



Expedition 63

1
00:00:15,669 --> 00:00:05,150
ignition sequence starts

2
00:00:17,830 --> 00:00:15,679
[Music]

3
00:00:19,750 --> 00:00:17,840
good morning and welcome to a view of

4
00:00:21,990 --> 00:00:19,760
the international space station flight

5
00:00:23,509 --> 00:00:22,000
control room at nasa's johnson space

6
00:00:25,589 --> 00:00:23,519
center you're watching the flight

7
00:00:27,990 --> 00:00:25,599
control team members as they keep an eye

8
00:00:30,310 --> 00:00:28,000
on the space station systems and stand

9
00:00:32,790 --> 00:00:30,320
by to work with the expedition 65 crew

10
00:00:33,830 --> 00:00:32,800
members on science research and station

11
00:00:35,510 --> 00:00:33,840
maintenance

12
00:00:37,750 --> 00:00:35,520
the station crew members got a new

13
00:00:39,670 --> 00:00:37,760

commander this week and then three new

14

00:00:41,990 --> 00:00:39,680

crewmates who arrived in a soyuz

15

00:00:44,470 --> 00:00:42,000

spacecraft two of them they are on a

16

00:00:48,389 --> 00:00:44,480

commercial contract with plans to shoot

17

00:00:52,470 --> 00:00:50,470

houston station on space to ground

18

00:00:54,790 --> 00:00:52,480

welcome to space to ground i'm kayla

19

00:00:57,510 --> 00:00:54,800

lafrance there is a lot of change on

20

00:00:59,750 --> 00:00:57,520

board the iss with new crews arriving

21

00:01:01,430 --> 00:00:59,760

and others preparing to leave

22

00:01:03,189 --> 00:01:01,440

tomorrow you've been an

23

00:01:04,070 --> 00:01:03,199

amazing crewmate

24

00:01:08,469 --> 00:01:04,080

and

25

00:01:11,350 --> 00:01:08,479

congratulations

26
00:01:13,910 --> 00:01:11,360
on monday october 4th european astronaut

27
00:01:16,469 --> 00:01:13,920
kama pesquet took command of the space

28
00:01:18,550 --> 00:01:16,479
station from japanese astronaut aki

29
00:01:21,270 --> 00:01:18,560
hoshide in the traditional change of

30
00:01:23,350 --> 00:01:21,280
command ceremony pasque became the

31
00:01:26,230 --> 00:01:23,360
fourth european astronaut to command the

32
00:01:28,950 --> 00:01:26,240
iss and the first french astronaut to

33
00:01:31,030 --> 00:01:28,960
hold the position pasque will remain as

34
00:01:33,109 --> 00:01:31,040
the commander of the orbiting laboratory

35
00:01:35,670 --> 00:01:33,119
until november where he will pass the

36
00:01:38,149 --> 00:01:35,680
command roll over to cosmonaut anton

37
00:01:40,310 --> 00:01:38,159
shkaplerov before he returns with his

38
00:01:42,550 --> 00:01:40,320

crew 2 crewmates

39

00:01:44,389 --> 00:01:42,560

then on tuesday the crew on board the

40

00:01:46,710 --> 00:01:44,399

space station welcomed three new

41

00:01:49,109 --> 00:01:46,720

crewmates when the hatches opened for

42

00:01:51,749 --> 00:01:49,119

the latest mission to the orbiting lab

43

00:01:53,510 --> 00:01:51,759

engines maximum thrust fuel tower

44

00:01:55,510 --> 00:01:53,520

separation liftoff

45

00:01:58,429 --> 00:01:55,520

