> 00:21:08,640  
then we can do a very detailed study and

461  
00:21:13,400 --> 00:21:10,590  
then collect information that we

462  
00:21:16,760 --> 00:21:13,410  
couldn't collect on people but then we

463  
00:21:18,650 --> 00:21:16,770

use those results to come up to study

464

00:21:21,770 --> 00:21:18,660

diseases or come up come up with cures

465

00:21:24,260 --> 00:21:21,780

or countermeasures for people and then

466

00:21:27,910 --> 00:21:24,270

so basically my job is working with the

467

00:21:31,580 --> 00:21:27,920

scientists at either NASA or

468

00:21:34,430 --> 00:21:31,590

universities commercial entities you

469

00:21:36,590 --> 00:21:34,440

know industrial companies to take their

470

00:21:38,750 --> 00:21:36,600

science from the lab bench to their

471

00:21:41,600 --> 00:21:38,760

national space station now as you can

472

00:21:43,340 --> 00:21:41,610

imagine that involves working with the

473

00:21:45,350 --> 00:21:43,350

scientists scientists and and

474

00:21:47,600 --> 00:21:45,360

translating what they have for their

475

00:21:49,530 --> 00:21:47,610

science requirements for engineers for

476

00:21:51,090 --> 00:21:49,540

operations special

477

00:21:52,770 --> 00:21:51,100

trained the crew members to do the

478

00:21:56,910 --> 00:21:52,780

science I mean a lot of the crew members

479

00:21:59,900 --> 00:21:56,920

don't have a science background but you

480

00:22:02,330 --> 00:21:59,910

know the overachiever people they are

481

00:22:04,860 --> 00:22:02,340

[Laughter]

482

00:22:07,860 --> 00:22:04,870

you know an Air Force pilot or test

483

00:22:10,050 --> 00:22:07,870

pilot you can work with rodents or

484

00:22:13,500 --> 00:22:10,060

plants or souls that they've never done

485

00:22:16,200 --> 00:22:13,510

before so you know once once we do all

486

00:22:18,660 --> 00:22:16,210

that then we're ready for flight so we

487

00:22:22,020 --> 00:22:18,670

go down to Kennedy Space Center to

488

00:22:24,810 --> 00:22:22,030

launch our payload on SpaceX Dragon and

489

00:22:26,640 --> 00:22:24,820

then we just wait for it hoping it

490

00:22:28,230 --> 00:22:26,650

launches if it doesn't launch then you

491

00:22:30,420 --> 00:22:28,240

know we go back to the drawing board do

492

00:22:32,040 --> 00:22:30,430

everything all over again and then the

493

00:22:33,570 --> 00:22:32,050

minute it launches you want to you know

494

00:22:35,280 --> 00:22:33,580

take a deep breath because you're so

495

00:22:36,930 --> 00:22:35,290

relieved but then you have to remind

496

00:22:38,220 --> 00:22:36,940

yourself that this is just the beginning

497

00:22:42,960 --> 00:22:38,230

because now you have to do the whole

498

00:22:44,460 --> 00:22:42,970

mission on orbit not only you have to go

499

00:22:48,130 --> 00:22:44,470

to work but now you have to go to work

500

00:22:52,540 --> 00:22:51,130

a lot of times we come to work at 11:00

501  
00:22:55,150 --> 00:22:52,550  
p.m. California time we're talking

502  
00:22:58,450 --> 00:22:55,160  
California time so that we can work with

503  
00:23:01,180 --> 00:22:58,460  
the crew when they wake up so I have a

504  
00:23:04,450 --> 00:23:01,190  
couple of things for you so like what

505  
00:23:08,020 --> 00:23:04,460  
are what's this like these are 3d

506  
00:23:12,460 --> 00:23:08,030  
printed bone models that's so these

507  
00:23:18,400 --> 00:23:12,470  
these have been gained by computer

508  
00:23:20,680 --> 00:23:18,410  
tomography or so so the micro CT that we

509  
00:23:23,200 --> 00:23:20,690  
use is just like the clinical CT that

510  
00:23:26,620 --> 00:23:23,210  
everyone uses but at a very smaller

511  
00:23:30,940 --> 00:23:26,630  
scale with a high resolution okay one of

512  
00:23:33,370 --> 00:23:30,950  
the things that happens to humans as

513  
00:23:35,710 --> 00:23:33,380

well as rodents in microgravity is bone

514

00:23:41,350 --> 00:23:35,720

loss so being in microgravity is similar

515

00:23:43,540 --> 00:23:41,360

to accelerated aging and so now now

516

00:23:45,280 --> 00:23:43,550

we're we're working with you know

517

00:23:46,620 --> 00:23:45,290

different groups to both an exercise

518

00:23:49,440 --> 00:23:46,630

machine to come up with countermeasures

519

00:23:51,490 --> 00:23:49,450

for our astronauts and then we use

520

00:23:54,580 --> 00:23:51,500

rodent models to study this because

521

00:23:57,280 --> 00:23:54,590

rodents have a much shorter lifespan

522

00:23:59,800 --> 00:23:57,290

their lifespan is about two years and

523

00:24:03,250 --> 00:23:59,810

then the changes that happen in their

524

00:24:05,920 --> 00:24:03,260

fazil like muscular skull physiology is

525

00:24:09,310 --> 00:24:05,930

very similar to changes that happens in

526

00:24:12,070 --> 00:24:09,320

humans so we use rodents we send them to

527

00:24:14,710 --> 00:24:12,080

the ISS in microgravity so that the the

528

00:24:16,720 --> 00:24:14,720

changes that happens in there let's say

529

00:24:19,510 --> 00:24:16,730

muscles or bones in you know a matter of

530

00:24:20,890 --> 00:24:19,520

30 or 60 days is it cool and - you know

531

00:24:23,500 --> 00:24:20,900

couple months or a couple of years in

532

00:24:25,510 --> 00:24:23,510

people yeah and that's all we have - yes

533

00:24:33,370 --> 00:24:25,520

does that mean you've got a little tiny

534

00:24:42,100 --> 00:24:33,380

Mouse treadmill here on the ground we

535

00:24:44,370 --> 00:24:42,110

have a full 1/2 ISS yes actually that's

536

00:24:46,510 --> 00:24:44,380

that's one of my expertise during my

537

00:24:49,780 --> 00:24:46,520

graduate work and then here my

538

00:24:52,090 --> 00:24:49,790

postdoctoral work at NASA I worked on

539

00:24:54,520 --> 00:24:52,100

countermeasures focusing on exercise so

540

00:24:57,640 --> 00:24:54,530

treadmill running resistance training

541

00:24:59,080 --> 00:24:57,650

aerobic versus you know does this stand

542

00:25:01,200 --> 00:24:59,090

so that's that's a lot of whittling

543

00:25:05,320 --> 00:25:01,210

working on

544

00:25:07,660 --> 00:25:05,330

nutrition and exercise is something that

545

00:25:10,240 --> 00:25:07,670

has proven to be beneficial for both

546

00:25:12,070 --> 00:25:10,250

rodents and humans so I read the

547

00:25:14,260 --> 00:25:12,080

advanced resistance exercise device is

548

00:25:21,130 --> 00:25:14,270

on orbit now so all the crew have to

549

00:25:23,500 --> 00:25:21,140

workout about 2 to 3 hours of day so I

550

00:25:25,120 --> 00:25:23,510

think we have before we move on real

551

00:25:26,410 --> 00:25:25,130

quickly we have an origin photo or

552

00:25:31,570 --> 00:25:26,420

another origin photo a day-in-the-life

553

00:25:33,730 --> 00:25:31,580

photo this is this is the micro CT

554

00:25:35,740 --> 00:25:33,740

machine that I mentioned so what you see

555

00:25:38,890 --> 00:25:35,750

there is a femur but this is basically

556

00:25:41,680 --> 00:25:38,900

where these scans are made and we create

557

00:25:43,960 --> 00:25:41,690

3d models of the bones to quantify the

558

00:25:45,190 --> 00:25:43,970

changes that have happened so we've got

559

00:25:46,870 --> 00:25:45,200

two types of bones we've got the

560

00:25:49,360 --> 00:25:46,880

cortical bone which is like the long

561

00:25:51,100 --> 00:25:49,370

tube-like bone and we have cat cells or

562

00:25:54,430 --> 00:25:51,110

spongy bone which is what I showed you

563

00:25:57,240 --> 00:25:54,440

okay and then all those little struts

564

00:26:00,520 --> 00:25:57,250

are called tropical eyes so we look at

565

00:26:01,990 --> 00:26:00,530

their structure their integrity and

566

00:26:04,570 --> 00:26:02,000

whether they're broken or whether

567

00:26:06,940 --> 00:26:04,580

they're intact and how they change with

568

00:26:11,800 --> 00:26:06,950

spaceflight or exercise or diet or

569

00:26:14,110 --> 00:26:11,810

nutrition shall we go on to our first

570

00:26:18,070 --> 00:26:14,120

segment because we have so much to talk

571

00:26:21,310 --> 00:26:18,080

about and games to play ok head into our

572

00:26:24,400 --> 00:26:21,320

let's play segment ok this may include

573

00:26:26,500 --> 00:26:24,410

game controllers 12 sided dice or matted

574

00:26:29,910 --> 00:26:26,510

bubbles it's all an excuse to play games

575

00:26:34,940 --> 00:26:29,920

and talk about science let's get

576

00:26:38,909 --> 00:26:37,200

all right so let me tell you what's

577

00:26:41,310 --> 00:26:38,919

gonna happen here we're calling this our

578

00:26:42,870 --> 00:26:41,320

women at NASA quiz and here's how it's

579

00:26:45,030 --> 00:26:42,880

gonna work we'll put up an image on the

580

00:26:47,430 --> 00:26:45,040

monitor of an amazing NASA woman and

581

00:26:49,440 --> 00:26:47,440

we're we're gonna give you clues about

582

00:26:53,370 --> 00:26:49,450

who that person might be you try to

583

00:26:55,500 --> 00:26:53,380

identify them by name and if anybody

584

00:26:56,820 --> 00:26:55,510

playing at home wants to get in on it

585

00:26:59,520 --> 00:26:56,830

write your answer in the chat and we'll

586

00:27:01,140 --> 00:26:59,530

see who finds it first yeah okay all

587

00:27:04,350 --> 00:27:01,150

right ready so let's bring up our first

588

00:27:06,299 --> 00:27:04,360

Wonder Woman so for your first clue

589

00:27:08,789 --> 00:27:06,309

so prior to NASA her research

590

00:27:29,960 --> 00:27:08,799

engineering career resulted in three

591

00:27:32,940 --> 00:27:29,970

patents so other fun facts for you guys

592

00:27:35,940 --> 00:27:32,950

watching she was the first Hispanic

593

00:27:38,940 --> 00:27:35,950

woman to go to space and she recently

594

00:27:41,450 --> 00:27:38,950

just retired but before that she serves

595

00:27:43,980 --> 00:27:41,460

as director of NASA's Johnson Space

596

00:27:44,960 --> 00:27:43,990

Center and she was the second woman to

597

00:27:50,220 --> 00:27:44,970

do so

598

00:27:54,210 --> 00:27:50,230

that's pretty impressive not too shabby

599

00:27:57,690 --> 00:27:54,220

for a career path all right let's go on

600

00:28:00,270 --> 00:27:57,700

to our second NASA woman get that up

601  
00:28:06,200 --> 00:28:00,280  
there I will read you the first clue

602  
00:28:14,190 --> 00:28:12,030  
and I at least read the first classes

603  
00:28:16,650 --> 00:28:14,200  
first female non-military

604  
00:28:20,580 --> 00:28:16,660  
chief of the astronaut office not too

605  
00:28:28,920 --> 00:28:20,590  
bad she is I'm gonna give these two a

606  
00:28:30,690 --> 00:28:28,930  
chance she is NASA's most experienced

607  
00:28:33,000 --> 00:28:30,700  
astronaut holding the American record

608  
00:28:34,770 --> 00:28:33,010  
for the most time spent in space

609  
00:28:39,240 --> 00:28:34,780  
surpassing Jeffrey Williams and Scott

610  
00:28:41,250 --> 00:28:39,250  
Kelly in 2017 with 665 days yeah and she

611  
00:28:43,950 --> 00:28:41,260  
also holds the records for total

612  
00:28:46,430 --> 00:28:43,960  
spacewalks by a woman at 10 and the

613  
00:28:49,800 --> 00:28:46,440

longest single space flight by a woman

614

00:28:52,140 --> 00:28:49,810

so she clearly is amazing yes man why

615

00:29:01,170 --> 00:28:52,150

don't you tell us dr. Peggy Whitson

616

00:29:04,260 --> 00:29:01,180

yeah she's amazing very motivated very

617

00:29:08,820 --> 00:29:04,270

committed so yeah also very much enjoyed

618

00:29:11,430 --> 00:29:08,830

it move on to our third third Wonder

619

00:29:15,360 --> 00:29:11,440

Woman and I'm hoping that I can at least

620

00:29:18,120 --> 00:29:15,370

get through the first couple clues so

621

00:29:19,830 --> 00:29:18,130

she is known for her work analyzing data

622

00:29:24,470 --> 00:29:19,840

from Windtunnel experiments in

623

00:29:38,640 --> 00:29:28,290

she was NASA's first african-american

624

00:29:40,590 --> 00:29:38,650

female engineer same group and so along

625

00:29:42,330 --> 00:29:40,600

with Catherine Johnson and Dorothy

626

00:29:44,700 --> 00:29:42,340

Vaughn she made it part of NASA's

627

00:29:46,410 --> 00:29:44,710

Langley of research

628

00:29:50,880 --> 00:29:46,420

Langley's research center human-computer

629

00:29:52,770 --> 00:29:50,890

group mm-hmm human computers yes so if

630

00:29:57,390 --> 00:29:52,780

it's not Katherine Johnson and it's not

631

00:30:10,790 --> 00:29:57,400

Dorothy Vaughn Mary Jackson yeah

632

00:30:17,610 --> 00:30:15,120

awesome alright number four we ready she

633

00:30:19,740 --> 00:30:17,620

helped launch NASA's first successful

634

00:30:23,040 --> 00:30:19,750

astronomical mission the orbiting solar

635

00:30:24,570 --> 00:30:23,050

observatory one she was the first chief

636

00:30:26,340 --> 00:30:24,580

of astronomy in the office of space

637

00:30:28,530 --> 00:30:26,350

science and the first woman to hold an

638

00:30:31,620 --> 00:30:28,540

executive position at NASA that's cool

639

00:30:34,080 --> 00:30:31,630

and I love this she is called the mother

640

00:30:36,210 --> 00:30:34,090

of Hubble through her oversight for

641

00:30:42,300 --> 00:30:36,220

planning and development of the Hubble

642

00:30:45,180 --> 00:30:42,310

Space Telescope Mother does anybody know

643

00:30:50,070 --> 00:30:45,190

her name no I don't then let us

644

00:30:57,990 --> 00:30:50,080

introduce you to Nancy Roman so cool

645

00:31:01,560 --> 00:30:58,000

honestly and we are going to move on to

646

00:31:03,930 --> 00:31:01,570

our Wonder Woman number five she lived

647

00:31:06,030 --> 00:31:03,940

underwater in an undersea habitat for

648

00:31:08,280 --> 00:31:06,040

nine days as a member of NASA's mission

649

00:31:12,390 --> 00:31:08,290

Explorer preparing astronauts for future

650

00:31:15,330 --> 00:31:12,400

exploration she is biess she's second on

651  
00:31:22,760 --> 00:31:15,340  
the list in kampala motive a spacewalk

652  
00:31:28,200 --> 00:31:25,190  
[Music]

653  
00:31:30,330 --> 00:31:28,210  
and another cool fun fact is that she

654  
00:31:32,840 --> 00:31:30,340  
was actually selected to fly aboard

655  
00:31:42,330 --> 00:31:32,850  
Boeing's at Commercial Crew spacecraft

656  
00:31:45,830 --> 00:31:42,340  
did she also run a marathon also

657  
00:31:48,899 --> 00:31:45,840  
completed a triathlon on ISS

658  
00:31:48,899 --> 00:31:48,909  
[Music]