three and a half hours after its launch

46

00:02:01,830 --> 00:01:58,439

from the baikonur cosmodrome the soyuz

47

00:02:04,469 --> 00:02:01,840

ms-19 cruise ship successfully docked at

48

00:02:07,270 --> 00:02:04,479

the station's rasvat module

49

00:02:09,990 --> 00:02:07,280

veteran cosmonaut anton shkaplerov on

50

00:02:12,550 --> 00:02:10,000

his fourth flight into space commanded

51
00:02:15,030 --> 00:02:12,560
the spacecraft and was joined by russian

52
00:02:17,510 --> 00:02:15,040
space flight participants who are making

53
00:02:19,670 --> 00:02:17,520
their first flights into space

54
00:02:21,830 --> 00:02:19,680
they will spend 12 days on the space

55
00:02:24,070 --> 00:02:21,840
station filming segments for a movie

56
00:02:26,309 --> 00:02:24,080
titled challenge under a commercial

57
00:02:29,430 --> 00:02:26,319
agreement between ross cosmos and

58
00:02:32,150 --> 00:02:29,440
moscow-based media entities

59
00:02:34,949 --> 00:02:32,160
last week nasa and spacex set the launch

60
00:02:38,150 --> 00:02:34,959
date for the third commercial crew space

61
00:02:41,190 --> 00:02:38,160
flight aboard a crew dragon spacecraft

62
00:02:44,550 --> 00:02:41,200
nasa's spacex crew 3 mission will carry

63
00:02:47,509 --> 00:02:44,560

nasa astronauts raja chari tom marshburn

64

00:02:50,150 --> 00:02:47,519

and caleb barron as well as european

65

00:02:52,949 --> 00:02:50,160

space agency astronaut matthias mauer

66

00:02:56,150 --> 00:02:52,959

aboard a crew dragon spacecraft on a

67

00:02:57,990 --> 00:02:56,160

falcon 9 rocket to the space station the

68

00:03:00,790 --> 00:02:58,000

mission is scheduled to launch no

69

00:03:04,070 --> 00:03:00,800

earlier than saturday october 30th from

70

00:03:06,550 --> 00:03:04,080

launch complex 39a at nasa's kennedy

71

00:03:10,309 --> 00:03:06,560

space center in florida be sure to

72

00:03:12,710 --> 00:03:10,319

follow along on nasa tv nasa.gov or the

73

00:03:15,030 --> 00:03:12,720

nasa app as we share pre-launch

74

00:03:17,589 --> 00:03:15,040

interviews and briefings leading up to

75

00:03:19,670 --> 00:03:17,599

our full live coverage of launch and

76

00:03:21,670 --> 00:03:19,680

subsequent docking

77

00:03:23,509 --> 00:03:21,680

and that's face to ground for this week

78

00:03:24,949 --> 00:03:23,519

thanks for watching we'll see you next

79

00:03:32,630 --> 00:03:24,959

week

80

00:03:38,710 --> 00:03:35,670

recently the space station crew woke up

81

00:03:40,550 --> 00:03:38,720

another flying robot to add it to the

82

00:03:42,949 --> 00:03:40,560

fleet of them being tested to see if

83

00:03:44,390 --> 00:03:42,959

they can do simple tasks that will help

84

00:03:46,550 --> 00:03:44,400

humans in space

85

00:03:48,869 --> 00:03:46,560

astronaut chris cassidy demonstrates the

86

00:03:54,500 --> 00:03:48,879

flying robots being developed by nasa's

87

00:03:54,510 --> 00:04:08,309

[Applause]