659  
00:32:01,659 --> 00:31:53,110  
shoes do weight bearing exercises that

660  
00:32:07,919 --> 00:32:01,669  
mimic these strokes okay so our clear

661  
00:32:12,370 --> 00:32:11,080  
all right so seriously we got to move on

662  
00:32:15,279 --> 00:32:12,380  
because there's so much good information

663  
00:32:16,779 --> 00:32:15,289

and we're gonna move into our Q&A so our

664

00:32:18,759 --> 00:32:16,789

viewers have some questions for you if

665

00:32:20,230 --> 00:32:18,769

you have a question now that you want to

666

00:32:22,389 --> 00:32:20,240

add throw it in the chat and we'll see

667

00:32:24,909 --> 00:32:22,399

how many we can get to before they have

668

00:32:27,190 --> 00:32:24,919

to go so the first thing that Daniele

669

00:32:30,220 --> 00:32:27,200

and I wanted to know right was can you

670

00:32:32,909 --> 00:32:30,230

name a particularly memorable moment

671

00:32:39,039 --> 00:32:32,919

from your career you have like a really

672

00:32:40,539 --> 00:32:39,049

favorite moment of shining example I've

673

00:32:44,980 --> 00:32:40,549

got a memorable one but it's probably

674

00:32:51,700 --> 00:32:44,990

not my favorite a couple of fire trucks

675

00:32:53,409 --> 00:32:51,710

and some hazmat school and we finally

676  
00:32:54,909 --> 00:32:53,419  
decided we should call my advisor and

677  
00:32:58,419 --> 00:32:54,919  
let her know that the fire trucks were

678  
00:33:00,549 --> 00:32:58,429  
coming down okay the end but we had to

679  
00:33:02,590 --> 00:33:00,559  
evacuate the lab for a little while and

680  
00:33:05,590 --> 00:33:02,600  
what did you do Laura I didn't do

681  
00:33:08,919 --> 00:33:05,600  
anything but the vacuum do were broke

682  
00:33:10,330 --> 00:33:08,929  
and releasing sulfur trioxide into the

683  
00:33:11,950 --> 00:33:10,340  
air which is a really bad thing because

684  
00:33:14,379 --> 00:33:11,960  
it mixes with the water in your lungs

685  
00:33:17,440 --> 00:33:14,389  
and make sulfuric acid in your nose oh

686  
00:33:19,570 --> 00:33:17,450  
so fortunately I had the good sense to

687  
00:33:21,879 --> 00:33:19,580  
run screaming from the building yeah

688  
00:33:23,289 --> 00:33:21,889

after pulling the fire alarm and all of

689

00:33:25,269 --> 00:33:23,299

the I think the first-year graduate

690

00:33:26,320 --> 00:33:25,279

students had been having a lecture down

691

00:33:27,399 --> 00:33:26,330

the other end of the building because

692

00:33:29,049 --> 00:33:27,409

they were all just kind of standing

693

00:33:32,080 --> 00:33:29,059

around outside the door cuz somebody had

694

00:33:33,940 --> 00:33:32,090

pulled the fire alarm and I come

695

00:33:40,810 --> 00:33:33,950

screaming out of the building lab coat

696

00:33:45,500 --> 00:33:40,820

glasses started running

697

00:33:53,550 --> 00:33:51,150

adventures in science every time which I

698

00:33:57,000 --> 00:33:53,560

do want these things you know there is

699

00:33:58,730 --> 00:33:57,010

something memorable about it I can tell

700

00:34:05,610 --> 00:33:58,740

you the last one

701

00:34:07,860 --> 00:34:05,620

not as tragic as we were setting up

702

00:34:11,790 --> 00:34:07,870

tickets at a which is the last one I put

703

00:34:13,200 --> 00:34:11,800

him you know we build and deliver and we

704

00:34:15,150 --> 00:34:13,210

were going to do thermo back so

705

00:34:18,750 --> 00:34:15,160

basically we put in the oven we take all

706

00:34:21,680 --> 00:34:18,760

the air and then we race it to certain

707

00:34:24,300 --> 00:34:21,690

temperature and the water temperature so

708

00:34:26,790 --> 00:34:24,310

you know we put it in there with all the

709

00:34:29,610 --> 00:34:26,800

sensors and then we had two people you

710

00:34:31,080 --> 00:34:29,620

know Monday ting the whole you know you

711

00:34:33,120 --> 00:34:31,090

because you have to wash the whole

712

00:34:36,000 --> 00:34:33,130

experiment for the new days right okay

713

00:34:38,010 --> 00:34:36,010

mm-hmm and so the guys are looking at

714

00:34:39,960 --> 00:34:38,020

the temperature you know is that

715

00:34:42,900 --> 00:34:39,970

changing you know if one app to certain

716

00:34:45,090 --> 00:34:42,910

tip you know like like 40 degrees

717

00:34:47,520 --> 00:34:45,100

Fahrenheit and then it was gonna come

718

00:34:50,340 --> 00:34:47,530

down and it's not changing after two

719

00:34:53,100 --> 00:34:50,350

hours and so they ended up calling

720

00:34:55,860 --> 00:34:53,110

somebody and turns out that the you know

721

00:34:58,170 --> 00:34:55,870

oven actually had malfunction so yeah

722

00:35:01,440 --> 00:34:58,180

always to the whole weekend and we

723

00:35:03,030 --> 00:35:01,450

needed to do before you know we for the

724

00:35:04,740 --> 00:35:03,040

even the satellite so we were trying to

725

00:35:07,230 --> 00:35:04,750

scramble in world can we take the

726

00:35:09,090 --> 00:35:07,240

satellite you know to do this testing

727

00:35:12,120 --> 00:35:09,100

whether it was going to be gay Johnson

728

00:35:14,820 --> 00:35:12,130

Space Center or no there's if I seemed

729

00:35:17,790 --> 00:35:14,830

to hear round so luckily the the people

730

00:35:21,210 --> 00:35:17,800

in the e L which is a facility here were

731

00:35:22,770 --> 00:35:21,220

able to fix the problem and ultimate

732

00:35:24,420 --> 00:35:22,780

experiment next you know a week later

733

00:35:25,950 --> 00:35:24,430

but you know it was kind of stressful

734

00:35:35,130 --> 00:35:25,960

because we needed to deliver the

735

00:35:36,990 --> 00:35:35,140

satellite in two weeks so every single

736

00:35:41,130 --> 00:35:37,000

one you know we build we have one yeah

737

00:35:44,010 --> 00:35:41,140

cool like I'm sure dealing with rodents

738

00:35:45,420 --> 00:35:44,020

can be very memorable I mean the

739

00:35:48,960 --> 00:35:45,430

spaceflight in general is always

740

00:35:50,400 --> 00:35:48,970

memorable I mean not every single launch

741

00:35:53,070 --> 00:35:50,410

is different there's always you know

742

00:35:56,000 --> 00:35:53,080

first you know working with crew is

743

00:35:58,460 --> 00:35:56,010

always you know in unique experience

744

00:36:01,730 --> 00:35:58,470

for me though the most rewarding part of

745

00:36:04,609 --> 00:36:01,740

my job is when I can inspire someone

746

00:36:06,500 --> 00:36:04,619

else so I used to teach for a brief

747

00:36:08,210 --> 00:36:06,510

amount of time and then you know here

748

00:36:09,980 --> 00:36:08,220

you know we always have interns we have

749

00:36:13,640 --> 00:36:09,990

students that come through the lab and

750

00:36:16,250 --> 00:36:13,650

we worked with them so for me like if I

751

00:36:18,319 --> 00:36:16,260

see that light bulb go on in you know

752

00:36:20,839 --> 00:36:18,329

like one out of hundred kids that's just

753

00:36:22,309 --> 00:36:20,849

the most rewarding part for me and you

754

00:36:25,250 --> 00:36:22,319

know we've had students coming through

755

00:36:27,079 --> 00:36:25,260

our lab who did not really know what

756

00:36:29,420 --> 00:36:27,089

they wanted to do but now you know

757

00:36:32,240 --> 00:36:29,430

they're in medical school or at school

758

00:36:33,559 --> 00:36:32,250

getting their PhDs and for me know it at

759

00:36:36,049 --> 00:36:33,569

the end of the day it just makes it all

760

00:36:37,670 --> 00:36:36,059

the work worth it isn't that's uh it's

761

00:36:40,549 --> 00:36:37,680

amazing you'd change the life right

762

00:36:42,920 --> 00:36:40,559

there right so cool well ladies we would

763

00:36:45,289 --> 00:36:42,930

love to spend the rest of our episode

764

00:36:48,289 --> 00:36:45,299

with you but unfortunately we can't

765

00:36:52,760 --> 00:36:48,299

because we have another group of wonder

766

00:37:01,510 --> 00:36:52,770

woman here at NASA so unfortunately we

767

00:37:09,559 --> 00:37:04,519

well we'll be calling them right in in a

768

00:37:11,089 --> 00:37:09,569

moment so just as a reminder for

769

00:37:13,069 --> 00:37:11,099

everybody watching at home this is NASA

770

00:37:15,620 --> 00:37:13,079

in Silicon Valley live and today we're

771

00:37:17,200 --> 00:37:15,630

celebrating national stem day by talking

772

00:37:19,640 --> 00:37:17,210

with some amazing wonder women of NASA

773

00:37:21,289 --> 00:37:19,650

so if you have a question for our guests

774

00:37:22,880 --> 00:37:21,299

write it in the chat and we'll try to

775

00:37:25,519 --> 00:37:22,890

get to more of them we just have so much

776

00:37:27,710 --> 00:37:25,529

amazing information to cover that we

777

00:37:29,000 --> 00:37:27,720

sometimes run out of time what but

778

00:37:31,430 --> 00:37:29,010

that's the fishing though it's a good

779

00:37:33,200 --> 00:37:31,440

problem to have absolutely do you want

780

00:37:37,670 --> 00:37:33,210

to introduce our second group yeah so

781

00:37:44,569 --> 00:37:37,680

come on out Diana Jessica and Kathy

782

00:38:01,140 --> 00:37:49,859

I miss the dress-code memo today looks

783

00:38:03,089 --> 00:38:01,150

great welcome it's like we did last time

784

00:38:05,130 --> 00:38:03,099

you just introduce yourselves and tell

785

00:38:07,349 --> 00:38:05,140

us couple sentences about what you do at

786

00:38:09,720 --> 00:38:07,359

NASA Kathryn Bywaters I'm an

787

00:38:14,010 --> 00:38:09,730

astrobiologist and I work on life

788

00:38:17,430 --> 00:38:14,020

detection instrumentation astrobiology

789

00:38:19,200 --> 00:38:17,440

later awesome I'm Jessica Marquez and I

790

00:38:20,910 --> 00:38:19,210

work in the human systems integration

791

00:38:23,120 --> 00:38:20,920

division and I build software for

792

00:38:26,579 --> 00:38:23,130

Mission Control

793

00:38:29,099 --> 00:38:26,589

I'm Diana gentry I am a bioengineer

794

00:38:32,250 --> 00:38:29,109

which means I get to wear many hats at

795

00:38:35,250 --> 00:38:32,260

the intersection of science and math and

796

00:38:36,990 --> 00:38:35,260

technology but I primarily look at ways

797

00:38:39,480 --> 00:38:37,000

of better measuring how microbes

798

00:38:42,030 --> 00:38:39,490

interact with their environments that's

799

00:38:45,900 --> 00:38:42,040

just it's very interesting that's a lot

800

00:38:49,950 --> 00:38:45,910

to unpack but before we do like when did

801  
00:38:53,280 --> 00:38:49,960  
you know that you wanted to be anything

802  
00:38:57,210 --> 00:38:53,290  
involved in space like yeah it was your

803  
00:38:59,880 --> 00:38:57,220  
aha moment well it happened in stages I

804  
00:39:02,700 --> 00:38:59,890  
think the very first thing that set me

805  
00:39:05,849 --> 00:39:02,710  
on that path I was about four years old

806  
00:39:08,880 --> 00:39:05,859  
and my dad was watching TV he said hello

807  
00:39:11,099 --> 00:39:08,890  
come here come here sit down this is

808  
00:39:13,890 --> 00:39:11,109  
very important and it was the original

809  
00:39:16,770 --> 00:39:13,900  
Star Trek watch the whole series with

810  
00:39:19,079 --> 00:39:16,780  
him and at that point I was I was bitten

811  
00:39:20,490 --> 00:39:19,089  
by the space bug and I thought clearly I

812  
00:39:22,200 --> 00:39:20,500  
need to be a scientist

813  
00:39:23,220 --> 00:39:22,210

and as I got a little older and in

814

00:39:25,140 --> 00:39:23,230

middle school in high school I started

815

00:39:28,530 --> 00:39:25,150

to realize that I also really enjoyed

816

00:39:30,569 --> 00:39:28,540

math and I also kind of enjoyed building

817

00:39:31,980 --> 00:39:30,579

things with my hands and I thought but

818

00:39:36,150 --> 00:39:31,990

science is really the most important

819

00:39:39,359 --> 00:39:36,160

thing and eventually I got to college

820

00:39:41,309 --> 00:39:39,369

and I was listening to a presentation

821

00:39:42,780 --> 00:39:41,319

about the various majors that they

822

00:39:46,079 --> 00:39:42,790

offered and so on and so forth and I was

823

00:39:47,250 --> 00:39:46,089

talking with a classmate afterwards he

824

00:39:49,380 --> 00:39:47,260

said what are you interested in and I

825

00:39:51,480 --> 00:39:49,390

said well I think I'm probably going to

826

00:39:52,559 --> 00:39:51,490

do biology although I kind of wish I

827

00:39:54,329 --> 00:39:52,569

could also do

828

00:39:55,650 --> 00:39:54,339

than maybe some engineering and he said

829

00:39:57,509 --> 00:39:55,660

well you know there's this

830

00:39:59,130 --> 00:39:57,519

bioengineering program it's a little

831

00:40:01,769 --> 00:39:59,140

weird and I don't know much about it I

832

00:40:04,759 --> 00:40:01,779

was this I can have my cake and eat it

833

00:40:10,339 --> 00:40:08,309

so from then on I kind of I knew that

834

00:40:13,169 --> 00:40:10,349

was the direction I was going in

835

00:40:15,809 --> 00:40:13,179

speaking of bioengineering I think we

836

00:40:27,449 --> 00:40:15,819

have a really cool and very interesting

837

00:40:29,189 --> 00:40:27,459

photo of you so at my university there's

838

00:40:33,089 --> 00:40:29,199

a tradition that when you go to graduate

839

00:40:34,829 --> 00:40:33,099

you go in costume and as I said when I

840

00:40:36,329 --> 00:40:34,839

was studying math I felt like I wasn't

841

00:40:38,009 --> 00:40:36,339

getting quite enough building things

842

00:40:39,799 --> 00:40:38,019

with my hands going on and I might have

843

00:40:43,140 --> 00:40:39,809

gone a little bit overboard with this

844

00:40:45,659 --> 00:40:43,150

event and so I decided I was going to

845

00:40:48,059 --> 00:40:45,669

build a working shower stall that strap

846

00:40:50,279 --> 00:40:48,069

on my back and a water tank so I could

847

00:40:51,779 --> 00:40:50,289

spray water at people and so I've got

848

00:40:53,819 --> 00:40:51,789

the curtain on and you can see the

849

00:40:55,499 --> 00:40:53,829

faucet coming over there and the shower

850

00:40:59,969 --> 00:40:55,509

cap on my mortar board it was a great

851

00:41:06,569 --> 00:40:59,979

day it it didn't hurt that it was about

852

00:41:08,159 --> 00:41:06,579

95 degrees can you tell us really

853

00:41:10,469 --> 00:41:08,169

quickly before we move on you told me a

854

00:41:13,890 --> 00:41:10,479

story about how you chose between math

855

00:41:15,989 --> 00:41:13,900

and engineering oh yes this was probably

856

00:41:21,689 --> 00:41:15,999

one of the best pieces of mentorship

857

00:41:23,459 --> 00:41:21,699

advice I ever got I was taking a kind of

858

00:41:24,719 --> 00:41:23,469

introductory engineering class at the

859

00:41:27,359 --> 00:41:24,729

time I thought I was probably going to

860

00:41:28,979 --> 00:41:27,369

be an applied math major but the

861

00:41:30,059 --> 00:41:28,989

previous quarter I had seen all of these

862

00:41:32,069 --> 00:41:30,069

people who were getting to do things

863

00:41:33,689 --> 00:41:32,079

like build little robots out of balsa

864

00:41:35,489 --> 00:41:33,699

wood and rubber bands that played

865

00:41:38,039 --> 00:41:35,499

frisbee and things like that I want to

866

00:41:39,839 --> 00:41:38,049

do that so I was taking this class and

867

00:41:40,890 --> 00:41:39,849

the woman teaching it called me over

868

00:41:42,120 --> 00:41:40,900

about halfway through and said you're

869

00:41:43,319 --> 00:41:42,130

doing very well in this class I just

870

00:41:45,390 --> 00:41:43,329

wanted to know are you planning to major

871

00:41:46,979 --> 00:41:45,400

in engineering and I said well no I

872

00:41:50,039 --> 00:41:46,989

think I'm gonna be doing math and she

873

00:41:52,259 --> 00:41:50,049

said look there are two kinds of people

874

00:41:54,779 --> 00:41:52,269

in this world there are answer finders

875

00:41:56,640 --> 00:41:54,789

and there are problem solvers the answer

876

00:41:59,009 --> 00:41:56,650

finder says is this right and the

877

00:42:01,439 --> 00:41:59,019

problem solver says does this work and

878

00:42:03,209 --> 00:42:01,449

you are clearly a problem solver you are

879

00:42:04,049 --> 00:42:03,219

going to be bored stiff and applied

880

00:42:05,729 --> 00:42:04,059

mathematics

881

00:42:07,140 --> 00:42:05,739

Engineering where you actually get to

882

00:42:08,729 --> 00:42:07,150

build stuff and see the lights come on

883

00:42:09,299 --> 00:42:08,739

and the motors turn and so on and so

884

00:42:11,670 --> 00:42:09,309

forth

885

00:42:13,049 --> 00:42:11,680

and if you really want the you know the

886

00:42:14,670 --> 00:42:13,059

more mathematical rigor you can do that

887

00:42:16,049 --> 00:42:14,680

in grad school that was one of the best

888

00:42:17,969 --> 00:42:16,059

pieces of advice I ever got it was

889

00:42:19,799 --> 00:42:17,979

absolutely true right that simple

890

00:42:20,549 --> 00:42:19,809

comment made you realize I'm that kind

891

00:42:23,999 --> 00:42:20,559

of person

892

00:42:27,120 --> 00:42:24,009

yeah do engineering awesome cool what

893

00:42:30,390 --> 00:42:27,130

about you Jessica so I have always been

894

00:42:32,819 --> 00:42:30,400

interested in science and learning and

895

00:42:35,849 --> 00:42:32,829

math and ever since I was a little kid

896

00:42:38,039 --> 00:42:35,859

and I remember my dad taking me to see

897

00:42:39,689 --> 00:42:38,049

the Halley's Comet when he was passing

898

00:42:43,099 --> 00:42:39,699

and so I would always had this interest

899

00:42:44,789 --> 00:42:43,109

in science but it wasn't until I got to

900

00:42:46,739 --> 00:42:44,799

undergraduate and I was studying

901  
00:42:49,859 --> 00:42:46,749  
engineering at that point that I really

902  
00:42:51,509 --> 00:42:49,869  
understood how I can contribute to NASA

903  
00:42:52,289 --> 00:42:51,519  
and how I can contribute to the space

904  
00:42:54,120 --> 00:42:52,299  
program

905  
00:42:58,589 --> 00:42:54,130  
so it was actually through an internship

906  
00:43:01,799 --> 00:42:58,599  
here at NASA Ames and I learned about

907  
00:43:04,019 --> 00:43:01,809  
how NASA works what kind of careers are

908  
00:43:06,689 --> 00:43:04,029  
involved in engineering or the different

909  
00:43:09,150 --> 00:43:06,699  
aspects that I could work on in order to

910  
00:43:11,130 --> 00:43:09,160  
contribute to human spaceflight and then

911  
00:43:12,179 --> 00:43:11,140  
that led me to apply to grad school and

912  
00:43:14,609 --> 00:43:12,189  
that's where I really started focusing

913  
00:43:16,529 --> 00:43:14,619

on the intersection of humans and

914

00:43:19,259 --> 00:43:16,539

engineering so understanding how we can

915

00:43:22,979 --> 00:43:19,269

develop and create tools that support

916

00:43:25,829 --> 00:43:22,989

people in a very complex aerospace

917

00:43:28,739 --> 00:43:25,839

system so my focus is always how do I

918

00:43:31,439 --> 00:43:28,749

make this tool better for people and

919

00:43:34,079 --> 00:43:31,449

that's how I that's what I do now here

920

00:43:37,289 --> 00:43:34,089

in NASA Ames well let's bring up

921

00:43:39,749 --> 00:43:37,299

Jessica's origin photo because this is

922

00:43:42,569 --> 00:43:39,759

also a cool one yeah so this is a

923

00:43:46,319 --> 00:43:42,579

picture of me back in 1998 I did my

924

00:43:48,689 --> 00:43:46,329

internship and this cohort of class we

925

00:43:50,880 --> 00:43:48,699

had a research project we got to visit

926  
00:43:52,620 --> 00:43:50,890  
different NASA centers this is a picture

927  
00:43:53,969 --> 00:43:52,630  
of us visiting the space shuttle

928  
00:43:56,999 --> 00:43:53,979  
Atlantis when it was being refurbished

929  
00:44:00,120 --> 00:43:57,009  
and it just got me really excited about

930  
00:44:02,309 --> 00:44:00,130  
working with people in human spaceflight

931  
00:44:04,589 --> 00:44:02,319  
and there are several people in there

932  
00:44:07,140 --> 00:44:04,599  
that also has already now still work at

933  
00:44:09,179 --> 00:44:07,150  
NASA so it was a pretty great set of

934  
00:44:11,069 --> 00:44:09,189  
teams and like not only at NASA but

935  
00:44:13,799 --> 00:44:11,079  
didn't you mention that a lot of them

936  
00:44:16,620 --> 00:44:13,809  
are here at Ames as well yeah

937  
00:44:19,890 --> 00:44:16,630  
just like our whole little cohort was

938  
00:44:22,199 --> 00:44:19,900

really tight-knit and we all got the

939

00:44:24,979 --> 00:44:22,209

space bug and yeah some of us work here

940

00:44:27,929 --> 00:44:24,989

some of us work at Johnson Space Center

941

00:44:30,689 --> 00:44:27,939

yeah and then our mentor for that

942

00:44:33,229 --> 00:44:30,699

program also helped me get my job so it

943

00:44:35,640 --> 00:44:33,239

was quite a life changing into

944

00:44:42,349 --> 00:44:35,650

internships are a great way to get

945

00:44:44,640 --> 00:44:42,359

started I had to uh ha moments I think

946

00:44:47,789 --> 00:44:44,650

first one was that when I knew I wanted

947

00:44:49,259 --> 00:44:47,799

to be a biologist so my background my

948

00:44:50,400 --> 00:44:49,269

educational backgrounds a little

949

00:44:52,439 --> 00:44:50,410

unconventional

950

00:44:54,449 --> 00:44:52,449

I completed sixth grade and then my

951  
00:44:55,739 --> 00:44:54,459  
father moved my sister and I overseas so

952  
00:44:58,559 --> 00:44:55,749  
that was pretty much the end of my

953  
00:44:59,819 --> 00:44:58,569  
education and until I moved back to the

954  
00:45:02,609 --> 00:44:59,829  
States and I started at a community

955  
00:45:05,009 --> 00:45:02,619  
college and I took a biology class

956  
00:45:07,079 --> 00:45:05,019  
because I had no idea what it was really

957  
00:45:09,239 --> 00:45:07,089  
about and I remember just sitting and

958  
00:45:11,039 --> 00:45:09,249  
learning about the inner workings of a

959  
00:45:14,729 --> 00:45:11,049  
cell and it's like a whole nother world

960  
00:45:16,859 --> 00:45:14,739  
a whole universe inside of us that I had

961  
00:45:20,099 --> 00:45:16,869  
no idea even existed so that's when I

962  
00:45:23,249 --> 00:45:20,109  
was fascinated with biology and I was

963  
00:45:24,709 --> 00:45:23,259

told how to do biology and then for when

964

00:45:28,410 --> 00:45:24,719

I decided I really wanted to be an

965

00:45:30,630 --> 00:45:28,420

astrobiologist was I went to Utah with a

966

00:45:34,410 --> 00:45:30,640

group of people to a Mars analog and

967

00:45:36,630 --> 00:45:34,420

what an analog is is it's an environment

968

00:45:36,989 --> 00:45:36,640

that replicates some aspect of something

969

00:45:40,019 --> 00:45:36,999

else

970

00:45:42,089 --> 00:45:40,029

so here it's you know it looks a lot

971

00:45:44,849 --> 00:45:42,099

like Mars so that's nice for for the

972

00:45:46,499 --> 00:45:44,859

psyche but it also is very dry and it

973

00:45:48,900 --> 00:45:46,509

has some of the same sorts of habitats

974

00:45:51,390 --> 00:45:48,910

that you might find on Mars so going

975

00:45:53,969 --> 00:45:51,400

there and investigating that and really

976  
00:45:56,130 --> 00:45:53,979  
learning about extremophiles so microbes

977  
00:45:58,049 --> 00:45:56,140  
that live under these extreme conditions

978  
00:46:01,990 --> 00:45:58,059  
it's like BIOS someone's gonna pay me to

979  
00:46:02,000 --> 00:46:09,450  
so that's that with my aha moment photos

980  
00:46:14,150 --> 00:46:11,440  
[Music]

981  
00:46:16,700 --> 00:46:14,160  
like and this is a group of us just

982  
00:46:17,900 --> 00:46:16,710  
hanging out and the experts in the field

983  
00:46:20,240 --> 00:46:17,910  
we're explaining the different

984  
00:46:22,220 --> 00:46:20,250  
environments and you know the different

985  
00:46:25,069 --> 00:46:22,230  
habitats in way the microbes were making

986  
00:46:29,210 --> 00:46:25,079  
a living and I was just fascinated yeah

987  
00:46:30,770 --> 00:46:29,220  
this is it so then I know a little bit

988  
00:46:32,930 --> 00:46:30,780

about what you went on to do because I'm

989

00:46:36,740 --> 00:46:32,940

lucky enough to have experienced some of

990

00:46:40,760 --> 00:46:36,750

Kathy's day in the life when I went to

991

00:46:43,130 --> 00:46:40,770

cover this NASA research project doing

992

00:46:44,420 --> 00:46:43,140

their field campaign fieldwork so why

993

00:46:50,000 --> 00:46:44,430

don't you tell everybody a little bit

994

00:46:52,460 --> 00:46:50,010

about what is life so I do lab work as

995

00:46:54,880 --> 00:46:52,470

well as fieldwork and my lab work

996

00:46:57,109 --> 00:46:54,890

consists of testing different

997

00:46:59,690 --> 00:46:57,119

instrumentation that would go for

998

00:47:03,380 --> 00:46:59,700

looking for life on different planetary

999

00:47:05,150 --> 00:47:03,390

bodies so Mars Europa Enceladus and it's

1000

00:47:07,970 --> 00:47:05,160

really thinking about the questions of

1001  
00:47:09,500 --> 00:47:07,980  
you know how would we look for life what

1002  
00:47:11,720 --> 00:47:09,510  
would we look for and what if it doesn't

1003  
00:47:14,089 --> 00:47:11,730  
look like us but you know what

1004  
00:47:17,359 --> 00:47:14,099  
what sort of signatures can we pick up

1005  
00:47:19,490 --> 00:47:17,369  
on so it's testing instrumentation and

1006  
00:47:24,440 --> 00:47:19,500  
then when not test and I think we

1007  
00:47:30,109 --> 00:47:24,450  
actually have yes yeah that you brought

1008  
00:47:32,780 --> 00:47:30,119  
this interesting little object needs to

1009  
00:47:39,710 --> 00:47:32,790  
be lightweight and small so actually if

1010  
00:47:42,230 --> 00:47:39,720  
you flip it around yeah and we can so if

1011  
00:47:44,660 --> 00:47:42,240  
you see there are two little wells there

1012  
00:47:47,780 --> 00:47:44,670  
the sample goes in one side and comes

1013  
00:47:49,670 --> 00:47:47,790

out the other if you apply a current

1014

00:47:52,099 --> 00:47:49,680

through it the sample will move through

1015

00:47:55,300 --> 00:47:52,109

a tiny little fluidic channel and then

1016

00:47:57,800 --> 00:47:55,310

through a tiny little nanopore as the

1017

00:48:00,559 --> 00:47:57,810

biomolecules of interest go through the

1018

00:48:01,940 --> 00:48:00,569

tiny tiny tiny pore it just reps the

1019

00:48:05,050 --> 00:48:01,950

current and then we can learn about what

1020

00:48:09,170 --> 00:48:05,060

it is so we can investigate DNA RNA

1021

00:48:11,809 --> 00:48:09,180

proteins viruses all the sudden in this

1022

00:48:13,339 --> 00:48:11,819

small so you're literally doing science

1023

00:48:14,060 --> 00:48:13,349

that's small enough to fit in your

1024

00:48:18,390 --> 00:48:14,070

pocket yes

1025

00:48:21,030 --> 00:48:18,400

[Laughter]