88

00:04:13,509 --> 00:04:11,030

the unique thing about this particular

89

00:04:16,069 --> 00:04:13,519

one on the right docking station it goes

90

00:04:20,390 --> 00:04:16,079

in upside down

91

00:04:33,830 --> 00:04:22,710

went and got some snacks some nuts and

92

00:04:38,550 --> 00:04:36,629

so the scientific team is in california

93

00:04:41,270 --> 00:04:38,560

the payload control center is in

94

00:04:43,270 --> 00:04:41,280

huntsville and of course i'm here so

95

00:04:44,469 --> 00:04:43,280

we've got three different locations

96

00:04:50,790 --> 00:04:44,479

we're all

97

00:04:55,430 --> 00:04:52,870

the international space station is well

98

00:04:57,830 --> 00:04:55,440

known as an orbiting laboratory but its

99

00:05:00,469 --> 00:04:57,840

mission also includes preparing us for

100

00:05:02,629 --> 00:05:00,479

future exploration improving life down

101
00:05:05,830 --> 00:05:02,639
here on earth and encouraging

102
00:05:08,070 --> 00:05:05,840
commercialization of space in that area

103
00:05:15,990 --> 00:05:08,080
one of its great success stories is a

104
00:05:20,870 --> 00:05:18,550
think of the international space station

105
00:05:23,430 --> 00:05:20,880
and most likely you imagine an orbiting

106
00:05:26,629 --> 00:05:23,440
laboratory where scientists observe how

107
00:05:29,110 --> 00:05:26,639
plants materials and humans react to

108
00:05:31,430 --> 00:05:29,120
microgravity conditions

109
00:05:34,469 --> 00:05:31,440
but during the past decade the station

110
00:05:37,110 --> 00:05:34,479
has also served a very different role

111
00:05:39,590 --> 00:05:37,120
that of being a business incubator

112
00:05:47,590 --> 00:05:39,600
and this is one of its star products the

113
00:05:52,629 --> 00:05:49,749

the cubesat is one of many types of

114

00:05:54,550 --> 00:05:52,639

satellites now found in space

115

00:05:57,350 --> 00:05:54,560

it is one of the smallest

116

00:05:59,830 --> 00:05:57,360

one unit is a compact 10 by 10 by 10

117

00:06:01,830 --> 00:05:59,840

centimeter cube and is commonly referred

118

00:06:04,070 --> 00:06:01,840

to as 1u

119

00:06:07,270 --> 00:06:04,080

and it can be deployed for a fraction of

120

00:06:09,189 --> 00:06:07,280

what its larger cousins cost

121

00:06:11,990 --> 00:06:09,199

early small satellites launched from the

122

00:06:14,309 --> 00:06:12,000

station were literally thrown into space

123

00:06:17,350 --> 00:06:14,319

by russian cosmonauts

124

00:06:19,590 --> 00:06:17,360

in 2012 crew members began utilizing the

125

00:06:22,390 --> 00:06:19,600

airlock in the japanese kibo module to

126
00:06:23,749 --> 00:06:22,400
deploy up to 6u of cubesats per airlock

127
00:06:26,469 --> 00:06:23,759
cycle

128
00:06:29,029 --> 00:06:26,479
and not long after the american company

129
00:06:32,150 --> 00:06:29,039
nanoracks built and began operating an

130
00:06:34,790 --> 00:06:32,160
even more robust deployer on the station

131
00:06:35,909 --> 00:06:34,800
capable of launching up to 48 u per

132
00:06:38,710 --> 00:06:35,919
cycle

133
00:06:40,469 --> 00:06:38,720
that changed everything

134
00:06:42,150 --> 00:06:40,479
mike reed is the manager of space

135
00:06:44,710 --> 00:06:42,160
station business and economic

136
00:06:46,710 --> 00:06:44,720
development at johnson space center

137
00:06:48,550 --> 00:06:46,720
he notes how one of nanorack's first

138
00:06:50,550 --> 00:06:48,560

customers planet

139

00:06:52,870 --> 00:06:50,560

leveraged the new launch capabilities

140

00:06:54,950 --> 00:06:52,880

aboard the space station

141

00:06:56,710 --> 00:06:54,960

planet wanted to take high resolution

142

00:06:58,309 --> 00:06:56,720

photos of earth

143

00:07:00,469 --> 00:06:58,319

while you can take pictures from the

144

00:07:02,710 --> 00:07:00,479

space station your coverage is limited

145

00:07:04,950 --> 00:07:02,720

by the station's orbit

146

00:07:07,270 --> 00:07:04,960

with multiple cubesats however you can

147

00:07:07,910 --> 00:07:07,280

position them to cover almost any point

148

00:07:09,110 --> 00:07:07,920

on earth

149

00:07:11,350 --> 00:07:09,120

[Music]