1026

00:48:23,250 --> 00:48:21,040

and then I get to go and test things

1027

00:48:28,140 --> 00:48:23,260

like this out in the field and that's

1028

00:48:30,750 --> 00:48:28,150

where I got to hang out with you in the

1029

00:48:33,480 --> 00:48:30,760

Atacama Desert as it happens which is so

1030

00:48:36,180 --> 00:48:33,490

dry it's a lot like Mars so where is the

1031

00:48:39,329 --> 00:48:36,190

Atacama Desert so that is in Chile okay

1032

00:48:42,150 --> 00:48:39,339

I and it is one of the driest locations

1033

00:48:44,940 --> 00:48:42,160

on earth and its rival would be the

1034

00:48:47,819 --> 00:48:44,950

Antarctic Dry Valleys okay and we go

1035

00:48:50,150 --> 00:48:47,829

there because because it's so dry it was

1036

00:48:53,550 --> 00:48:50,160

a good analog for Mars again and

1037

00:48:55,140 --> 00:48:53,560

planetary bodies that are you know might

1038

00:48:57,960 --> 00:48:55,150

be considered dead but might have

1039

00:49:00,480 --> 00:48:57,970

remnants of life or life making a living

1040

00:49:02,760 --> 00:49:00,490

in very special environments so we go

1041

00:49:04,710 --> 00:49:02,770

there and you know when you look out

1042

00:49:06,390 --> 00:49:04,720

it's very barren there's no life you

1043

00:49:08,819 --> 00:49:06,400

don't see little bushes or plants

1044

00:49:10,050 --> 00:49:08,829

anywhere and so we have to be really

1045

00:49:17,790 --> 00:49:10,060

careful not to contaminate the

1046

00:49:20,670 --> 00:49:17,800

environment we can all suited up right

1047

00:49:22,980 --> 00:49:20,680

there I am we've dug this hole and then

1048

00:49:25,740 --> 00:49:22,990

you have to wear the cleanroom suit hole

1049

00:49:27,750 --> 00:49:25,750

gown and booties and hat and be very

1050

00:49:30,300 --> 00:49:27,760

careful to take your sample because any

1051  
00:49:32,460 --> 00:49:30,310  
of you know your own microbes or your

1052  
00:49:34,950 --> 00:49:32,470  
own DNA that gets contaminated in there

1053  
00:49:48,210 --> 00:49:34,960  
will overwhelm the background so you

1054  
00:49:54,650 --> 00:49:48,220  
have to be very careful what I do I mean

1055  
00:49:59,130 --> 00:49:54,660  
you get paid to clean the dirt thank you

1056  
00:50:02,849 --> 00:49:59,140  
how'd you just good um so my main goal

1057  
00:50:05,069 --> 00:50:02,859  
and add here is to develop software so

1058  
00:50:07,079 --> 00:50:05,079  
the bay focus that we do is billing

1059  
00:50:09,569 --> 00:50:07,089  
planning and scheduling tools and so I

1060  
00:50:11,700 --> 00:50:09,579  
get to actually learn about everybody

1061  
00:50:14,550 --> 00:50:11,710  
else's job in order to create these

1062  
00:50:17,760 --> 00:50:14,560  
software tools so and then I get to test

1063  
00:50:21,079 --> 00:50:17,770

feel them in different places so I get

1064

00:50:23,490 --> 00:50:21,089

to learn about how trainers might be

1065

00:50:25,620 --> 00:50:23,500

teaching astronauts how to do their job

1066

00:50:27,430 --> 00:50:25,630

I get to go to Mission Control and learn

1067

00:50:29,500 --> 00:50:27,440

how they control robots

1068

00:50:32,320 --> 00:50:29,510

how they manage the International Space

1069

00:50:34,180 --> 00:50:32,330

Station how they schedule astronauts

1070

00:50:36,310 --> 00:50:34,190

time and all we take all that

1071

00:50:38,890 --> 00:50:36,320

information in order to build and design

1072

00:50:40,270 --> 00:50:38,900

our tools and then we get to test them

1073

00:50:41,470 --> 00:50:40,280

in different environments so we've

1074

00:50:44,050 --> 00:50:41,480

gotten to test them everywhere from

1075

00:50:46,540 --> 00:50:44,060

underwater in the extreme environments

1076

00:50:49,780 --> 00:50:46,550

of analogs we also work in analogs

1077

00:50:52,930 --> 00:50:49,790

but these analogs don't necessarily have

1078

00:50:55,150 --> 00:50:52,940

to simulate a planetary environment it

1079

00:50:57,610 --> 00:50:55,160

is simulating some aspect of mission

1080

00:50:59,890 --> 00:50:57,620

control so they have a slightly

1081

00:51:01,750 --> 00:50:59,900

different or they're trying to push some

1082

00:51:05,830 --> 00:51:01,760

aspect of human spaceflight maybe

1083

00:51:08,320 --> 00:51:05,840

isolation so we give them our tools and

1084

00:51:12,010 --> 00:51:08,330

we get feedback and so I've gotten to go

1085

00:51:15,340 --> 00:51:12,020

to places like volcanoes and the mission

1086

00:51:17,500 --> 00:51:15,350

under the waterless in underwater the

1087

00:51:19,870 --> 00:51:17,510

Arctic mission control at Johnson Space

1088

00:51:21,700 --> 00:51:19,880

Center so our tool has been up in space

1089

00:51:23,860 --> 00:51:21,710

stations that I was also very exciting

1090

00:51:27,490 --> 00:51:23,870

it's pretty cool so Mission Control is

1091

00:51:30,010 --> 00:51:27,500

it's like the brain of space missions

1092

00:51:31,600 --> 00:51:30,020

right where they're controlling what how

1093

00:51:32,980 --> 00:51:31,610

would you describe it yeah so Mission

1094

00:51:35,440 --> 00:51:32,990

Control so we have astronauts up in

1095

00:51:37,930 --> 00:51:35,450

space station and they are super busy

1096

00:51:41,110 --> 00:51:37,940

and the whole entire space station is

1097

00:51:43,090 --> 00:51:41,120

managed by a huge team of flight

1098

00:51:46,330 --> 00:51:43,100

controllers back on ground and so

1099

00:51:47,830 --> 00:51:46,340

they're located physically in Johnson

1100

00:51:50,860 --> 00:51:47,840

Space Center but there's also different

1101  
00:51:53,290 --> 00:51:50,870  
smaller mission controls i'm in europe

1102  
00:51:56,230 --> 00:51:53,300  
and japan and we have another one in

1103  
00:51:59,170 --> 00:51:56,240  
alabama we also actually have one here

1104  
00:52:00,730 --> 00:51:59,180  
nasa ames and they all coordinated to

1105  
00:52:02,470 --> 00:52:00,740  
make sure that the space station is

1106  
00:52:04,660 --> 00:52:02,480  
healthy that all the science payloads

1107  
00:52:08,620 --> 00:52:04,670  
are working and that we're keeping the

1108  
00:52:09,730 --> 00:52:08,630  
science sorry the astronauts working if

1109  
00:52:13,120 --> 00:52:09,740  
they have any questions

1110  
00:52:15,040 --> 00:52:13,130  
we keep them healthy did you bring a

1111  
00:52:16,540 --> 00:52:15,050  
photo I think she I think she did and

1112  
00:52:20,710 --> 00:52:16,550  
this one has a really cool background

1113  
00:52:24,130 --> 00:52:20,720

story yes so this is a picture of me in

1114

00:52:26,290 --> 00:52:24,140

at NASA Johnson Space Center in Mission

1115

00:52:28,600 --> 00:52:26,300

Control so this is when we did our first

1116

00:52:31,870 --> 00:52:28,610

deployment of our tool up in Space

1117

00:52:33,970 --> 00:52:31,880

Station so I got to sit down in Mission

1118

00:52:37,300 --> 00:52:33,980

Control and I have to talk on the loops

1119

00:52:39,990 --> 00:52:37,310

which is just the the way they talk the

1120

00:52:42,840 --> 00:52:40,000

the communication loops that they have

1121

00:52:45,220 --> 00:52:42,850

and yeah it was very excited we got to

1122

00:52:47,740 --> 00:52:45,230

talk to the astronauts and work with

1123

00:52:51,340 --> 00:52:47,750

them that whole week that we were there

1124

00:52:53,320 --> 00:52:51,350

so your voice is forever like down in

1125

00:52:56,020 --> 00:52:53,330

the NASA records yeah so I was actually

1126

00:52:58,660 --> 00:52:56,030

very hesitant to talk during uh during

1127

00:53:00,280 --> 00:52:58,670

the mission and one of my colleagues

1128

00:53:02,230 --> 00:53:00,290

that was sitting in the front room so

1129

00:53:03,130 --> 00:53:02,240

there's actually multiple not only are

1130

00:53:05,080 --> 00:53:03,140

there thousands of people there in

1131

00:53:06,730 --> 00:53:05,090

multiple rooms started sitting in one of

1132

00:53:08,470 --> 00:53:06,740

the back rooms and someone in the front

1133

00:53:10,330 --> 00:53:08,480

room calls over as like can you please

1134

00:53:13,090 --> 00:53:10,340

give me a status on playbook that's our

1135

00:53:22,050 --> 00:53:13,100

tool and so forced me to actually talk

1136

00:53:28,900 --> 00:53:26,500

because it is they are listening to so

1137

00:53:31,840 --> 00:53:28,910

many conversations that I didn't want to

1138

00:53:34,720 --> 00:53:31,850

like add to that problem or add to that

1139

00:53:36,670 --> 00:53:34,730

workload so I was actually very much

1140

00:53:44,620 --> 00:53:36,680

like I'm gonna just be here unless I

1141

00:53:46,390 --> 00:53:44,630

have to talk I'm only gonna talk all

1142

00:53:49,470 --> 00:53:46,400

right let's keep going so what about you

1143

00:53:55,870 --> 00:53:49,480

Diana like what is the day in the life

1144

00:53:59,320 --> 00:53:55,880

it's very seasonal so in the winter time

1145

00:54:04,000 --> 00:53:59,330

most of what I'm doing is benchtop work

1146

00:54:07,530 --> 00:54:04,010

so we build these devices that you can

1147

00:54:10,440 --> 00:54:07,540

grow microbes in and we can control the

1148

00:54:13,090 --> 00:54:10,450

environments on a very small scale and

1149

00:54:15,250 --> 00:54:13,100

with a bunch of sensors attached and so

1150

00:54:16,960 --> 00:54:15,260

we can expose them to different types of

1151  
00:54:21,900 --> 00:54:16,970  
environmental stresses and we can see

1152  
00:54:26,380 --> 00:54:21,910  
how they respond to that in the summer

1153  
00:54:28,180 --> 00:54:26,390  
we are frequently out in Mars analog

1154  
00:54:30,550 --> 00:54:28,190  
environments like the type that Kathy

1155  
00:54:33,040 --> 00:54:30,560  
was talking about in particular we tend

1156  
00:54:35,710 --> 00:54:33,050  
to visit recent eruption sites in

1157  
00:54:38,200 --> 00:54:35,720  
Iceland one of the things that I work on

1158  
00:54:41,500 --> 00:54:38,210  
is instrumentation for life detection

1159  
00:54:43,510 --> 00:54:41,510  
and one of the things that's very

1160  
00:54:45,490 --> 00:54:43,520  
important with life detection is that

1161  
00:54:47,470 --> 00:54:45,500  
you have to know what your null case is

1162  
00:54:49,090 --> 00:54:47,480  
what your baseline is and that's

1163  
00:54:50,860 --> 00:54:49,100

actually extremely difficult to do on

1164

00:54:55,090 --> 00:54:50,870

earth because life is everywhere

1165

00:54:57,310 --> 00:54:55,100

and very hard to kill so we go to recent

1166

00:54:58,990 --> 00:54:57,320

eruption sites that have basically cools

1167

00:54:59,980 --> 00:54:59,000

down just enough that you can walk on

1168

00:55:01,900 --> 00:54:59,990

them and go out there with your

1169

00:55:03,400 --> 00:55:01,910

instrument and we try and figure out

1170

00:55:05,800 --> 00:55:03,410

what it will actually read when there

1171

00:55:08,530 --> 00:55:05,810

shouldn't be any life there okay like to

1172

00:55:11,710 --> 00:55:08,540

set your instrument at zero right yes

1173

00:55:14,170 --> 00:55:11,720

and then in the spring and the fall

1174

00:55:16,150 --> 00:55:14,180

which is fog season around here in the

1175

00:55:19,540 --> 00:55:16,160

Bay Area I work on a project that

1176  
00:55:21,940 --> 00:55:19,550  
develops payloads for drones for UAVs

1177  
00:55:23,980 --> 00:55:21,950  
and that captures fog and cloud water

1178  
00:55:26,680 --> 00:55:23,990  
for biochemical analysis so that we can

1179  
00:55:28,600 --> 00:55:26,690  
see what's up there in the fog and if

1180  
00:55:32,920 --> 00:55:28,610  
it's alive and if it's doing anything so

1181  
00:55:34,990 --> 00:55:32,930  
why fog like I know it's very prevalent

1182  
00:55:37,980 --> 00:55:35,000  
around here but that it is like why

1183  
00:55:42,220 --> 00:55:37,990  
exactly like what's so special about fog

1184  
00:55:46,360 --> 00:55:42,230  
so the so the core question that we're

1185  
00:55:48,490 --> 00:55:46,370  
trying to get at is is life possible on

1186  
00:55:51,400 --> 00:55:48,500  
an extended basis in the absence of

1187  
00:55:53,050 --> 00:55:51,410  
stable surface water and on earth this

1188  
00:55:55,120 --> 00:55:53,060

isn't an issue because all of the fog

1189

00:55:57,700 --> 00:55:55,130

that we have cycles fairly rapidly

1190

00:55:59,590 --> 00:55:57,710

through having been puddles or lakes or

1191

00:56:00,910 --> 00:55:59,600

rivers or the ocean and then it comes up

1192

00:56:02,740 --> 00:56:00,920

into the atmosphere and then it comes

1193

00:56:05,200 --> 00:56:02,750

back down again but if you look at a

1194

00:56:06,940 --> 00:56:05,210

planet like say Venus where the surface

1195

00:56:08,770 --> 00:56:06,950

is way too hot for there to be any

1196

00:56:10,870 --> 00:56:08,780

staple liquid there but you have

1197

00:56:13,690 --> 00:56:10,880

kilometers and kilometers of much cooler

1198

00:56:14,890 --> 00:56:13,700

dense clouds above the surface is that

1199

00:56:18,310 --> 00:56:14,900

an area that we should consider a

1200

00:56:19,870 --> 00:56:18,320

possible habitat hmm it just seems

1201

00:56:23,740 --> 00:56:19,880

pretty amazing that's actually really

1202

00:56:29,350 --> 00:56:23,750

cool we have a photo of you know trips

1203

00:56:31,960 --> 00:56:29,360

right so this trip actually melted a

1204

00:56:34,600 --> 00:56:31,970

little bit of the - so I'm standing in

1205

00:56:37,000 --> 00:56:34,610

front of a hydrothermal vent so there's

1206

00:56:39,310 --> 00:56:37,010

basically a hot spot under the ground

1207

00:56:41,980 --> 00:56:39,320

that is hot enough that it's forcing

1208

00:56:44,380 --> 00:56:41,990

boiling hot water up to the surface and

1209

00:56:46,150 --> 00:56:44,390

so we've got a combination of boiling

1210

00:56:47,890 --> 00:56:46,160

hot water coming up off of the ground

1211

00:56:49,960 --> 00:56:47,900

and then it's mixing with a very cool

1212

00:56:52,180 --> 00:56:49,970

air and causing a ton of steam to

1213

00:56:54,970 --> 00:56:52,190

condense okay so that interface is very

1214

00:56:57,010 --> 00:56:54,980

interesting in terms of what's alive

1215

00:56:59,710 --> 00:56:57,020

what survives how far does it get

1216

00:57:01,240 --> 00:56:59,720

carried and what kinds of chemistry is

1217

00:57:03,930 --> 00:57:01,250

in there that could possibly be the

1218

00:57:06,730 --> 00:57:03,940

foundation for stuff team

1219

00:57:08,770 --> 00:57:06,740

really cool cool stuff you guys alright

1220

00:57:12,339 --> 00:57:08,780

so folks we have to make a decision I

1221

00:57:13,930 --> 00:57:12,349

think we're gonna run out of time so do

1222

00:57:17,470 --> 00:57:13,940

you want to talk about the weirdest

1223

00:57:20,559 --> 00:57:17,480

moment in your science or the most

1224

00:57:22,690 --> 00:57:20,569

memorable favorite moment and answer

1225

00:57:31,660 --> 00:57:22,700

some questions Danielle do you have a

1226  
00:57:33,780 --> 00:57:31,670  
preference weird science because you

1227  
00:57:36,190 --> 00:57:33,790  
guys get to do some really cool things

1228  
00:57:38,800 --> 00:57:36,200  
experience some really cool things that

1229  
00:57:40,920 --> 00:57:38,810  
also happen to be documented while

1230  
00:57:43,120 --> 00:57:40,930  
you're doing these really cool things

1231  
00:57:44,589 --> 00:57:43,130  
that's true why don't we roll into weird

1232  
00:57:56,079 --> 00:57:44,599  
science if you want to tell us something

1233  
00:57:58,510 --> 00:57:56,089  
else you knew that this is the part of

1234  
00:58:00,400 --> 00:57:58,520  
the show where we want to hear from our

1235  
00:58:03,710 --> 00:58:00,410  
guests about the craziest things that

1236  
00:58:11,020 --> 00:58:03,720  
they've done in the name of science

1237  
00:58:15,710 --> 00:58:11,030  
[Music]

1238  
00:58:18,080 --> 00:58:15,720

okay so Cathy you're up first

1239

00:58:20,380 --> 00:58:18,090

let's go ahead and bring up her photo of

1240

00:58:27,080 --> 00:58:20,390

weird science

1241

00:58:30,550 --> 00:58:27,090

weirdest things I've done for science

1242

00:58:32,990 --> 00:58:30,560

would be to spend four months on a

1243

00:58:39,860 --> 00:58:33,000

deserted island in the Canadian High

1244

00:58:42,110 --> 00:58:39,870

Arctic it turned out great we had a

1245

00:58:46,940 --> 00:58:42,120

great crew you know we we still talk to

1246

00:58:50,090 --> 00:58:46,950

each other but it was looking at the

1247

00:58:51,950 --> 00:58:50,100

transition between the winter to spring

1248

00:58:53,990 --> 00:58:51,960

thaw in the active layer above the

1249

00:58:56,630 --> 00:58:54,000

permafrost and we were doing it in

1250

00:58:59,480 --> 00:58:56,640

simulation so we had the isolation of

1251  
00:59:01,460 --> 00:58:59,490  
fact we were on Mars time so you've got

1252  
00:59:03,410 --> 00:59:01,470  
a few extra minutes in the day and being

1253  
00:59:04,910 --> 00:59:03,420  
in the Arctic it's light all all the

1254  
00:59:06,650 --> 00:59:04,920  
time so we could create our own

1255  
00:59:09,920 --> 00:59:06,660  
light-dark cycles so we took advantage

1256  
00:59:13,160 --> 00:59:09,930  
of that and I got to go out and take

1257  
00:59:15,590 --> 00:59:13,170  
some great samples and that was I was a

1258  
00:59:21,860 --> 00:59:15,600  
two of us out in the field returning

1259  
00:59:33,950 --> 00:59:21,870  
home been like probably one of the

1260  
00:59:36,380 --> 00:59:33,960  
coolest things that you've done what

1261  
00:59:39,500 --> 00:59:36,390  
about you Jessica like you said that you

1262  
00:59:40,820 --> 00:59:39,510  
get the opportunity to be a day in the

1263  
00:59:43,220 --> 00:59:40,830

life of these other people when you're

1264

00:59:45,110 --> 00:59:43,230

trying to help them build platforms like

1265

00:59:49,010 --> 00:59:45,120

what's your weird sites so my weird

1266

00:59:50,660 --> 00:59:49,020

science is not that it was the

1267

00:59:52,550 --> 00:59:50,670

opportunity so one of the things that

1268

00:59:54,380 --> 00:59:52,560

you learn in grad school is that you

1269

00:59:54,830 --> 00:59:54,390

especially if you're doing research with

1270

00:59:57,280 --> 00:59:54,840

humans

1271

01:00:00,050 --> 00:59:57,290

you always volunteer for your classmates

1272

01:00:01,520 --> 01:00:00,060

experiments so I have always volunteered

1273

01:00:03,470 --> 01:00:01,530

for everybody's experiment everybody

1274

01:00:06,110 --> 01:00:03,480

volunteers for my experiments so when I

1275

01:00:07,280 --> 01:00:06,120

here was here at Ames I volunteered to

1276

01:00:08,930 --> 01:00:07,290

be on the Vomit Comet

1277

01:00:11,720 --> 01:00:08,940

anyone is bad

1278

01:00:13,460 --> 01:00:11,730

the airplane that does parabolic flight

1279

01:00:16,940 --> 01:00:13,470

so it goes up and then comes down and so

1280

01:00:20,840 --> 01:00:16,950

depending on its trajectory you get

1281

01:00:22,820 --> 01:00:20,850

different amounts of gravity and so we

1282

01:00:26,180 --> 01:00:22,830

in this particular flight we were doing

1283

01:00:28,220 --> 01:00:26,190

lunar gravity so I have experienced

1284

01:00:31,940 --> 01:00:28,230

lunar gravity and that was really cool

1285

01:00:34,610 --> 01:00:31,950

and the point the purpose of the

1286

01:00:37,640 --> 01:00:34,620

experiment was to understand how blood

1287

01:00:39,350 --> 01:00:37,650

flows in partial gravity so I was all

1288

01:00:42,980 --> 01:00:39,360

instrumented up with a whole bunch of

1289

01:00:45,530 --> 01:00:42,990

electrodes and they took a gram of my

1290

01:00:47,330 --> 01:00:45,540

heart and while I was in on the

1291

01:00:51,950 --> 01:00:47,340

parabolic flight though you know I think

1292

01:00:53,330 --> 01:00:51,960

we have a photo of us so you can see all

1293

01:00:54,500 --> 01:00:53,340

the electrodes and it was actually

1294

01:00:56,750 --> 01:00:54,510

really cool and made me think about all

1295

01:00:58,370 --> 01:00:56,760

sorts of interesting challenges in terms

1296

01:01:00,380 --> 01:00:58,380

of like how would we build things in

1297

01:01:03,920 --> 01:01:00,390

partial gravity because there's still

1298

01:01:05,840 --> 01:01:03,930

enough weight to you but not a lot and

1299

01:01:07,280 --> 01:01:05,850

so in case you guys like this very

1300

01:01:08,870 --> 01:01:07,290

interesting mixture because they

1301

01:01:11,180 --> 01:01:08,880

microgravity we know how to design

1302

01:01:13,220 --> 01:01:11,190

things for microgravity mm-hmm sort of

1303

01:01:14,540 --> 01:01:13,230

we know yeah we know what's expect in

1304

01:01:15,710 --> 01:01:14,550

some ways that's like on the space

1305

01:01:17,930 --> 01:01:15,720

station right yeah on the space station

1306

01:01:19,760 --> 01:01:17,940

but lunar is like we spend so little

1307

01:01:22,220 --> 01:01:19,770

time on it and there's a whole whole

1308

01:01:24,920 --> 01:01:22,230

slew of design problems there

1309

01:01:27,740 --> 01:01:24,930

that's fascinating cool very cool all

1310

01:01:30,710 --> 01:01:27,750

right well Diana are you up for sharing

1311

01:01:36,020 --> 01:01:30,720

a weird science moment well I I can't

1312

01:01:38,030 --> 01:01:36,030

top Kathy's story but in our Iceland

1313

01:01:40,400 --> 01:01:38,040

trips because one of the things that

1314

01:01:42,740 --> 01:01:40,410

we're looking for is very very low

1315

01:01:44,900 --> 01:01:42,750

levels of life we also have to get very

1316

01:01:47,510 --> 01:01:44,910

far away from any other place that

1317

01:01:53,660 --> 01:01:47,520

people normally go because people shed

1318

01:01:56,870 --> 01:01:53,670

life everywhere so we have a tiny little

1319

01:01:58,370 --> 01:01:56,880

Hut that we drive out to and spend the

1320

01:02:00,500 --> 01:01:58,380

night at and then spend another couple

1321

01:02:02,510 --> 01:02:00,510

of hours driving to in the morning to

1322

01:02:04,130 --> 01:02:02,520

get out to our sites we take our samples

1323

01:02:05,270 --> 01:02:04,140

we bundled them all back on top of the

1324

01:02:07,490 --> 01:02:05,280

Land Rover and then we come all the way

1325

01:02:09,680 --> 01:02:07,500

back and spend another night in the tiny

1326

01:02:14,120 --> 01:02:09,690

little Hut in Iceland which even in the

1327

01:02:20,739 --> 01:02:15,599

[Music]

1328

01:02:23,200 --> 01:02:20,749

we got to fit eight people and so we

1329

01:02:31,960 --> 01:02:23,210

basically repeat cycles of this for

1330

01:02:36,190 --> 01:02:31,970

three weeks at the time I saw that and I

1331

01:02:37,900 --> 01:02:36,200

thought it might be in people it turns

1332

01:02:39,220 --> 01:02:37,910

out it's very important to select your

1333

01:02:52,089 --> 01:02:39,230

collaborators by whether or not they

1334

01:02:54,940 --> 01:02:52,099

snore right again we've run out of time

1335

01:02:57,519 --> 01:02:54,950

and while we would love to spend the

1336

01:03:06,759 --> 01:02:57,529

rest of our show with you guys we

1337

01:03:08,890 --> 01:03:06,769

unfortunately have to thank you thanks

1338

01:03:11,349 --> 01:03:08,900

guys so remember you guys are watching

1339

01:03:14,410 --> 01:03:11,359

NASA in Silicon Valley live today we're

1340

01:03:16,180 --> 01:03:14,420

celebrating national stem day by talking

1341

01:03:18,609 --> 01:03:16,190

to some of the amazing wonder women of

1342

01:03:20,380 --> 01:03:18,619

NASA and if you have any questions for

1343

01:03:21,700 --> 01:03:20,390

our guests feel free to write them in

1344

01:03:25,089 --> 01:03:21,710

the chat and if you want to learn more

1345

01:03:29,769 --> 01:03:25,099

about women at NASA you can go to women

1346

01:03:33,130 --> 01:03:29,779

dot nasa.gov beuliss all right so let's

1347

01:03:36,009 --> 01:03:33,140

go now to our fabulous Aeronautics crew

1348

01:03:37,870 --> 01:03:36,019

let's bring out Nettie Patricia and

1349

01:03:48,390 --> 01:03:37,880

Sarah come on

1350

01:03:53,630 --> 01:03:50,860

[Laughter]