150

00:07:13,510 --> 00:07:11,360

in a relatively short time

151
00:07:15,749 --> 00:07:13,520
planet deployed several generations of

152
00:07:17,270 --> 00:07:15,759
cubesats from the space station

153
00:07:19,270 --> 00:07:17,280
proving the viability of their

154
00:07:20,870 --> 00:07:19,280
technology approach and their business

155
00:07:23,029 --> 00:07:20,880
model

156
00:07:25,430 --> 00:07:23,039
with these successes planet quickly

157
00:07:28,710 --> 00:07:25,440
expanded to an operational fleet of over

158
00:07:30,629 --> 00:07:28,720
150 satellites deployed using commercial

159
00:07:32,469 --> 00:07:30,639
launch providers

160
00:07:34,950 --> 00:07:32,479
this fleet gives them the ability to

161
00:07:36,309 --> 00:07:34,960
image the entire earth's land mass every

162
00:07:38,629 --> 00:07:36,319
day

163
00:07:40,710 --> 00:07:38,639

planet's imagery is now in high demand

164

00:07:42,309 --> 00:07:40,720

by companies and governments who use

165

00:07:43,670 --> 00:07:42,319

this big data in the fields of

166

00:07:45,589 --> 00:07:43,680

agriculture

167

00:07:48,629 --> 00:07:45,599

forestry and land use

168

00:07:50,629 --> 00:07:48,639

mapping and disaster response

169

00:07:53,189 --> 00:07:50,639

within a decade the company has grown

170

00:07:55,749 --> 00:07:53,199

from a true startup to employing nearly

171

00:07:57,430 --> 00:07:55,759

500 people

172

00:07:59,510 --> 00:07:57,440

multiple companies are now building

173

00:08:01,430 --> 00:07:59,520

small launch vehicles specifically to

174

00:08:03,909 --> 00:08:01,440

deploy cubesats and other small

175

00:08:06,070 --> 00:08:03,919

satellites into low earth orbit

176

00:08:07,909 --> 00:08:06,080

for use in a variety of ways for

177

00:08:10,710 --> 00:08:07,919

companies as well as students and

178

00:08:12,469 --> 00:08:10,720

non-profit organizations

179

00:08:14,390 --> 00:08:12,479

cubesats are being used to provide

180

00:08:16,869 --> 00:08:14,400

internet services to even the most

181

00:08:18,710 --> 00:08:16,879

remote regions of the planet

182

00:08:20,469 --> 00:08:18,720

they're helping build better weather and

183

00:08:22,390 --> 00:08:20,479

climate models to improve weather

184

00:08:24,230 --> 00:08:22,400

forecasting

185

00:08:27,029 --> 00:08:24,240

they're enabling text messaging for your

186

00:08:28,710 --> 00:08:27,039

phone around the globe even without a

187

00:08:31,830 --> 00:08:28,720

sell signal

188

00:08:33,990 --> 00:08:31,840

cubesats are also leaving the planet

189

00:08:36,310 --> 00:08:34,000

the first and second interplanetary

190

00:08:39,029 --> 00:08:36,320

cubesats accompanied nasa's insight

191

00:08:41,269 --> 00:08:39,039

lander on its recent mission to mars

192

00:08:43,829 --> 00:08:41,279

relaying data about the spacecraft as it

193

00:08:45,670 --> 00:08:43,839

entered the planet's atmosphere

194

00:08:47,990 --> 00:08:45,680

some cubesat missions will serve as

195

00:08:50,150 --> 00:08:48,000

pathfinders to help map the way for the

196

00:08:52,550 --> 00:08:50,160

artemis missions to the moon

197

00:08:55,509 --> 00:08:52,560

and 13 cubesats will launch on the first

198

00:08:58,470 --> 00:08:55,519

mission artemis one

199

00:09:01,269 --> 00:08:58,480

reed concludes with this observation

200

00:09:03,750 --> 00:09:01,279

today more and more a single large and

201
00:09:05,269 --> 00:09:03,760
expensive satellite is being replaced by

202
00:09:07,110 --> 00:09:05,279
one of the newest members of the

203
00:09:08,630 --> 00:09:07,120
satellite portfolio

204
00:09:10,790 --> 00:09:08,640
a flock of small

205
00:09:12,389 --> 00:09:10,800
less expensive yet very powerful

206
00:09:14,710 --> 00:09:12,399
cubesats

207
00:09:16,949 --> 00:09:14,720
affordable access to space has broadened

208
00:09:19,350 --> 00:09:16,959
the station's capabilities in a way that

209
00:09:22,150 --> 00:09:19,360
frankly was never envisioned

210
00:09:25,030 --> 00:09:22,160
however that access has enabled cubesats

211
00:09:27,190 --> 00:09:25,040
to become a sustained commercial success

212
00:09:30,150 --> 00:09:27,200
contributing significantly to the

213
00:09:31,990 --> 00:09:30,160

growing space marketplace

214

00:09:35,509 --> 00:09:32,000

for more science and research from the

215

00:09:37,110 --> 00:09:35,519

international space station go to www

216

00:09:39,509 --> 00:09:37,120

nasa

217

00:09:42,389 --> 00:09:39,519

iss science

218

00:09:45,110 --> 00:09:42,399

to discover more about the space on

219

00:09:49,620 --> 00:09:45,120

around and beyond our planet visit

220

00:09:49,630 --> 00:09:55,190

[Music]

221

00:09:59,829 --> 00:09:57,430

the effort to design and produce the

222

00:10:02,150 --> 00:09:59,839

hardware we'll need to explore the moon

223

00:10:04,870 --> 00:10:02,160

on artemis missions isn't restricted

224

00:10:06,949 --> 00:10:04,880

just to nasa engineers and scientists we

225

00:10:09,190 --> 00:10:06,959

have a program designed to reach out for

226

00:10:11,350 --> 00:10:09,200

the particular expertise of today's

227

00:10:13,590 --> 00:10:11,360

college students for their help in

228

00:10:16,150 --> 00:10:13,600

developing the software and technology

229

00:10:17,190 --> 00:10:16,160

that will be needed to create those new

230

00:10:19,269 --> 00:10:17,200

tools

231

00:10:22,310 --> 00:10:19,279

take a look at what the suits program is

232

00:10:25,010 --> 00:10:22,320

doing not only for exploration but for

233

00:10:27,030 --> 00:10:25,020

student education

234

00:10:28,870 --> 00:10:27,040

[Music]

235

00:10:31,110 --> 00:10:28,880

nasa is building exciting new

236

00:10:33,829 --> 00:10:31,120

technologies to help astronauts explore

237

00:10:36,310 --> 00:10:33,839

the moon and it is tapping into the

238

00:10:37,269 --> 00:10:36,320

unique perspective of today's college

239

00:10:39,430 --> 00:10:37,279

students

240

00:10:43,560 --> 00:10:39,440

to contribute research to those new

241

00:10:43,570 --> 00:10:49,750

[Music]

242

00:10:53,990 --> 00:10:51,750

today is test day

243

00:10:56,790 --> 00:10:54,000

nasa engineers are helping evaluate

244

00:10:59,269 --> 00:10:56,800

software designed by students the task

245

00:11:00,949 --> 00:10:59,279

is to see how this technology can help

246

00:11:03,030 --> 00:11:00,959

during a space mission it's the

247

00:11:05,670 --> 00:11:03,040

culmination of the student's hard work

248

00:11:08,310 --> 00:11:05,680

on the program known as suits

249

00:11:11,190 --> 00:11:08,320

so suits is spacesuit user interface

250

00:11:14,389 --> 00:11:11,200

technologies for students what that

251
00:11:17,430 --> 00:11:14,399
means is we're having students design

252
00:11:19,430 --> 00:11:17,440
a graphic user interface for

253
00:11:20,870 --> 00:11:19,440
the suit helmet bubble you know a

254
00:11:21,750 --> 00:11:20,880
heads-up display would be something

255
00:11:24,470 --> 00:11:21,760
that's

256
00:11:27,910 --> 00:11:24,480
fairly far out from your face

257
00:11:30,069 --> 00:11:27,920
so maybe a couple of feet or further

258
00:11:33,190 --> 00:11:30,079
what the students are using is a

259
00:11:36,470 --> 00:11:33,200
head-mounted display and we really kind

260
00:11:39,110 --> 00:11:36,480
of refer to that as a heads on like it's

261
00:11:41,509 --> 00:11:39,120
on the head and so it's only

262
00:11:42,470 --> 00:11:41,519
maybe a half inch or so away from the

263
00:11:45,509 --> 00:11:42,480

eyes

264

00:11:46,710 --> 00:11:45,519

and they wear it like goggles it allows

265

00:11:49,110 --> 00:11:46,720

them to

266

00:11:52,069 --> 00:11:49,120

not only see the real environment in

267

00:11:56,069 --> 00:11:52,079

front of them or around them but also it

268

00:11:58,629 --> 00:11:56,079

overlays text or imagery in front of

269

00:12:01,269 --> 00:11:58,639

their eye so that they see that on top

270

00:12:03,350 --> 00:12:01,279

of the real environment seeing both the

271

00:12:06,310 --> 00:12:03,360

graphic overlays and the real

272

00:12:08,310 --> 00:12:06,320

environment is called augmented reality

273

00:12:11,110 --> 00:12:08,320

the challenge for the students is to use

274

00:12:13,750 --> 00:12:11,120

this technology to be of help during one

275

00:12:18,550 --> 00:12:13,760

of the most difficult tasks encountered

276

00:12:24,949 --> 00:12:22,069

[Music]