1351

01:03:56,630 --> 01:03:53,640

first things first can you ladies

1352

01:03:59,180 --> 01:03:56,640

introduce yourselves and I know you guys

1353

01:04:02,780 --> 01:03:59,190

are all aerospace engineers but what

1354

01:04:04,790 --> 01:04:02,790

exactly do you do okay I'll start my

1355

01:04:06,500 --> 01:04:04,800

name is Ned eros boom I am an aerospace

1356

01:04:08,990 --> 01:04:06,510

engineer and I lead our

1357

01:04:12,800 --> 01:04:09,000

pressure-sensitive paint technology here

1358

01:04:14,810 --> 01:04:12,810

at NASA Ames okay I'm Patricia Ventura

1359

01:04:16,850 --> 01:04:14,820

I'm another space engineer also and

1360

01:04:17,980 --> 01:04:16,860

actually I work in a super computing

1361

01:04:19,850 --> 01:04:17,990

division here at NASA Ames

1362

01:04:22,400 --> 01:04:19,860

supercomputing awesome

1363

01:04:24,160 --> 01:04:22,410

my name is Sarah de Souza and I design

1364

01:04:28,970 --> 01:04:24,170

guidance and control systems for

1365

01:04:33,140 --> 01:04:28,980

spacecrafts all right should we find out

1366

01:04:35,240 --> 01:04:33,150

where you come from origin stories how

1367

01:04:37,760 --> 01:04:35,250

how did you know you wanted to do this

1368

01:04:44,870 --> 01:04:37,770

so I will claim that I knew when I was

1369

01:04:48,110 --> 01:04:44,880

eight months when I was why kid is

1370

01:04:50,210 --> 01:04:48,120

because when I was a freshman in college

1371

01:04:53,120 --> 01:04:50,220

or sorry a sophomore in college I was

1372

01:04:55,070 --> 01:04:53,130

able to get a internship at Johnson

1373

01:04:56,990 --> 01:04:55,080

Space Center and work us alongside

1374

01:05:01,460 --> 01:04:57,000

astronauts who were on the space shuttle

1375

01:05:03,500 --> 01:05:01,470

and many years later my sister was going

1376

01:05:05,630 --> 01:05:03,510

through our photo album and she sent me

1377

01:05:08,090 --> 01:05:05,640

a picture that was a picture of my mom

1378

01:05:11,090 --> 01:05:08,100

holding me when I was a baby and with a

1379

01:05:14,260 --> 01:05:11,100

picture of the Space Shuttle in the back

1380

01:05:16,520 --> 01:05:14,270

in our room and I just I just think

1381

01:05:19,070 --> 01:05:16,530

everything I've done throughout my life

1382

01:05:20,570 --> 01:05:19,080

has been influenced by my family and

1383

01:05:23,810 --> 01:05:20,580

what we did as kids

1384

01:05:31,330 --> 01:05:23,820

I've always loved space and it's always

1385

01:05:39,200 --> 01:05:35,870

the picture that is very much a space

1386

01:05:44,930 --> 01:05:39,210

enthusiasts and a dreamer and I

1387

01:05:46,040 --> 01:05:44,940

definitely get that from my dad - so

1388

01:05:48,530 --> 01:05:46,050

what about you Patricia

1389

01:05:49,970 --> 01:05:48,540

so actually yeah I remember that my

1390

01:05:53,390 --> 01:05:49,980

grandmother took me to the planetarium

1391

01:05:56,210 --> 01:05:53,400

when I was like 4 years old and then I

1392

01:05:58,250 --> 01:05:56,220

was so surprised but all the stars you

1393

01:05:59,930 --> 01:05:58,260

could see and said I thought at that

1394

01:06:03,980 --> 01:05:59,940

point that I wanted to do something

1395

01:06:05,330 --> 01:06:03,990

space related and then when you know

1396

01:06:07,280 --> 01:06:05,340

when they always ask kids what do you

1397

01:06:09,440 --> 01:06:07,290

wanna do when you're like a grown up I

1398

01:06:13,400 --> 01:06:09,450

was so I was always saying an astronaut

1399

01:06:15,230 --> 01:06:13,410

but then when I was in high school I I

1400

01:06:17,440 --> 01:06:15,240

was very good in math and then in

1401

01:06:20,480 --> 01:06:17,450

physics so I decided to go for

1402

01:06:24,080 --> 01:06:20,490

engineering and well I could do space so

1403

01:06:27,080 --> 01:06:24,090

aerospace engineering okay yeah so we

1404

01:06:30,350 --> 01:06:27,090

have a photo of a young you can we take

1405

01:06:33,610 --> 01:06:30,360

that front upon well he's not very all

1406

01:06:41,780 --> 01:06:37,490

so that photo is three years old is a

1407

01:06:43,990 --> 01:06:41,790

was taking I think one month after I

1408

01:06:46,550 --> 01:06:44,000

started my internship here at NASA Ames

1409

01:06:49,490 --> 01:06:46,560

and it was the first time I visited the

1410

01:06:52,910 --> 01:06:49,500

supercomputer and I was so surprised it

1411

01:06:54,800 --> 01:06:52,920

was so big allowed all supercomputer

1412

01:06:57,260 --> 01:06:54,810

happened to have a name that we may know

1413

01:07:00,140 --> 01:06:57,270

about yeah so that one is the Pleiades

1414

01:07:01,610 --> 01:07:00,150

supercomputer but here at Ames we have

1415

01:07:04,070 --> 01:07:01,620

another supercomputer that is called

1416

01:07:07,940 --> 01:07:04,080

Electra and we're actually building a

1417

01:07:11,990 --> 01:07:07,950

third one for those Pleiades and Electra

1418

01:07:14,440 --> 01:07:12,000

right so what about unity like

1419

01:07:18,380 --> 01:07:14,450

what's what's your origin stories yeah I

1420

01:07:22,370 --> 01:07:18,390

grew up in Tennessee I remember going to

1421

01:07:24,620 --> 01:07:22,380

see a see the st. Louis Arch

1422

01:07:27,380 --> 01:07:24,630

and I remember driving across the bridge

1423

01:07:29,930 --> 01:07:27,390

and going to the st. Louis Arch and I

1424

01:07:31,550 --> 01:07:29,940

just you know looked at both of these

1425

01:07:35,140 --> 01:07:31,560

things are studying drafting in high

1426

01:07:37,180 --> 01:07:35,150

school and is like wow these are

1427

01:07:39,550 --> 01:07:37,190

really impressive and I want to do

1428

01:07:41,590 --> 01:07:39,560

whatever it is that can produce

1429

01:07:44,770 --> 01:07:41,600

something like this so you know I went

1430

01:07:47,200 --> 01:07:44,780

into college started studying mechanical

1431

01:07:50,350 --> 01:07:47,210

engineering and then I found fluid

1432

01:07:54,180 --> 01:07:50,360

dynamics thermodynamics and wow you're

1433

01:07:59,500 --> 01:07:56,950

yeah just kept wiggling my way that I

1434

01:08:02,860 --> 01:07:59,510

had an internship as well here at NASA

1435

01:08:04,750 --> 01:08:02,870

Ames we got my way over to the wind

1436

01:08:06,370 --> 01:08:04,760

tunnel division wow this is really cool

1437

01:08:08,050 --> 01:08:06,380

you have these giant compressors and

1438

01:08:09,850 --> 01:08:08,060

radiators and all the things that you

1439

01:08:14,280 --> 01:08:09,860

had studied there in your and your

1440

01:08:17,050 --> 01:08:14,290

textbooks we here in life and looks huge

1441

01:08:20,490 --> 01:08:17,060

over to pressure-sensitive paint which

1442

01:08:23,890 --> 01:08:20,500

which was just a great melody I like

1443

01:08:39,970 --> 01:08:23,900

hardware/software wind tunnel is so I'm

1444

01:08:41,080 --> 01:08:39,980

really in my happy place ya know before

1445

01:08:43,480 --> 01:08:41,090

you went there that you could go up in

1446

01:08:50,380 --> 01:08:43,490

this little tram and go the hole it's

1447

01:08:57,430 --> 01:08:50,390

crazy I feel this is must be how a chick

1448

01:08:59,770 --> 01:08:57,440

feels in an egg all right so should we

1449

01:09:02,050 --> 01:08:59,780

go back to basics for just a moment and

1450

01:09:03,640 --> 01:09:02,060

do some vocabulary yes because you guys

1451

01:09:05,860 --> 01:09:03,650

have mentioned computational fluid

1452

01:09:07,270 --> 01:09:05,870

dynamics and wind tolls and whatnot but

1453

01:09:09,550 --> 01:09:07,280

I know that was new to me when I got to

1454

01:09:11,080 --> 01:09:09,560

NASA so can you tell us really quickly

1455

01:09:12,790 --> 01:09:11,090

what's a wind tunnel really quickly with

1456

01:09:15,370 --> 01:09:12,800

a wind tunnel you don't know how an

1457

01:09:17,380 --> 01:09:15,380

aircraft is going to fly in space so

1458

01:09:19,330 --> 01:09:17,390

instead of throwing the aircraft through

1459

01:09:22,240 --> 01:09:19,340

the air we hold the aircraft still and

1460

01:09:25,800 --> 01:09:22,250

we blow the wind over the aircraft bring

1461

01:09:27,970 --> 01:09:25,810

the the model to the air yes yes okay

1462

01:09:28,990 --> 01:09:27,980

very cool all right and I know you do a

1463

01:09:31,090 --> 01:09:29,000

lot of work in there so we're gonna talk

1464

01:09:33,040 --> 01:09:31,100

more about that later yeah so like what

1465

01:09:38,440 --> 01:09:33,050

about CFD or commonly known as

1466

01:09:46,269 --> 01:09:43,150

so it means we simulate the flow of air

1467

01:09:50,130 --> 01:09:46,279

or anything it just has to be a fluid

1468

01:09:52,780 --> 01:09:50,140

around your geometry and with

1469

01:09:55,630 --> 01:09:52,790

supercomputers we get to see the

1470

01:09:58,060 --> 01:09:55,640

performances the acoustics we calculate

1471

01:10:03,100 --> 01:09:58,070

the pressure distribution we can improve

1472

01:10:16,120 --> 01:10:03,110

the designs and yeah all right mate

1473

01:10:17,979 --> 01:10:16,130

I think we have a common the beauty of

1474

01:10:20,470 --> 01:10:17,989

engineering is that there's things that

1475

01:10:23,080 --> 01:10:20,480

really click with someone and and they

1476

01:10:24,550 --> 01:10:23,090

love and really embrace and it is their

1477

01:10:26,470 --> 01:10:24,560

love language and then there's other

1478

01:10:29,440 --> 01:10:26,480

things like why would you even study

1479

01:10:31,240 --> 01:10:29,450

this that's beautiful you for having

1480

01:10:33,640 --> 01:10:31,250

diverse folks looking at the same

1481

01:10:36,460 --> 01:10:33,650

problems yeah yeah for sure and so also

1482

01:10:39,010 --> 01:10:36,470

so wanted to remind you guys and also

1483

01:10:43,060 --> 01:10:39,020

for our viewers at home that the first a

1484

01:10:45,040 --> 01:10:43,070

in NASA is aeronautics his research

1485

01:10:47,350 --> 01:10:45,050

center is one of the leaders in that

1486

01:10:51,160 --> 01:10:47,360

research and for all you fun facts at

1487

01:10:54,670 --> 01:10:51,170

home we are the second Aeronautics lab

1488

01:10:56,800 --> 01:10:54,680

in the country country behind Langley we

1489

01:11:04,900 --> 01:10:56,810

were there in establishment in

1490

01:11:07,570 --> 01:11:04,910

establishment yeah okay so we're gonna

1491

01:11:09,700 --> 01:11:07,580

we're gonna move along so we're gonna do

1492

01:11:11,380 --> 01:11:09,710

your origin story so it's like when did

1493

01:11:14,500 --> 01:11:11,390

you ladies know that you wanted to be an

1494

01:11:20,380 --> 01:11:14,510

aerospace engineer you wanna start with

1495

01:11:22,390 --> 01:11:20,390

start with Nettie yeah well I I you know

1496

01:11:24,760 --> 01:11:22,400

it was really here at NASA Ames that I

1497

01:11:26,979 --> 01:11:24,770

was studying mechanical and so that's

1498

01:11:30,310 --> 01:11:26,989

where I made the leap over to aerospace

1499

01:11:33,729 --> 01:11:30,320

engineering and you know that's how I

1500

01:11:36,520 --> 01:11:33,739

found pressure-sensitive paint maybe we

1501

01:11:38,260 --> 01:11:36,530

want to be backing on that let's talk

1502

01:11:41,050 --> 01:11:38,270

about your day in the life yeah yeah

1503

01:11:42,670 --> 01:11:41,060

yeah um day in my life like the other

1504

01:11:46,630 --> 01:11:42,680

women that came before you know we have

1505

01:11:48,130 --> 01:11:46,640

a very diverse set of days it depends

1506

01:11:50,200 --> 01:11:48,140

you know if we're planning if we're

1507

01:11:51,370 --> 01:11:50,210

trying to execute or if we're processing

1508

01:11:54,310 --> 01:11:51,380

data

1509

01:11:55,570 --> 01:11:54,320

yeah so we have different customers that

1510

01:11:57,640 --> 01:11:55,580

I work with that come to the wind tunnel

1511

01:11:59,770 --> 01:11:57,650

and they come to me and I say I want

1512

01:12:02,050 --> 01:11:59,780

pressure-sensitive paint on my model and

1513

01:12:05,830 --> 01:12:02,060

I said great what do you expect what do

1514

01:12:07,240 --> 01:12:05,840

you want and then we do this planning we

1515

01:12:09,850 --> 01:12:07,250

actually installed the model in the wind

1516

01:12:22,810 --> 01:12:09,860

tunnel and then I paint the wind tunnel

1517

01:12:26,650 --> 01:12:22,820

model so we'll take large wind tunnel

1518

01:12:28,600 --> 01:12:26,660

models this one's a small replica but

1519

01:12:30,580 --> 01:12:28,610

you know one that we have worked on in

1520

01:12:32,080 --> 01:12:30,590

the past maybe about a foot and a half

1521

01:12:34,900 --> 01:12:32,090

in diameter that we'll put in the wind

1522

01:12:36,910 --> 01:12:34,910

tunnel model I'll paint it with a base

1523

01:12:41,650 --> 01:12:36,920

coat and then I'll paint it with a top

1524

01:12:45,240 --> 01:12:41,660

coat and this top coat has a luminescent

1525

01:12:48,520 --> 01:12:45,250

molecule that responds to oxygen and why

1526

01:12:51,960 --> 01:12:48,530

oxygen is interesting is because a

1527

01:12:55,810 --> 01:12:51,970

partial pressure of oxygen is pressure

1528

01:12:58,720 --> 01:12:55,820

so yeah so this this paint will sense

1529

01:13:01,060 --> 01:12:58,730

how much oxygen is in the air and so we

1530

01:13:02,320 --> 01:13:01,070

read that as pressure why that's

1531

01:13:05,650 --> 01:13:02,330

interesting is that you know

1532

01:13:07,270 --> 01:13:05,660

traditionally we put pressure taps on

1533

01:13:08,980 --> 01:13:07,280

the wind tunnel model in a discreet

1534

01:13:11,350 --> 01:13:08,990

location so we only know the pressure at

1535

01:13:13,540 --> 01:13:11,360

that specific location but now as you

1536

01:13:15,910 --> 01:13:13,550

can see with the pink model here we can

1537

01:13:17,920 --> 01:13:15,920

sense everywhere there's pressure so now

1538

01:13:20,230 --> 01:13:17,930

that we know the pressure of the mall

1539

01:13:22,240 --> 01:13:20,240

over the model we know the area of the

1540

01:13:25,330 --> 01:13:22,250

model then we can know the forces that

1541

01:13:31,780 --> 01:13:25,340

the model is seeing okay so you know I

1542

01:13:33,670 --> 01:13:31,790

think we have a photo of you in my

1543

01:13:36,400 --> 01:13:33,680

domain yeah yeah so that was a recent

1544

01:13:39,040 --> 01:13:36,410

test I don't know where NASA is

1545

01:13:41,560 --> 01:13:39,050

developing the largest rocket ever built

1546

01:13:44,650 --> 01:13:41,570

and we will be going to the moon onto

1547

01:13:47,380 --> 01:13:44,660

Mars and we are sending different Rovers

1548

01:13:50,590 --> 01:13:47,390

and things into deep space and so this

1549

01:13:52,900 --> 01:13:50,600

is the crew version of SLS and it was

1550

01:13:55,870 --> 01:13:52,910

here testing in our wind tunnels back in

1551  
01:13:59,440 --> 01:13:55,880  
December and we took pressure-sensitive

1552  
01:14:02,410 --> 01:13:59,450  
paint measurements on it then - yeah

1553  
01:14:04,299 --> 01:14:02,420  
it's it's a lot of fun to be applying

1554  
01:14:05,859 --> 01:14:04,309  
this technology to

1555  
01:14:08,410 --> 01:14:05,869  
you know this next generation of space

1556  
01:14:11,319 --> 01:14:08,420  
vehicles and aircraft that NASA is

1557  
01:14:12,760 --> 01:14:11,329  
producing super cool what about you

1558  
01:14:15,580 --> 01:14:12,770  
Patrice yeah like what's a

1559  
01:14:26,399 --> 01:14:15,590  
day-in-the-life sighs they spend most of

1560  
01:14:32,350 --> 01:14:31,060  
so my work consists on computational

1561  
01:14:37,000 --> 01:14:32,360  
fluid dynamics as we mentioned before

1562  
01:14:49,930 --> 01:14:37,010  
and so we model the geometry of our

1563  
01:14:51,640 --> 01:14:49,940

aircraft or rotor craft we all right so

1564

01:14:56,770 --> 01:14:51,650

this is a drone yeah yeah this is a

1565

01:14:59,709 --> 01:14:56,780

drone so for this case for example we

1566

01:15:02,290 --> 01:14:59,719

obtained the geometry and then I spend a

1567

01:15:06,370 --> 01:15:02,300

lot of time meshing that geometry that

1568

01:15:09,729 --> 01:15:06,380

means so removing a lot of details that

1569

01:15:11,740 --> 01:15:09,739

we don't need for the CFE and then we

1570

01:15:14,410 --> 01:15:11,750

put points everywhere on the surface

1571

01:15:17,290 --> 01:15:14,420

that's what we're gonna solve our fluid

1572

01:15:19,240 --> 01:15:17,300

dynamics equations and then we need to

1573

01:15:24,279 --> 01:15:19,250

fill the rest of the place space around

1574

01:15:28,750 --> 01:15:24,289

the vehicle so we like model a bigger

1575

01:15:32,620 --> 01:15:28,760

volume around the drone and after once I

1576

01:15:35,709 --> 01:15:32,630

confident with my mesh I I run the

1577

01:15:39,729 --> 01:15:35,719

simulation with a supercomputer so we

1578

01:15:42,399 --> 01:15:39,739

use from 1,000 to 2,000 processors and

1579

01:15:47,680 --> 01:15:42,409

that's a lot of processors and it takes

1580

01:15:50,229 --> 01:15:47,690

a few days to complete that's oh yeah

1581

01:15:53,740 --> 01:15:50,239

first we I need to be sure I haven't

1582

01:15:56,979 --> 01:15:53,750

made any mistakes and then we come we

1583

01:15:59,680 --> 01:15:56,989

check the solutions we we see if there

1584

01:16:02,140 --> 01:15:59,690

are problems with a geometry design and

1585

01:16:05,339 --> 01:16:02,150

we might we might modify the the

1586

01:16:08,320 --> 01:16:05,349

geometry to find better more performant

1587

01:16:10,030 --> 01:16:08,330

quieter safer vehicles

1588

01:16:12,550 --> 01:16:10,040

okay so I just want to review you were

1589

01:16:15,940 --> 01:16:12,560

talking about you get the geometry of

1590

01:16:18,190 --> 01:16:15,950

this flying vehicle right so I do likes

1591

01:16:22,960 --> 01:16:18,200

you scan it somehow to get its shape

1592

01:16:25,920 --> 01:16:22,970

yeah yeah so we first we scan the

1593

01:16:28,660 --> 01:16:25,930

geometry but this scan is not 100%

1594

01:16:30,130 --> 01:16:28,670

precise or sometimes it's a bit we go

1595

01:16:33,370 --> 01:16:30,140

and so then we need to spend a lot of

1596

01:16:35,110 --> 01:16:33,380

time smoothing that geometry okay

1597

01:16:39,970 --> 01:16:35,120

so you get the perfect shape the outline

1598

01:16:49,060 --> 01:16:39,980

yeah this real real close to this yes

1599

01:16:51,430 --> 01:16:49,070

that's close to reality isn't it okay so

1600

01:16:56,080 --> 01:16:51,440

yeah that's the surface mesh of this

1601

01:16:57,880 --> 01:16:56,090

vehicle and then so I think he had so

1602

01:17:04,140 --> 01:16:57,890

that's the surface but once I did the

1603

01:17:08,110 --> 01:17:04,150

volume mesh so the complete mesh it has

1604

01:17:18,520 --> 01:17:08,120

500 million grid points Wow which is a