277

00:12:28,150 --> 00:12:24,959

so an eva or an extravehicular activity

278

00:12:30,150 --> 00:12:28,160

um a fancy word for a spacewalk at nasa

279

00:12:32,470 --> 00:12:30,160

is typically a crew member

280

00:12:36,150 --> 00:12:32,480

leaving their vehicle their spacecraft

281

00:12:37,829 --> 00:12:36,160

in a pressurized suit evas are

282

00:12:39,829 --> 00:12:37,839

oftentimes if you ask an astronaut

283

00:12:41,670 --> 00:12:39,839

they'll say that they're much like doing

284

00:12:43,110 --> 00:12:41,680

brain surgery and running a marathon at

285

00:12:45,829 --> 00:12:43,120

the same time

286

00:12:48,629 --> 00:12:45,839

what we do with suits is simulate this

287

00:12:51,590 --> 00:12:48,639

intense eva environment but we then

288

00:12:54,629 --> 00:12:51,600

introduce an augmented reality display

289

00:12:57,030 --> 00:12:54,639

in harmony with the audio feed that that

290

00:12:59,509 --> 00:12:57,040

comes over the loop from mission control

291

00:13:02,150 --> 00:12:59,519

astronauts today don't have augmented

292

00:13:03,910 --> 00:13:02,160

reality visible inside the space helmet

293

00:13:05,910 --> 00:13:03,920

during an eva

294

00:13:08,389 --> 00:13:05,920

they rely on their training mission

295

00:13:11,590 --> 00:13:08,399

control and in some cases a small

296

00:13:14,470 --> 00:13:11,600

booklet known as a cuff checklist should

297

00:13:16,389 --> 00:13:14,480

they need more information

298

00:13:19,190 --> 00:13:16,399

the suits project challenges the

299

00:13:21,990 --> 00:13:19,200

students to look forward and wonder

300

00:13:23,829 --> 00:13:22,000

what if astronauts could access data

301
00:13:25,670 --> 00:13:23,839
using this technology

302
00:13:28,230 --> 00:13:25,680
what would it look like

303
00:13:31,350 --> 00:13:28,240
yeah i think suits is an awesome program

304
00:13:33,990 --> 00:13:31,360
and asks teams to create some kind of

305
00:13:36,470 --> 00:13:34,000
user interface it can be virtual reality

306
00:13:37,190 --> 00:13:36,480
or it can be augmented reality

307
00:13:39,189 --> 00:13:37,200
but

308
00:13:41,670 --> 00:13:39,199
the goal is to

309
00:13:43,430 --> 00:13:41,680
basically build a tool that astronauts

310
00:13:44,629 --> 00:13:43,440
can use when they're doing space

311
00:13:46,949 --> 00:13:44,639
operations

312
00:13:49,430 --> 00:13:46,959
students come up with ideas that run the

313
00:13:51,990 --> 00:13:49,440

gamut of eva activity

314

00:13:54,470 --> 00:13:52,000

such as operating complex equipment

315

00:13:57,350 --> 00:13:54,480

cataloging a lunar sample

316

00:13:59,590 --> 00:13:57,360

or navigating to a remote location

317

00:14:01,189 --> 00:13:59,600

our main goal was to build the

318

00:14:04,310 --> 00:14:01,199

minimalistic and

319

00:14:06,710 --> 00:14:04,320

unobtrusive interface that's easy to use

320

00:14:09,189 --> 00:14:06,720

so we made sure to develop exclusively

321

00:14:12,629 --> 00:14:09,199

natural inputs like hand gestures and

322

00:14:16,150 --> 00:14:12,639

voice command to control the eva system

323

00:14:18,230 --> 00:14:16,160

nasa mentors and academia sponsors help

324

00:14:20,629 --> 00:14:18,240

the students achieve their goals

325

00:14:22,470 --> 00:14:20,639

it was extremely constructive altogether

326

00:14:24,150 --> 00:14:22,480

i would like to say that we riled each

327

00:14:26,389 --> 00:14:24,160

other up

328

00:14:28,710 --> 00:14:26,399

positively in the sense that we were

329

00:14:30,550 --> 00:14:28,720

able to achieve greater things because

330

00:14:32,870 --> 00:14:30,560

at every meeting we would say hey what

331

00:14:34,949 --> 00:14:32,880

if we do this hey what if we do that hey

332

00:14:37,189 --> 00:14:34,959

wouldn't it be awesome math so overall

333

00:14:39,030 --> 00:14:37,199

we were positively reinforcing each

334

00:14:41,189 --> 00:14:39,040

other's interests

335

00:14:43,670 --> 00:14:41,199

nasa engineers evaluate the students

336