1605

01:17:23,340 --> 01:17:18,530

lot and then what is the final result of

1606

01:17:28,090 --> 01:17:23,350

all that work so what can we see so

1607

01:17:29,800 --> 01:17:28,100

visualize the flow then we can calculate

1608

01:17:32,400 --> 01:17:29,810

the forces on the vehicle this is

1609

01:17:34,150 --> 01:17:32,410

anything with with the wind tunnels but

1610

01:17:36,220 --> 01:17:34,160

because everything is with a

1611

01:17:37,990 --> 01:17:36,230

supercomputer then I can just modify the

1612

01:17:41,800 --> 01:17:38,000

geometry I don't have to rebuild a

1613

01:17:43,750 --> 01:17:41,810

different drone okay also visualize the

1614

01:17:48,210 --> 01:17:43,760

acoustic field we can see if it's quiet

1615

01:17:51,670 --> 01:17:48,220

or noisy can we see the visualization

1616

01:17:53,560 --> 01:17:51,680

let's bring up that simulation so is

1617

01:17:55,690 --> 01:17:53,570

that that drone flying so actually

1618

01:17:58,360 --> 01:17:55,700

that's a modification we did of that

1619

01:18:01,450 --> 01:17:58,370

drone if you see the front rotors

1620

01:18:03,940 --> 01:18:01,460

they're mountain underneath of the arm

1621

01:18:06,910 --> 01:18:03,950

so when we first run the simulation for

1622

01:18:10,360 --> 01:18:06,920

the original drone we saw that the wake

1623

01:18:12,640 --> 01:18:10,370

of the rotors was interact the four

1624

01:18:14,650 --> 01:18:12,650

rotors was interacting with the afters

1625

01:18:17,500 --> 01:18:14,660

and reducing the performances so we

1626  
01:18:19,150 --> 01:18:17,510  
figure we might mount the rotors in the

1627  
01:18:19,959 --> 01:18:19,160  
front underneath to avoid this

1628  
01:18:23,830 --> 01:18:19,969  
interaction

1629  
01:18:26,200 --> 01:18:23,840  
and actually this vehicle is 60% more

1630  
01:18:29,229 --> 01:18:26,210  
efficient than the original one oh and

1631  
01:18:32,740 --> 01:18:29,239  
yes others we could see there was a

1632  
01:18:46,300 --> 01:18:32,750  
pressure and the spaghetti things that's

1633  
01:18:47,280 --> 01:18:46,310  
the vortex pike how about get Sarah's

1634  
01:18:51,150 --> 01:18:47,290  
day-in-the-life

1635  
01:18:54,160 --> 01:18:51,160  
good to some other objects they brought

1636  
01:18:56,530 --> 01:18:54,170  
alright I will say my day in the life is

1637  
01:18:59,110 --> 01:18:56,540  
being able to work with wonderful people

1638  
01:19:02,170 --> 01:18:59,120

like Nettie and Patricia here because we

1639

01:19:04,390 --> 01:19:02,180

take the data that they create and tell

1640

01:19:07,750 --> 01:19:04,400

us about how the vehicle performs and

1641

01:19:10,000 --> 01:19:07,760

use that in our simulations to tell us

1642

01:19:11,880 --> 01:19:10,010

can we really fly these vehicles and

1643

01:19:13,810 --> 01:19:11,890

within the requirements and the

1644

01:19:17,290 --> 01:19:13,820

environments that we want to fly them in

1645

01:19:19,420 --> 01:19:17,300

so for example with an aircraft there

1646

01:19:21,370 --> 01:19:19,430

with their simulations and the

1647

01:19:22,720 --> 01:19:21,380

Windtunnel results we can validate that

1648

01:19:24,930 --> 01:19:22,730

we have good predictions of what our

1649

01:19:28,390 --> 01:19:24,940

aerodynamics are for a particular

1650

01:19:30,939 --> 01:19:28,400

aircraft and then verify that it can

1651

01:19:35,910 --> 01:19:30,949

actually get from point A to point B so

1652

01:19:39,160 --> 01:19:35,920

for example one of the explains that

1653

01:19:42,250 --> 01:19:39,170

NASA has going right now which is an

1654

01:19:45,640 --> 01:19:42,260

experimental aircraft ex-59 they use

1655

01:19:48,550 --> 01:19:45,650

this information to be able to model in

1656

01:19:50,500 --> 01:19:48,560

the National Airspace how these vehicles

1657

01:19:52,900 --> 01:19:50,510

will perform and we can actually

1658

01:19:55,930 --> 01:19:52,910

understand can they integrate well can a

1659

01:19:57,729 --> 01:19:55,940

pilot actually maneuver this vehicle

1660

01:20:01,000 --> 01:19:57,739

with the performance that results from

1661

01:20:03,670 --> 01:20:01,010

the geometry so my day in the life is I

1662

01:20:07,000 --> 01:20:03,680

get to build simulations integrate them

1663

01:20:09,160 --> 01:20:07,010

together and much like them I didn't go

1664

01:20:10,930 --> 01:20:09,170

into it as a specific field but I love

1665

01:20:13,720 --> 01:20:10,940

fluids like

1666

01:20:16,720 --> 01:20:13,730

I really do I like that visualization

1667

01:20:19,390 --> 01:20:16,730

was amazing I just I love it so it's

1668

01:20:21,070 --> 01:20:19,400

just being able to work with other

1669

01:20:24,760 --> 01:20:21,080

engineers and then apply my own

1670

01:20:28,209 --> 01:20:24,770

expertise I end up in a lab or in front

1671

01:20:29,920 --> 01:20:28,219

of a computer or at another Center

1672

01:20:32,020 --> 01:20:29,930

trying to figure out how we can bring

1673

01:20:36,990 --> 01:20:32,030

all of our all the tools that nASA has

1674

01:20:39,490 --> 01:20:37,000

and leverage them together yeah I think

1675

01:20:42,100 --> 01:20:39,500

example like NASA Aeronautics that it's

1676

01:20:44,050 --> 01:20:42,110

you know you don't you don't build a

1677

01:20:45,459 --> 01:20:44,060

house we just went to we don't build an

1678

01:20:47,530 --> 01:20:45,469

airplane we just went to what we do wind

1679

01:20:50,890 --> 01:20:47,540

tunnel testing we do CFD we do

1680

01:20:51,790 --> 01:20:50,900

simulations and over a course course of

1681

01:20:53,920 --> 01:20:51,800

several years

1682

01:20:56,590 --> 01:20:53,930

you don't become and we develop an

1683

01:20:58,000 --> 01:20:56,600

aircraft that is produced and people

1684

01:21:03,430 --> 01:20:58,010

will fly one day right around

1685

01:21:06,540 --> 01:21:03,440

supersonically so we have a video of a

1686

01:21:09,700 --> 01:21:06,550

project you've worked on right yes

1687

01:21:12,340 --> 01:21:09,710

another part of this is we can't exactly

1688

01:21:14,290 --> 01:21:12,350

use wind tunnels yet I mean not yet I

1689

01:21:17,229 --> 01:21:14,300

should say it's more like arc Jets where

1690

01:21:18,729 --> 01:21:17,239

you can test whether or not the entry

1691

01:21:20,860 --> 01:21:18,739

vehicle can take the temperatures you

1692

01:21:24,010 --> 01:21:20,870

have but we currently don't have a way

1693

01:21:25,840 --> 01:21:24,020

to like test a spacecraft in a relevant

1694

01:21:30,010 --> 01:21:25,850

environment of high speed and high heat

1695

01:21:32,680 --> 01:21:30,020

in and have it kind of moved the way the

1696

01:21:38,200 --> 01:21:32,690

way it does when you fly an aircraft in

1697

01:21:39,700 --> 01:21:38,210

air on the a pin on earth right so we

1698

01:21:42,130 --> 01:21:39,710

have to do a number of different things

1699

01:21:44,350 --> 01:21:42,140

which is build simulations with CFD so

1700

01:21:47,350 --> 01:21:44,360

we get most of our aerodynamic

1701

01:21:52,030 --> 01:21:47,360

predictions forces and moments from CFD

1702

01:21:53,680 --> 01:21:52,040

from Patricia and then apply those to

1703

01:21:56,410 --> 01:21:53,690

our simulations and the video you're

1704

01:22:07,420 --> 01:21:56,420

going to see is a technology here at

1705

01:22:11,830 --> 01:22:07,430

Ames called adapt which is the entry

1706

01:22:13,270 --> 01:22:11,840

placement technology it tells you

1707

01:22:15,729 --> 01:22:13,280

everything you need to know about it

1708

01:22:18,580 --> 01:22:15,739

almost everything so we'll show you

1709

01:22:20,530 --> 01:22:18,590

footage of that and it kind of gives you

1710

01:22:22,529 --> 01:22:20,540

a sense of what the operations are

1711

01:22:24,000 --> 01:22:22,539

expected for that kind of you

1712

01:22:28,889 --> 01:22:24,010

okay all right so let's go ahead and

1713

01:22:29,219 --> 01:22:28,899

let's take a look hey what's happening

1714

01:22:32,309 --> 01:22:29,229

here

1715

01:22:33,869 --> 01:22:32,319

oh so it's deploying the the command

1716

01:22:36,419 --> 01:22:33,879

module and the and what I'll call the

1717

01:22:38,429 --> 01:22:36,429

the entry vehicle and now the entry

1718

01:22:40,919 --> 01:22:38,439

vehicle or a depth is deploying and

1719

01:22:44,250 --> 01:22:40,929

it'll separate from the service module

1720

01:22:46,799 --> 01:22:44,260

and prepare its attitude to enter the

1721

01:22:49,500 --> 01:22:46,809

atmosphere of a planet so here it's Mars

1722

01:22:51,750 --> 01:22:49,510

and you see it's it because of its high

1723

01:22:54,029 --> 01:22:51,760

speed at entry it has a high heat pulse

1724

01:22:55,649 --> 01:22:54,039

that it goes through it's very important

1725

01:22:59,399 --> 01:22:55,659

that that entry technology protects

1726

01:23:02,579 --> 01:22:59,409

whatever payload it's landing via that

1727

01:23:05,699 --> 01:23:02,589

thermal protection system that is facing

1728

01:23:08,579 --> 01:23:05,709

the earth as it enters okay and you're

1729

01:23:14,819 --> 01:23:08,589

working on the part behind I'm working

1730

01:23:17,369 --> 01:23:14,829

on this stuff behind excellent very cool

1731

01:23:20,219 --> 01:23:17,379

so we are going to move into our next

1732

01:23:23,009 --> 01:23:20,229

segment it's called show-and-tell

1733

01:23:24,779 --> 01:23:23,019

it's where as the name suggests we asked

1734

01:23:27,599 --> 01:23:24,789

our guests to bring in something fun and

1735

01:23:36,200 --> 01:23:27,609

unique to show us from the lab and tell

1736

01:23:43,410 --> 01:23:41,010

all right so Nettie gave us a preview of

1737

01:23:49,490 --> 01:23:43,420

the special stuff from her lab and I

1738

01:23:52,560 --> 01:23:49,500

still have questions about it okay so

1739

01:23:55,950 --> 01:23:52,570

you have a model in the wind tunnel yes

1740

01:23:58,859 --> 01:23:55,960

and in the past you used to have sensors

1741

01:23:59,879 --> 01:23:58,869

installed to capture the pressure the

1742

01:24:02,970 --> 01:23:59,889

air pressure yeah

1743

01:24:08,040 --> 01:24:02,980

readings right but this is a better

1744

01:24:09,540 --> 01:24:08,050

bigger better way lines as earlier as

1745

01:24:11,010 --> 01:24:09,550

like you know when we come to a wind

1746

01:24:15,359 --> 01:24:11,020

tunnel test there's different tools that

1747

01:24:17,430 --> 01:24:15,369

we can do use to measure flow measure

1748

01:24:19,830 --> 01:24:17,440

pressure measure force and a wind tunnel

1749

01:24:21,780 --> 01:24:19,840

test so traditionally it was pressure

1750

01:24:25,260 --> 01:24:21,790

taps and we still do a lot of testing

1751

01:24:27,300 --> 01:24:25,270

with pressure taps so often when we're

1752

01:24:29,010 --> 01:24:27,310

going to test either an aircraft or

1753

01:24:32,100 --> 01:24:29,020

spacecraft we talked about like it's

1754

01:24:34,709 --> 01:24:32,110

pressure sensitive paint realistic to

1755

01:24:36,390 --> 01:24:34,719

use and sometimes it's you know no we

1756

01:24:38,040 --> 01:24:36,400

just need pressure taps we don't need to

1757

01:24:41,490 --> 01:24:38,050

spend the time and money to do the

1758

01:24:43,890 --> 01:24:41,500

pressure sensitive paint other times you

1759

01:24:45,930 --> 01:24:43,900

know we need to know more about what's

1760

01:24:48,089 --> 01:24:45,940

happening on the surface of the vehicle

1761

01:24:52,020 --> 01:24:48,099

and measuring the surface pressure is

1762

01:24:53,790 --> 01:24:52,030

very insightful so different vehicles

1763

01:24:56,640 --> 01:24:53,800

we've done all three of the Commercial

1764

01:24:59,129 --> 01:24:56,650

Crew vehicles we've done Space Launch

1765

01:25:01,140 --> 01:24:59,139

System we've done several the X planes

1766

01:25:04,830 --> 01:25:01,150

using the pressure sensitive paint so

1767

01:25:07,950 --> 01:25:04,840

it's a new technology use it uses optics

1768

01:25:09,300 --> 01:25:07,960

so you know we have the the paint which

1769

01:25:11,310 --> 01:25:09,310

is interesting because there's the whole

1770

01:25:13,560 --> 01:25:11,320

chemistry of the paint the application

1771

01:25:16,350 --> 01:25:13,570

science of the paint and then the data

1772

01:25:19,020 --> 01:25:16,360

acquisition so we use UV lights to

1773

01:25:21,240 --> 01:25:19,030

excite this paint it responds to oxygen

1774

01:25:23,790 --> 01:25:21,250

as I mentioned earlier and so the oxygen

1775

01:25:26,010 --> 01:25:23,800

is going to come in and quench these

1776

01:25:27,570 --> 01:25:26,020

molecules so the luminescent molecules

1777

01:25:29,870 --> 01:25:27,580

they're shining really bright as we saw

1778

01:25:33,479 --> 01:25:29,880

in the the picture earlier is this

1779

01:25:35,669 --> 01:25:33,489

fluorescent pink light oxygen molecules

1780

01:25:39,000 --> 01:25:35,679

come in and make it shine really dim so

1781

01:25:41,399 --> 01:25:39,010

oxygen oxygen means there's higher

1782

01:25:43,200 --> 01:25:41,409

pressures present okay if there's an

1783

01:25:46,439 --> 01:25:43,210

absence of oxygen so a lower pressure

1784

01:25:48,589 --> 01:25:46,449

then it's not starving the luminescent

1785

01:25:50,810 --> 01:25:48,599

molecules of energy so it's Jenny really

1786

01:25:52,790 --> 01:25:50,820

right yeah okay so we use you know eight

1787

01:25:55,790 --> 01:25:52,800

to twelve cameras mounted around the

1788

01:26:00,229 --> 01:25:55,800

wind tunnel and we will record the

1789

01:26:02,119 --> 01:26:00,239

intensity that is being emitted by the

1790

01:26:06,949 --> 01:26:02,129

paints right so you can know the

1791

01:26:08,599 --> 01:26:06,959

pressure at every point yeah yeah in a

1792

01:26:10,639 --> 01:26:08,609

previous episode of NASA and Silicon

1793

01:26:13,399 --> 01:26:10,649

Valley live a few my colleagues came on

1794

01:26:18,290 --> 01:26:13,409

and we're talking about you know sensing

1795

01:26:19,909 --> 01:26:18,300

the the PSP and you know we equate like

1796

01:26:22,699 --> 01:26:19,919

you know we use cameras that have 1

1797

01:26:24,500 --> 01:26:22,709

million pixels on them and we use for

1798

01:26:26,679 --> 01:26:24,510

some of these we use like up to eight or

1799

01:26:29,810 --> 01:26:26,689

twelve so you can imagine we have 12

1800

01:26:31,399 --> 01:26:29,820

million pixels looking at this vehicle

1801

01:26:33,109 --> 01:26:31,409

so that's essentially 12 million

1802

01:26:35,209 --> 01:26:33,119

instruments that we're using to since

1803

01:26:37,819 --> 01:26:35,219

pressure you know on traditional models

1804

01:26:40,040 --> 01:26:37,829

maybe there's 200 or 300 pressure taps

1805

01:26:42,049 --> 01:26:40,050

if there's a lot sometimes we'll do it

1806

01:26:45,589 --> 01:26:42,059

even with just 12 pressure taps but yeah

1807

01:26:48,049 --> 01:26:45,599

using the you know the knowledge of and

1808

01:26:50,060 --> 01:26:48,059

the technology behind high-speed cameras

1809

01:26:52,689 --> 01:26:50,070

high intensity lighting that we use to

1810

01:26:54,439 --> 01:26:52,699

excite this paint and the and the

1811

01:26:56,119 --> 01:26:54,449

technology that's come along with the

1812

01:27:00,409 --> 01:26:56,129

paint it's really made this possible

1813

01:27:03,889 --> 01:27:00,419

that is so cool yeah a shout-out to you

1814

01:27:06,919 --> 01:27:03,899

the director of NASA Glenn Janet Cavani

1815

01:27:09,199 --> 01:27:06,929

she had her start in PSP or she did her

1816

01:27:12,949 --> 01:27:09,209

PhD in PSP chemistry and did some of the

1817

01:27:25,279 --> 01:27:12,959

very early Windtunnel tests involving PS

1818

01:27:28,459 --> 01:27:25,289

using PSP here at NASA Ames this is the

1819

01:27:30,649 --> 01:27:28,469

base coat and this is the top coat so

1820

01:27:34,129 --> 01:27:30,659

you know we need both of these for the

1821

01:27:37,009 --> 01:27:34,139

paint to work and and you know often

1822

01:27:39,949 --> 01:27:37,019

with painting this at it this is where

1823

01:27:41,899 --> 01:27:39,959

all my stress lies is that yeah I take a

1824

01:27:43,729 --> 01:27:41,909

lot of pride in the in the paint job and

1825

01:27:46,580 --> 01:27:43,739

that's one reason why I also have PSP is

1826

01:27:48,080 --> 01:27:46,590

like you know there's this artistic

1827

01:27:50,480 --> 01:27:48,090

all right behind it that you don't just

1828

01:27:55,130 --> 01:27:50,490

slap it on like yeah I wanted to do also

1829

01:27:59,540 --> 01:27:55,140

that the paint responsible is it take

1830

01:28:01,820 --> 01:27:59,550

for you to paint and to prepare these

1831

01:28:04,040 --> 01:28:01,830

models using your pressures that's it a

1832

01:28:07,250 --> 01:28:04,050

paint yeah yeah for some of the larger

1833

01:28:08,630 --> 01:28:07,260

models like we saw in the photo let's go

1834

01:28:12,500 --> 01:28:08,640

ahead and get that brought back up on

1835

01:28:14,840 --> 01:28:12,510

screen yeah you know that since we do

1836

01:28:16,520 --> 01:28:14,850

several different layers and then we

1837

01:28:18,650 --> 01:28:16,530

actually have to cure it so I will bake

1838

01:28:21,080 --> 01:28:18,660

the solvent out of the paint that that

1839

01:28:23,480 --> 01:28:21,090

took about eight hours to paint so you

1840

01:28:26,030 --> 01:28:23,490

know this paint is toxic so we wear

1841

01:28:28,940 --> 01:28:26,040

respirators so I would say that's one of

1842

01:28:30,320 --> 01:28:28,950

the more like the two physical parts of

1843

01:28:32,060 --> 01:28:30,330

the job or crawling around this wind

1844

01:28:33,530 --> 01:28:32,070

tunnel and mounting all the cameras and

1845

01:28:35,270 --> 01:28:33,540

layouts which is a lot of fun you get to

1846

01:28:37,520 --> 01:28:35,280

use your hands and use mechanical skills

1847

01:28:38,870 --> 01:28:37,530

and think of ways to design lamp mounts

1848

01:28:40,970 --> 01:28:38,880

camera mounts to to make things better

1849

01:28:43,430 --> 01:28:40,980

but yeah and then the the painting

1850

01:28:45,860 --> 01:28:43,440

wearing that hood for eight hours and

1851  
01:28:53,900 --> 01:28:45,870  
finally coming out and taking a breath

1852  
01:28:56,950 --> 01:28:53,910  
of fresh air all right well I think we

1853  
01:29:05,390 --> 01:29:03,200  
kisses object yeah parts of this look

1854  
01:29:10,190 --> 01:29:05,400  
kind of familiar to me but I don't

1855  
01:29:13,940 --> 01:29:10,200  
actually know what they end up to that's

1856  
01:29:20,060 --> 01:29:13,950  
it yep so this is a super computer note

1857  
01:29:23,300 --> 01:29:20,070  
is so one of the 1800 Sandy Bridge notes

1858  
01:29:27,110 --> 01:29:23,310  
we have in the pleiades supercomputer

1859  
01:29:30,680 --> 01:29:27,120  
1800 1800 and then

1860  
01:29:33,560 --> 01:29:30,690  
so each of these has 16 processors so

1861  
01:29:35,240 --> 01:29:33,570  
you just need to multiply Wow and the

1862  
01:29:37,790 --> 01:29:35,250  
thing is we don't we don't only have

1863  
01:29:41,290 --> 01:29:37,800

Sandy Bridge nodes we have a bunch of EB

1864

01:29:47,900 --> 01:29:41,300

Bridge knows Broadway knows has OneNote

1865

01:29:58,890 --> 01:29:53,430

yeah so basically air comes from here

1866

01:30:01,890 --> 01:29:58,900

and then equal sound the two processor

1867

01:30:04,830 --> 01:30:01,900

like the notes so there are is a double

1868

01:30:06,930 --> 01:30:04,840

and then it comes out here and then

1869

01:30:08,370 --> 01:30:06,940

there is like a water system okay to

1870

01:30:10,050 --> 01:30:08,380

cool down the air yeah

1871

01:30:19,230 --> 01:30:10,060

because there's so much computing

1872

01:30:21,630 --> 01:30:19,240

happening right this compare to my

1873

01:30:24,470 --> 01:30:21,640

computer like it dude you know any facts

1874

01:30:40,440 --> 01:30:24,480

about how much more powerful this might

1875

01:30:43,980 --> 01:30:40,450

be yeah it's crazy

1876

01:30:48,750 --> 01:30:43,990

we have so many computers this is a big

1877

01:30:51,360 --> 01:30:48,760

computer yeah I would add if we didn't

1878

01:30:56,240 --> 01:30:51,370

have this right hmm I mean the length of

1879

01:30:58,620 --> 01:30:56,250

time it would take you to calculate is

1880

01:31:00,840 --> 01:30:58,630

impossible it's not exactly it's like

1881

01:31:03,660 --> 01:31:00,850

it's take you years to do like the

1882

01:31:15,510 --> 01:31:03,670

simulation that so yeah it will take me

1883

01:31:16,770 --> 01:31:15,520

years some day that maybe computational

1884

01:31:19,020 --> 01:31:16,780

fluid dynamics isn't your thing but

1885

01:31:21,030 --> 01:31:19,030

maybe other areas of fluids and heat

1886

01:31:22,860 --> 01:31:21,040

transfer you know the design of these

1887

01:31:24,900 --> 01:31:22,870

and you know when you look at the

1888

01:31:26,400 --> 01:31:24,910

picture from Patricia and seeing all

1889

01:31:26,850 --> 01:31:26,410

those different nodes and like heating

1890

01:31:28,560 --> 01:31:26,860

and cooling

1891

01:31:29,830 --> 01:31:28,570

well not heating but cooling is a big

1892

01:31:32,260 --> 01:31:29,840

issue

1893

01:31:33,100 --> 01:31:32,270

keeping a certain temperature I think

1894

01:31:34,960 --> 01:31:33,110

that anything like with the

1895

01:31:37,720 --> 01:31:34,970

supercomputer it's like not just used by

1896

01:31:39,850 --> 01:31:37,730

the CFD group like people like Sarah and

1897

01:31:41,800 --> 01:31:39,860

I hop on there and like you know try out

1898

01:31:44,050 --> 01:31:41,810

things on your laptop in your office but

1899

01:31:46,210 --> 01:31:44,060

man I really need to make this work

1900

01:31:47,620 --> 01:31:46,220

faster so hop on the supercomputer it's

1901

01:31:52,810 --> 01:31:47,630

a great resource that we have here at

1902

01:31:55,060 --> 01:31:52,820

NASA Ames the new supercomputer the

1903

01:32:17,080 --> 01:31:55,070

Elektra supercomputer was designed using

1904

01:32:19,870 --> 01:32:17,090

the supercomputer all right we can I

1905

01:32:41,980 --> 01:32:19,880

might ask patrician to maybe move the

1906

01:32:45,340 --> 01:32:41,990

node over what I brought today no this

1907

01:32:48,760 --> 01:32:45,350

is kind of a partially stowed adept

1908

01:32:50,620 --> 01:32:48,770

vehicle okay so it's a one meter when

1909

01:32:53,290 --> 01:32:50,630

fully stowed it it comes out to one

1910

01:32:55,540 --> 01:32:53,300

meter in diameter I'm showing you the

1911

01:32:59,500 --> 01:32:55,550

back side of the adapter aeroshell if

1912

01:33:01,660 --> 01:32:59,510

you reference the video from the nose

1913

01:33:04,420 --> 01:33:01,670

and the forward-facing side of the

1914

01:33:09,130 --> 01:33:04,430

vehicle going through the atmosphere and

1915

01:33:10,720 --> 01:33:09,140

this material here is a 3d woven fabric

1916

01:33:13,170 --> 01:33:10,730

that is essentially the thermal

1917

01:33:15,580 --> 01:33:13,180

protection system well that enables a

1918

01:33:18,400 --> 01:33:15,590

technology where we're able to stow the

1919

01:33:22,060 --> 01:33:18,410

vehicle on launch and create a

1920

01:33:29,500 --> 01:33:22,070

technology that allows us to land larger

1921

01:33:36,620 --> 01:33:29,510

payloads on Mars and allow us to stow

1922

01:33:43,560 --> 01:33:40,110

to stow this payload in existing rockets

1923

01:33:45,959 --> 01:33:43,570

so we don't have to build new rockets to

1924

01:33:48,240 --> 01:33:45,969

launch this kind of vehicle because we

1925

01:33:50,700 --> 01:33:48,250

can grow the mass without growing the

1926

01:33:54,479 --> 01:33:50,710

the vehicle itself as big as the

1927

01:33:58,620 --> 01:33:54,489

payloads that we want to land on Mars to

1928

01:34:00,870 --> 01:33:58,630

cover a larger spacecraft exactly so so

1929

01:34:04,229 --> 01:34:00,880

why I'm showing you the backside of this

1930

01:34:06,600 --> 01:34:04,239

is to show you one that it is not like

1931

01:34:09,630 --> 01:34:06,610

your Apollo capsule right where it's

1932

01:34:12,180 --> 01:34:09,640

covered on the back and that poses a

1933

01:34:15,060 --> 01:34:12,190

really big design challenge for us which

1934

01:34:18,180 --> 01:34:15,070

is how do we put the kind of control

1935

01:34:20,610 --> 01:34:18,190

systems that Apollo used and placed on

1936

01:34:24,479 --> 01:34:20,620

that back shell on something like this

1937

01:34:26,100 --> 01:34:24,489

where it's non-existent so we're what

1938

01:34:28,439 --> 01:34:26,110

we're trying to do is do what the Wright

1939

01:34:30,360 --> 01:34:28,449

brothers did for aircraft try to

1940

01:34:33,540 --> 01:34:30,370

maneuver this vehicle to where we want

1941

01:34:35,939 --> 01:34:33,550

it to go and design the systems on this

1942

01:34:39,209 --> 01:34:35,949

existing structure this rib structure or

1943

01:34:43,140 --> 01:34:39,219

on the payload in order to land let's

1944

01:34:45,180 --> 01:34:43,150

say a human habitat where we want it to

1945

01:34:58,950 --> 01:34:45,190

go we don't want it to just kind of

1946

01:35:01,169 --> 01:34:58,960

float along and so what we wanted to do

1947

01:35:03,570 --> 01:35:01,179

is use these existing structures that

1948

01:35:07,260 --> 01:35:03,580

allow the vehicle to be stowed to

1949

01:35:10,740 --> 01:35:07,270

install new kinds of control systems to

1950

01:35:16,580 --> 01:35:10,750

guide these vehicles pretty cool it's

1951

01:35:23,780 --> 01:35:21,040

[Laughter]

1952

01:35:25,910 --> 01:35:23,790

we're gonna move on to our question and

1953

01:35:29,750 --> 01:35:25,920

answering session but Sara don't go too

1954

01:35:31,850 --> 01:35:29,760

far because one of our Watchers wants to

1955

01:35:37,729 --> 01:35:31,860

know can it cover a curiosity type

1956

01:35:39,410 --> 01:35:37,739

payload hmm so yes it can but there's

1957

01:35:41,930 --> 01:35:39,420

still design challenges I would say this

1958

01:35:46,040 --> 01:35:41,940

technology has the capability to grow in

1959

01:35:48,140 --> 01:35:46,050

scale to land large payloads but because

1960

01:35:49,490 --> 01:35:48,150

it's a cutting-edge technology there's

1961

01:35:51,229 --> 01:35:49,500

still a lot of development work to

1962

01:35:54,290 --> 01:35:51,239

overcome some challenges that we may

1963

01:35:55,910 --> 01:35:54,300

have and all of those challenges come

1964

01:35:58,459 --> 01:35:55,920

with how do you package and stow

1965

01:36:00,650 --> 01:35:58,469

everything that you need with respect to

1966

01:36:04,310 --> 01:36:00,660

the control system so land it where you

1967

01:36:07,700 --> 01:36:04,320

need to go okay but it's possible pretty

1968

01:36:18,830 --> 01:36:07,710

cool all right for nettie we have a

1969

01:36:20,959 --> 01:36:18,840

comment that's so cool what is the

1970

01:36:27,430 --> 01:36:20,969

operating temperature of the paint Oh

1971

01:36:32,020 --> 01:36:27,440

interesting yeah well I would say a nice

1972

01:36:35,780 --> 01:36:32,030

book in would be from down to like 40

1973

01:36:37,640 --> 01:36:35,790

degrees F up to maybe 140 degrees F when

1974

01:36:40,010 --> 01:36:37,650

we start going up to higher temperatures

1975

01:36:42,380 --> 01:36:40,020

the the paint will actually start to

1976

01:36:45,439 --> 01:36:42,390

peel off the model so then we need to

1977

01:36:48,290 --> 01:36:45,449

think about you know what kind of paint

1978

01:36:50,570 --> 01:36:48,300

we use how do we apply it yes there's

1979

01:36:52,100 --> 01:36:50,580

interesting design challenges with the

1980

01:36:55,280 --> 01:36:52,110

chemistry of the paint and actually the

1981

01:36:57,470 --> 01:36:55,290

application of the paint and Patricia we

1982

01:36:59,180 --> 01:36:57,480

have a question for you so someone wants

1983

01:37:01,700 --> 01:36:59,190

to know is NASA currently running any

1984

01:37:03,950 --> 01:37:01,710

quantum computers for calculations yet

1985

01:37:07,100 --> 01:37:03,960

and or are they not really worthwhile

1986

01:37:09,020 --> 01:37:07,110

yet so actually yes there is a quantum

1987

01:37:14,150 --> 01:37:09,030

computer in the supercomputing division

1988

01:37:16,459 --> 01:37:14,160

but they run so it's a semi quantum

1989

01:37:18,910 --> 01:37:16,469

computer it's not quite there yet but

1990

01:37:22,140 --> 01:37:18,920

they're still working on it and they

1991

01:37:26,800 --> 01:37:22,150

from the Ransom simulations on

1992

01:37:29,290 --> 01:37:26,810

predicting the trees like just from

1993

01:37:31,270 --> 01:37:29,300

images but it's at 3 on what is not at 3

1994

01:37:37,540 --> 01:37:31,280

I think that is you can find it on there

1995

01:37:39,760 --> 01:37:37,550

on the website ok yeah there is a

1996

01:37:41,530 --> 01:37:39,770

question if anybody has an instrument

1997

01:37:44,170 --> 01:37:41,540

has aims ever done aerodynamics tests

1998

01:37:48,430 --> 01:37:44,180

for a Martian atmosphere yeah you know

1999

01:38:00,720 --> 01:37:48,440

we have a Martian Windtunnel here short

2000

01:38:12,310 --> 01:38:10,060

that's another cool thing we've talked a

2001  
01:38:14,460 --> 01:38:12,320  
lot about Mars here on earth today for

2002  
01:38:17,380 --> 01:38:14,470  
the biology um

2003  
01:38:21,400 --> 01:38:17,390  
let's find another one oh one cool

2004  
01:38:23,800 --> 01:38:21,410  
question it's let's see what are the

2005  
01:38:27,850 --> 01:38:23,810  
most exciting technological developments

2006  
01:38:34,690 --> 01:38:27,860  
on the horizon for your field yeah I'll

2007  
01:38:37,060 --> 01:38:34,700  
hop in there we have been doing for the

2008  
01:38:38,880 --> 01:38:37,070  
past you know since the 1980s is this is

2009  
01:38:41,470 --> 01:38:38,890  
really a steady-state measurement and

2010  
01:38:45,100 --> 01:38:41,480  
what I would claim that we're leading

2011  
01:38:46,810 --> 01:38:45,110  
here is the looking at unsteady pressure

2012  
01:38:49,900 --> 01:38:46,820  
sensitive paint so it can instead of

2013  
01:38:51,640 --> 01:38:49,910

sensing a pressure over several seconds

2014

01:38:54,430 --> 01:38:51,650

what if we could sense a like twenty

2015

01:38:56,920 --> 01:38:54,440

five thousand times a second and that's

2016

01:39:01,000 --> 01:38:56,930

what we're working on now you know it's

2017

01:39:03,580 --> 01:39:01,010

been proven in the labs and in small

2018

01:39:05,410 --> 01:39:03,590

wind tunnels but I I love a good

2019

01:39:07,240 --> 01:39:05,420

challenge and I like to call it you know

2020

01:39:10,799 --> 01:39:07,250

I'm a child of the the Tim the tool man

2021

01:39:16,560 --> 01:39:13,859

yeah so yeah like we mentioned earlier

2022

01:39:17,970 --> 01:39:16,570

dream big I love to dream big so you

2023

01:39:19,830 --> 01:39:17,980

know that that model that we showed

2024

01:39:21,419 --> 01:39:19,840

earlier it was actually using pressure

2025

01:39:23,850 --> 01:39:21,429

since the unsteady pressure-sensitive

2026

01:39:24,479 --> 01:39:23,860

paint sitting at 10,000 frames per

2027

01:39:30,419 --> 01:39:24,489

second

2028

01:39:32,549 --> 01:39:30,429

interesting is that you know for CFD for

2029

01:39:34,950 --> 01:39:32,559

Windtunnel is when we start talking

2030

01:39:36,149 --> 01:39:34,960

about unsteady aerodynamics there's a

2031

01:39:37,740 --> 01:39:36,159

big question mark there and that's

2032

01:39:40,439 --> 01:39:37,750

that's probably one of the biggest feats

2033

01:39:41,879 --> 01:39:40,449

that we're facing is like NASA and even

2034

01:39:44,339 --> 01:39:41,889

just like the aerospace community in

2035

01:39:47,010 --> 01:39:44,349

general is like unsteady Aero is hard to

2036

01:39:48,390 --> 01:39:47,020

predict and one way that we you know

2037

01:39:49,770 --> 01:39:48,400

design vehicles is we just make them

2038

01:39:52,189 --> 01:39:49,780

heavier and stronger and that will

2039

01:39:55,379 --> 01:39:52,199

dampen out any of these unsteady Aero

2040

01:39:57,060 --> 01:39:55,389

flow physics that are happening but you

2041

01:39:59,189 --> 01:39:57,070

know we're on city PSP like why do I

2042

01:40:01,740 --> 01:39:59,199

even care about that is that if we can

2043

01:40:03,720 --> 01:40:01,750

actually measure this better and we

2044

01:40:05,819 --> 01:40:03,730

don't just throw mass at the problem and

2045

01:40:08,189 --> 01:40:05,829

make the make the you know tail of the

2046

01:40:10,560 --> 01:40:08,199

aircraft stronger make the the heat

2047

01:40:12,089 --> 01:40:10,570

shield around the astronauts thicker but

2048

01:40:14,609 --> 01:40:12,099

like if we could actually sense it and

2049

01:40:17,339 --> 01:40:14,619

measure it and be more accurate in our

2050

01:40:19,500 --> 01:40:17,349

calculations of the loads I it's really

2051

01:40:20,910 --> 01:40:19,510

crazy to think of the the possibilities

2052

01:40:22,680 --> 01:40:20,920

like we could we could put more payload

2053

01:40:24,779 --> 01:40:22,690

on we can make the the rocket lighter

2054

01:40:27,779 --> 01:40:24,789

not only that you the control systems

2055

01:40:30,060 --> 01:40:27,789

which take all of this input it it makes

2056

01:40:31,979 --> 01:40:30,070

my job easier because then I all I have

2057

01:40:33,629 --> 01:40:31,989

to do is worry about getting to the

2058

01:40:35,279 --> 01:40:33,639

location as opposed to now accounting

2059

01:40:36,600 --> 01:40:35,289

for all these dispersions we didn't know

2060

01:40:39,209 --> 01:40:36,610

we couldn't know what we couldn't

2061

01:40:41,549 --> 01:40:39,219

predict or I had to be really robust to

2062

01:40:44,040 --> 01:40:41,559

a large uncertainty which puts a lot of

2063

01:40:45,589 --> 01:40:44,050

pressure on the control systems yeah

2064

01:40:48,180 --> 01:40:45,599

it's funny

2065

01:40:50,310 --> 01:40:48,190

imagine stream for a moment cuz we're

2066

01:40:51,419 --> 01:40:50,320

not that far away but you know you have

2067

01:40:52,890 --> 01:40:51,429

to have that vision you have to have

2068

01:40:55,439 --> 01:40:52,900

that dream and I think that's really

2069

01:40:57,540 --> 01:40:55,449

what resonates with anyone here at NASA

2070

01:41:04,680 --> 01:40:57,550

is like yeah dream outside the box yeah

2071

01:41:08,279 --> 01:41:04,690

oh yeah what about YouTube so for me I'm

2072

01:41:09,790 --> 01:41:08,289

gonna mention two things okay so the

2073

01:41:13,060 --> 01:41:09,800

first is that

2074

01:41:16,540 --> 01:41:13,070

were CFD can be useful for not just like

2075

01:41:19,780 --> 01:41:16,550

predicting the floor just the first is

2076

01:41:21,430 --> 01:41:19,790

so Diana she was here before she said

2077

01:41:23,919 --> 01:41:21,440

she's working with drones and UAVs

2078

01:41:26,290 --> 01:41:23,929

mission info subtly that's one of the

2079

01:41:29,109 --> 01:41:26,300

projects I'm working on right now we're

2080

01:41:30,939 --> 01:41:29,119

using CFD to predict the ground effect

2081

01:41:33,520 --> 01:41:30,949

of their drone when they're taking off

2082

01:41:36,939 --> 01:41:33,530

really so in order to avoid the

2083

01:41:39,100 --> 01:41:36,949

contamination of the sample they want to

2084

01:41:42,549 --> 01:41:39,110

know where to put it before taking off

2085

01:41:45,220 --> 01:41:42,559

and landing so we run simulations to see

2086

01:41:47,290 --> 01:41:45,230

that and it might change the design or

2087

01:41:49,569 --> 01:41:47,300

they might make it more confident

2088

01:41:52,540 --> 01:41:49,579

alright yes change how they do their

2089

01:41:55,330 --> 01:41:52,550

science based on what you find and then

2090

01:42:00,160 --> 01:41:55,340

the other thing is it's called urban air

2091

01:42:05,169 --> 01:42:00,170

mobility so it means drones but for

2092

01:42:06,459 --> 01:42:05,179

people the rest of us ladies here that

2093

01:42:09,609 --> 01:42:06,469

you don't get to work with Jones

2094

01:42:12,280 --> 01:42:09,619

everyday work yeah so it means like in

2095

01:42:14,589 --> 01:42:12,290

the city instead of like taking your car

2096

01:42:16,569 --> 01:42:14,599

or the pass or whatever you could like

2097

01:42:19,689 --> 01:42:16,579

jump on one of these drones and take it

2098

01:42:22,030 --> 01:42:19,699

to the office so well there are many

2099

01:42:25,149 --> 01:42:22,040

challenges on that but the idea is to

2100

01:42:27,399 --> 01:42:25,159

have electric vehicles with multirotors

2101  
01:42:29,589 --> 01:42:27,409  
also because we want to be able to take

2102  
01:42:30,850 --> 01:42:29,599  
off and land vertically so we don't need

2103  
01:42:36,280 --> 01:42:30,860  
a like a long highway

2104  
01:42:37,629 --> 01:42:36,290  
yeah and runway sorry and then but we

2105  
01:42:41,439 --> 01:42:37,639  
also like there are challenges

2106  
01:42:42,939 --> 01:42:41,449  
so these vehicles need to be safe in

2107  
01:42:44,830 --> 01:42:42,949  
order to be able to fly in the cities

2108  
01:42:48,370 --> 01:42:44,840  
right and then we also need to make them

2109  
01:42:53,049 --> 01:42:48,380  
quiet and then also they need to be

2110  
01:42:55,440 --> 01:42:53,059  
efficient because right now i drone can

2111  
01:42:57,450 --> 01:42:55,450  
only fly for like 10 20 minutes

2112  
01:43:01,030 --> 01:42:57,460  
[Music]

2113  
01:43:02,290 --> 01:43:01,040

so okay okay you want to go bigger and

2114

01:43:04,090 --> 01:43:02,300

then you want to carry people and they

2115

01:43:05,920 --> 01:43:04,100

will have to be saved so we're doing CFD

2116

01:43:07,570 --> 01:43:05,930

simulations of these vehicles that's

2117

01:43:09,670 --> 01:43:07,580

pretty cool so all those challenges for

2118

01:43:11,350 --> 01:43:09,680

urban air mobility you can work on in

2119

01:43:18,460 --> 01:43:11,360

supercomputing mm-hmm and then you'll

2120

01:43:24,340 --> 01:43:18,470

pass those on to the aerospace we can

2121

01:43:28,440 --> 01:43:24,350

fly or work like what's what's your

2122

01:43:32,980 --> 01:43:28,450

dream big for for your area of expertise

2123

01:43:35,800 --> 01:43:32,990

my dream big is that we are a deep

2124

01:43:39,070 --> 01:43:35,810

spacefaring people I mean that that

2125

01:43:43,090 --> 01:43:39,080

really is kind of where we want to go

2126  
01:43:45,670 --> 01:43:43,100  
next NASA has been a pioneer on low

2127  
01:43:48,010 --> 01:43:45,680  
Earth orbit we've been a pioneer to the

2128  
01:43:51,340 --> 01:43:48,020  
moon we want to go back to the moon

2129  
01:43:53,410 --> 01:43:51,350  
right start looking at technologies that

2130  
01:43:57,060 --> 01:43:53,420  
would we would need to actually go to

2131  
01:44:00,160 --> 01:43:57,070  
planets farther out Mars specifically

2132  
01:44:03,220 --> 01:44:00,170  
but we've got to have a testing ground

2133  
01:44:06,730 --> 01:44:03,230  
we've got to understand what it means to

2134  
01:44:08,800 --> 01:44:06,740  
to do these things but still be able to

2135  
01:44:12,310 --> 01:44:08,810  
come back to earth and retool and you

2136  
01:44:17,010 --> 01:44:12,320  
know so a lot of technologies have to be

2137  
01:44:22,200 --> 01:44:17,020  
enabled for us to be to go farther right

2138  
01:44:25,210 --> 01:44:22,210

one such and shameless plug right is

2139

01:44:29,230 --> 01:44:25,220

entry descent and landing technologies

2140

01:44:31,540 --> 01:44:29,240

like this one adapt we want you know we

2141

01:44:36,190 --> 01:44:31,550

want to go larger than robotic missions

2142

01:44:39,160 --> 01:44:36,200

we want to go larger than small science

2143

01:44:42,550 --> 01:44:39,170

missions those kinds of things and we

2144

01:44:45,970 --> 01:44:42,560

want to land habitats and people and to

2145

01:44:48,250 --> 01:44:45,980

me if we can find that in it's hard work

2146

01:44:49,720 --> 01:44:48,260

there's no simple answer that's why no

2147

01:44:51,610 --> 01:44:49,730

one's done it yet no one's quite

2148

01:44:53,620 --> 01:44:51,620

completed it right because we're all

2149

01:44:57,070 --> 01:44:53,630

trying to figure out how what is the

2150

01:44:59,650 --> 01:44:57,080

efficient way what is the safest way how

2151  
01:45:03,220 --> 01:44:59,660  
do we do this successfully and I think

2152  
01:45:04,900 --> 01:45:03,230  
what's really great is NASA and the

2153  
01:45:09,010 --> 01:45:04,910  
United States is involved in this

2154  
01:45:11,290 --> 01:45:09,020  
problem I mean it's it's yeah absolutely

2155  
01:45:13,390 --> 01:45:11,300  
so this is my that's

2156  
01:45:15,520 --> 01:45:13,400  
it's my like technologies on the

2157  
01:45:17,980 --> 01:45:15,530  
forefront are really about how do we how

2158  
01:45:21,400 --> 01:45:17,990  
do we go to deep space I mean it's it

2159  
01:45:23,230 --> 01:45:21,410  
really is that is cool really cool I was

2160  
01:45:24,790 --> 01:45:23,240  
just saying what about the question we

2161  
01:45:29,800 --> 01:45:24,800  
wanted to ask do you guys have a

2162  
01:45:32,020 --> 01:45:29,810  
favorite base craft or aircraft could

2163  
01:45:39,580 --> 01:45:32,030

you choose is that a terrible choice to

2164

01:45:42,460 --> 01:45:39,590

force you to make well I like aircraft

2165

01:45:44,170 --> 01:45:42,470

and spacecraft so the ex-59 low boom

2166

01:45:48,040 --> 01:45:44,180

flight demonstrator is one of my

2167

01:45:52,000 --> 01:45:48,050

favorite aircraft right now just because

2168

01:45:54,460 --> 01:45:52,010

it is exactly what NASA does does the

2169

01:45:57,100 --> 01:45:54,470

work to create the next industry in our

2170

01:46:02,020 --> 01:45:57,110

country which is really amazing yeah

2171

01:46:04,000 --> 01:46:02,030

and that's the plan is to create a

2172

01:46:07,330 --> 01:46:04,010

supersonic plane that reduces the noise

2173

01:46:22,390 --> 01:46:07,340

of the boom and and can fly over land

2174

01:46:24,880 --> 01:46:22,400

and I was open to civilians so I love I

2175

01:46:30,360 --> 01:46:24,890

love spacecraft and right now my

2176

01:46:34,510 --> 01:46:33,070

yeah I guess I have to say the these

2177

01:46:37,660 --> 01:46:34,520

urban air mobility vehicles have been

2178

01:46:41,560 --> 01:46:37,670

working on so I don't think we have a

2179

01:46:44,800 --> 01:46:41,570

picture for it but it's called a side by

2180

01:46:47,740 --> 01:46:44,810

side aircraft it's a concept it's like

2181

01:46:50,070 --> 01:46:47,750

looks like a helicopter but instead of

2182

01:46:53,200 --> 01:46:50,080

one main rotor he has two rotors and

2183

01:46:55,180 --> 01:46:53,210

these two rotors overlap but they're

2184

01:46:57,670 --> 01:46:55,190

synchronized so like the blades on yeah

2185

01:47:01,060 --> 01:46:57,680

I guess against each other and these

2186

01:47:03,910 --> 01:47:01,070

overlapping we were still working on it

2187

01:47:07,780 --> 01:47:03,920

but it looks like improves the

2188

01:47:11,479 --> 01:47:07,790

efficiency by 20% in cruise flight okay

2189

01:47:14,030 --> 01:47:11,489

so yeah I'm cool

2190

01:47:25,040 --> 01:47:14,040

yeah that's cool yeah might there might

2191

01:47:28,160 --> 01:47:25,050

be a video soon you know I I'm like

2192

01:47:29,350 --> 01:47:28,170

Sarah I we all love fluid so anything

2193

01:47:32,660 --> 01:47:29,360

that flies through the air

2194

01:47:36,590 --> 01:47:32,670

we're just in love with so many more

2195

01:47:38,870 --> 01:47:36,600

thing actually air is a fluid in the

2196

01:47:41,180 --> 01:47:38,880

beginning yeah as fluid dynamicists

2197

01:47:42,800 --> 01:47:41,190

aerospace engineers we consider anything

2198

01:47:52,280 --> 01:47:42,810

that's a gas or liquid anything that's

2199

01:47:54,770 --> 01:47:52,290

deformable yeah yeah my favorites happen

2200

01:47:57,170 --> 01:47:54,780

to be the ones I've worked on yeah and I

2201

01:47:59,840 --> 01:47:57,180

you know the really exciting piece of

2202

01:48:01,220 --> 01:47:59,850

that is like you know in my career so

2203

01:48:03,110 --> 01:48:01,230

far I've gotten to work on the Orion

2204

01:48:04,040 --> 01:48:03,120

space vehicle we've applied the PSP

2205

01:48:07,490 --> 01:48:04,050

there

2206

01:48:09,200 --> 01:48:07,500

the SLS at tres brace wing is one of the

2207

01:48:11,990 --> 01:48:09,210

experimental aircraft that we are

2208

01:48:14,690 --> 01:48:12,000

testing and collecting a lot of data on

2209

01:48:16,910 --> 01:48:14,700

assessing and I think the really

2210

01:48:20,300 --> 01:48:16,920

interesting part I remember when we did

2211

01:48:21,500 --> 01:48:20,310

am one of the Orion spacecraft and I

2212

01:48:23,450 --> 01:48:21,510

woke up early because you know it was

2213

01:48:24,650 --> 01:48:23,460

launching at Kennedy so it was like

2214

01:48:27,050 --> 01:48:24,660

three o'clock in the morning here at

2215

01:48:29,660 --> 01:48:27,060

woke up early and you know I've been

2216

01:48:32,930 --> 01:48:29,670

here maybe four years at that point so

2217

01:48:35,390 --> 01:48:32,940

you're just like shy and and excited but

2218

01:48:37,970 --> 01:48:35,400

yeah it was like magical in my heart

2219

01:48:40,700 --> 01:48:37,980

because you know my fingerprint was on

2220

01:48:42,290 --> 01:48:40,710

that yeah and it's really cool and like

2221

01:48:43,880 --> 01:48:42,300

each of one of us here have our

2222

01:48:46,040 --> 01:48:43,890

fingerprints on something like that and

2223

01:48:48,110 --> 01:48:46,050

I think it's a wonderful example about

2224

01:48:51,830 --> 01:48:48,120

NASA that it's like not any one of us

2225

01:48:54,400 --> 01:48:51,840

creates an SLS or in a dead or a drone

2226

01:48:58,010 --> 01:48:54,410

but it's like this community of experts

2227

01:48:59,360 --> 01:48:58,020

across many fields including the two of

2228

01:49:01,729 --> 01:48:59,370

y'all that like it's important to get

2229

01:49:03,260 --> 01:49:01,739

the PR out there and do shows like this

2230

01:49:05,000 --> 01:49:03,270

does show like this is what NASA is

2231

01:49:06,709 --> 01:49:05,010

doing so like we have our finger prints

2232

01:49:08,810 --> 01:49:06,719

on that and a nice because we all have a

2233

01:49:10,630 --> 01:49:08,820

little piece of the story yeah yeah and

2234

01:49:13,729 --> 01:49:10,640

it's all about telling our story yeah

2235

01:49:16,130 --> 01:49:13,739

explaining we have some questions about

2236

01:49:17,180 --> 01:49:16,140

your careers but a quick technical

2237

01:49:20,720 --> 01:49:17,190

question for Sara

2238

01:49:22,340 --> 01:49:20,730

how is it going to reduce the supersonic

2239

01:49:24,120 --> 01:49:22,350

boom so that would be the ex-59

2240

01:49:26,129 --> 01:49:24,130

experimental plane

2241

01:49:28,950 --> 01:49:26,139

the way it reduces the boom is by virtue

2242

01:49:31,589 --> 01:49:28,960

of its geometry so you can design the

2243

01:49:34,319 --> 01:49:31,599

the vehicle's geometry to create a

2244

01:49:37,290 --> 01:49:34,329

pressure wave does that does not have as

2245

01:49:38,990 --> 01:49:37,300

much of a loud boom when it reaches well

2246

01:49:42,830 --> 01:49:39,000

when it when it creates that shockwave

2247

01:49:45,629 --> 01:49:42,840

mm-hmm the geometry of the plane coat

2248

01:49:47,729 --> 01:49:45,639

yeah and if we can think of it was like

2249

01:49:49,709 --> 01:49:47,739

that pressure wave that we hear is the

2250

01:49:51,780 --> 01:49:49,719

sonic boom like that's energy coming

2251  
01:49:54,270 --> 01:49:51,790  
from the airplane and hitting our ear so

2252  
01:49:56,490 --> 01:49:54,280  
if we can distribute that energy over

2253  
01:49:58,800 --> 01:49:56,500  
like a longer nose which we'll look at

2254  
01:50:00,959 --> 01:49:58,810  
the can look at pictures of the ex-59

2255  
01:50:03,089 --> 01:50:00,969  
and see how long the nose is then we're

2256  
01:50:04,859 --> 01:50:03,099  
not deep we're decreasing the energy

2257  
01:50:06,330 --> 01:50:04,869  
that's coming to us to our ears so

2258  
01:50:17,669 --> 01:50:06,340  
spreading it out yeah so that's why it's

2259  
01:50:19,140 --> 01:50:17,679  
called the low boom okay well I do have

2260  
01:50:34,500 --> 01:50:19,150  
a comment from the chat they said these

2261  
01:50:36,689 --> 01:50:34,510  
women are such an inspiration model here

2262  
01:50:37,950 --> 01:50:36,699  
since its national stem day and I'm sure

2263  
01:50:39,600 --> 01:50:37,960

there's people out there thinking about

2264

01:50:42,180 --> 01:50:39,610

like oh like I want to be an engineer

2265

01:50:43,470 --> 01:50:42,190

but I don't know what I think like

2266

01:50:45,180 --> 01:50:43,480

everything that we've talked about today

2267

01:50:46,950 --> 01:50:45,190

has been like a great example so it's

2268

01:50:49,350 --> 01:50:46,960

like if you like material science like I

2269

01:50:52,919 --> 01:50:49,360

see this woven fabric here and I saw the

2270

01:50:56,069 --> 01:50:52,929

chemistry of the paint yeah and I yeah

2271

01:50:58,800 --> 01:50:56,079

the the supercomputing know like heat

2272

01:51:00,180 --> 01:50:58,810

transfer we look at the structure here

2273

01:51:02,879 --> 01:51:00,190

if you like structures if you're more of

2274

01:51:06,000 --> 01:51:02,889

a mechanical person the whole electrical

2275

01:51:08,370 --> 01:51:06,010

computer science field so you know

2276

01:51:10,080 --> 01:51:08,380

there's a great story about just our

2277

01:51:11,970 --> 01:51:10,090

sharing and then also the women that

2278

01:51:14,580 --> 01:51:11,980

have come before us to share just like

2279

01:51:16,410 --> 01:51:14,590

this plethora of ideas and like we all

2280

01:51:18,540 --> 01:51:16,420

have a different background and found

2281

01:51:21,180 --> 01:51:18,550

our love language

2282

01:51:22,770 --> 01:51:21,190

and in different areas so there's yeah

2283

01:51:24,300 --> 01:51:22,780

there's I think that's a beautiful story

2284

01:51:27,330 --> 01:51:24,310

about NASA that like there's really a

2285

01:51:29,610 --> 01:51:27,340

flavor of every engineer here okay so

2286

01:51:31,410 --> 01:51:29,620

specifically like if we have you know

2287

01:51:33,360 --> 01:51:31,420

some of our users at home or our viewers

2288

01:51:36,870 --> 01:51:33,370

at home like what piece of advice would

2289

01:51:38,460 --> 01:51:36,880

you give to a young student who's trying

2290

01:51:42,360 --> 01:51:38,470

to figure out what they want to do or

2291

01:51:44,850 --> 01:51:42,370

what they want to be yeah can i I will

2292

01:51:46,350 --> 01:51:44,860

say one thing communicate it's so

2293

01:51:47,910 --> 01:51:46,360

important to communicate like as we've

2294

01:51:50,640 --> 01:51:47,920

talked like passing data back and forth

2295

01:51:52,350 --> 01:51:50,650

talking to one another that's so

2296

01:51:54,150 --> 01:51:52,360

important to that that's often a kind of

2297

01:51:56,940 --> 01:51:54,160

a fluffy answer but communicate I also

2298

01:51:58,980 --> 01:51:56,950

would say start and don't stop like I

2299

01:52:00,360 --> 01:51:58,990

look at different times like in my

2300

01:52:01,650 --> 01:52:00,370

academic career and my professional

2301  
01:52:03,510 --> 01:52:01,660  
career where there's just this daunting

2302  
01:52:05,430 --> 01:52:03,520  
task that's like I've never heard of

2303  
01:52:06,750 --> 01:52:05,440  
pressure-sensitive paint but now you

2304  
01:52:08,730 --> 01:52:06,760  
know I claim I'm one of the world's

2305  
01:52:12,060 --> 01:52:08,740  
experts in that and so you just you just

2306  
01:52:15,050 --> 01:52:12,070  
stay the stay start and don't stop just

2307  
01:52:18,600 --> 01:52:15,060  
keep keep going at it keep plugging away

2308  
01:52:22,280 --> 01:52:18,610  
cool what about you Patrice she's yeah I

2309  
01:52:24,810 --> 01:52:22,290  
would say fashioned with excellence so

2310  
01:52:26,670 --> 01:52:24,820  
whatever you choose to do do it with

2311  
01:52:31,560 --> 01:52:26,680  
passion and the excellence will come

2312  
01:52:36,150 --> 01:52:31,570  
with it okay yeah I would my piece of

2313  
01:52:38,220 --> 01:52:36,160

advice is never let any self-doubt or

2314

01:52:41,760 --> 01:52:38,230

anything external to you prevent you

2315

01:52:45,230 --> 01:52:41,770

from staying the course and so stay the

2316

01:52:47,520 --> 01:52:45,240

course because I know for myself

2317

01:52:50,610 --> 01:52:47,530

math and science actually didn't come

2318

01:52:52,920 --> 01:52:50,620

easy to me I I struggled with it

2319

01:52:55,290 --> 01:52:52,930

but when I actually learned it it was

2320

01:52:57,480 --> 01:52:55,300

the most amazing experience every time I

2321

01:52:59,730 --> 01:52:57,490

sat down to a math problem even though I

2322

01:53:03,090 --> 01:52:59,740

knew I was gonna study longer or it was

2323

01:53:04,800 --> 01:53:03,100

gonna be harder at the end I was just

2324

01:53:06,210 --> 01:53:04,810

like oh my gosh I figured it out this is

2325

01:53:09,270 --> 01:53:06,220

so cool and now it's teaching me

2326

01:53:11,730 --> 01:53:09,280

something and so I no matter what

2327

01:53:14,880 --> 01:53:11,740

challenges I encountered throughout my

2328

01:53:17,820 --> 01:53:14,890

life it was really important to never

2329

01:53:20,730 --> 01:53:17,830

let those kinds of things prevent me

2330

01:53:25,440 --> 01:53:20,740

from staying the course and that's what

2331

01:53:26,880 --> 01:53:25,450

I would tell youngsters great piece of

2332

01:53:28,620 --> 01:53:26,890

advice I think that's really

2333

01:53:30,900 --> 01:53:28,630

inspirational to hear where it didn't

2334

01:53:33,150 --> 01:53:30,910

come easily to people like you

2335

01:53:35,490 --> 01:53:33,160

they don't have to be a superstar in

2336

01:53:38,040 --> 01:53:35,500

math to end up working at NASA he just

2337

01:53:41,790 --> 01:53:38,050

got a workout at it that's rapport ask

2338

01:53:44,460 --> 01:53:41,800

your sister she was one year she were

2339

01:53:45,420 --> 01:53:44,470

one year apart and she's always better

2340

01:53:53,220 --> 01:53:45,430

in math than me

2341

01:53:54,570 --> 01:53:53,230

so I would ask her questions I think

2342

01:53:57,390 --> 01:53:54,580

something that's really beautiful here

2343

01:53:59,370 --> 01:53:57,400

with having all the women that we've had

2344

01:54:01,470 --> 01:53:59,380

on the show it's you know there was

2345

01:54:02,970 --> 01:54:01,480

there's we were talking about running

2346

01:54:05,460 --> 01:54:02,980

when y'all showed Sunita Williams

2347

01:54:06,990 --> 01:54:05,470

earlier and you know she's famously ran

2348

01:54:09,120 --> 01:54:07,000

the Boston Marathon his face but there's

2349

01:54:10,920 --> 01:54:09,130

another marathon runner sheelane

2350

01:54:12,960 --> 01:54:10,930

Flanagan and she won the New York City

2351

01:54:15,120 --> 01:54:12,970

Marathon last year and she had this

2352

01:54:16,560 --> 01:54:15,130

great article talking about her bringing

2353

01:54:17,790 --> 01:54:16,570

other women into this running club and

2354

01:54:20,790 --> 01:54:17,800

she said it's not so lonely at the top

2355

01:54:24,750 --> 01:54:20,800

if you bring others along and you know

2356

01:54:26,820 --> 01:54:24,760

and in that passion you know talking to

2357

01:54:29,430 --> 01:54:26,830

one another making room for more women

2358

01:54:31,830 --> 01:54:29,440

and science technology engineering and

2359

01:54:33,810 --> 01:54:31,840

math like we we have a responsibility to

2360

01:54:37,350 --> 01:54:33,820

pull each other in and say look what

2361

01:54:39,060 --> 01:54:37,360

she's doing Wow she's amazing yeah get a

2362

01:54:53,160 --> 01:54:39,070

chance to highlight other Wonder Woman

2363

01:54:55,320 --> 01:54:53,170

in your life thank you for joining us

2364

01:54:57,480 --> 01:54:55,330

and also a thank you at home for joining

2365

01:55:02,940 --> 01:54:57,490

us you can learn more about women at

2366

01:55:05,090 --> 01:55:02,950

NASA by going to Women nasa.gov and this

2367

01:55:07,230 --> 01:55:05,100

has been NASA in Silicon Valley live a

2368

01:55:09,270 --> 01:55:07,240

conversational show out of NASA's Ames

2369

01:55:11,550 --> 01:55:09,280

Research Center with the various

2370

01:55:13,500 --> 01:55:11,560

scientists researchers and engineers and

2371

01:55:16,350 --> 01:55:13,510

all all around cool folks here at NASA

2372

01:55:18,060 --> 01:55:16,360

where we get to talk about all the nerdy

2373

01:55:20,940 --> 01:55:18,070

NASA news that you need to know about

2374

01:55:24,450 --> 01:55:20,950

and if you like that you can find us on

2375

01:55:26,550 --> 01:55:24,460

Twitter YouTube Facebook and NASA TV and

2376

01:55:28,260 --> 01:55:26,560

if you can't catch us live but that is

2377

01:55:29,940 --> 01:55:28,270

no big deal

2378

01:55:31,950 --> 01:55:29,950

we will have the video on demand after

2379

01:55:34,080 --> 01:55:31,960

the show is over and you can also catch

2380

01:55:36,570 --> 01:55:34,090

the audio version of this podcast

2381

01:55:39,150 --> 01:55:36,580

through services throughout these

2382

01:55:41,130 --> 01:55:39,160

awesome a beyond and a huge thank you to

2383

01:55:43,110 --> 01:55:41,140

our guests and everyone that joined us

2384

01:55:44,229 --> 01:55:43,120

on the twitch chat we'll be back next

2385

01:55:46,180 --> 01:55:44,239

week on

2386

01:55:48,040 --> 01:55:46,190

Thursday November 15th where we'll talk

2387

01:55:50,860 --> 01:55:48,050

about heat shields and how they help

2388

01:55:54,520 --> 01:55:50,870

spacecraft survive atmospheric entry and

2389

01:55:55,800 --> 01:55:54,530

tell that until next day thank you for