00:14:45,670 --> 00:14:43,680

work by trying out their ideas in a

337

00:14:48,550 --> 00:14:45,680

simulated space walk

338

00:14:51,350 --> 00:14:48,560

so that they and the students see what

339

00:14:54,310 --> 00:14:51,360

works and what needs tweaking it's a

340

00:14:56,310 --> 00:14:54,320

unique educational experience

341

00:14:59,110 --> 00:14:56,320

even though we had some technical issues

342

00:15:01,189 --> 00:14:59,120

while testing it was very surreal to see

343

00:15:02,550 --> 00:15:01,199

our tool being tested at johnson space

344

00:15:04,230 --> 00:15:02,560

center

345

00:15:06,790 --> 00:15:04,240

my favorite part about working with the

346

00:15:09,110 --> 00:15:06,800

team is that everyone was very excited

347

00:15:10,790 --> 00:15:09,120

to learn and also share what they know

348

00:15:12,870 --> 00:15:10,800

we all come from different majors and

349

00:15:14,710 --> 00:15:12,880

different backgrounds so by the end of

350

00:15:17,189 --> 00:15:14,720

the cycle everyone knew a little bit

351
00:15:18,949 --> 00:15:17,199
about rocks or about programming or got

352
00:15:20,629 --> 00:15:18,959
out of their comfort zone by presenting

353
00:15:23,030 --> 00:15:20,639
our project

354
00:15:25,110 --> 00:15:23,040
it also helps with interpersonal skills

355
00:15:27,110 --> 00:15:25,120
learning how to work within a team

356
00:15:28,629 --> 00:15:27,120
improving my technical communication you

357
00:15:31,350 --> 00:15:28,639
know i can talk about systems and

358
00:15:33,269 --> 00:15:31,360
software or you know helping me be more

359
00:15:35,430 --> 00:15:33,279
confident in liabilities

360
00:15:37,670 --> 00:15:35,440
it's great to see them grow it's great

361
00:15:39,509 --> 00:15:37,680
to see them collaborating with each

362
00:15:41,590 --> 00:15:39,519
other collaborating with subject matter

363
00:15:43,910 --> 00:15:41,600

experts to make their designs more

364

00:15:46,550 --> 00:15:43,920

effective or more efficient

365

00:15:47,670 --> 00:15:46,560

the research gathered in suits benefits

366

00:15:49,749 --> 00:15:47,680

nasa too

367

00:15:51,990 --> 00:15:49,759

as it develops its own designs for

368

00:15:54,949 --> 00:15:52,000

possible graphic displays

369

00:15:55,749 --> 00:15:54,959

its future forward work that is needed

370

00:15:57,749 --> 00:15:55,759

now

371

00:16:01,269 --> 00:15:57,759

when i entered the field of augmented

372

00:16:02,550 --> 00:16:01,279

reality for eva displays

373

00:16:05,430 --> 00:16:02,560

there was about

374

00:16:06,710 --> 00:16:05,440

one paper that i could reference

375

00:16:09,189 --> 00:16:06,720

what suits

376

00:16:10,949 --> 00:16:09,199

provides to the engineers at nasa is

377

00:16:13,590 --> 00:16:10,959

really the ability

378

00:16:15,910 --> 00:16:13,600

to explore many different designs to

379

00:16:19,350 --> 00:16:15,920

explore many different concepts and

380

00:16:21,189 --> 00:16:19,360

really have a think tank if you will for

381

00:16:22,470 --> 00:16:21,199

what the future of these displays really

382

00:16:26,069 --> 00:16:22,480

look like

383

00:16:28,629 --> 00:16:26,079

all the hard work testing and learning

384

00:16:31,910 --> 00:16:28,639

points to a brighter future using this

385

00:16:34,069 --> 00:16:31,920

technology it's an amalgamation of

386

00:16:35,189 --> 00:16:34,079

doing something that i love

387

00:16:38,310 --> 00:16:35,199

and also

388

00:16:40,230 --> 00:16:38,320

seeing the value that would come off of

389

00:16:41,590 --> 00:16:40,240

it in the long run and i think that's

390

00:16:43,749 --> 00:16:41,600

the same for

391

00:16:46,470 --> 00:16:43,759

most of my peers as well who worked in

392

00:16:49,910 --> 00:16:46,480

this present you could see some real

393

00:16:51,829 --> 00:16:49,920

genuine passion and working on this and

394

00:16:54,389 --> 00:16:51,839

everything shows that we really want

395

00:16:56,949 --> 00:16:54,399

this to work we really want tech and

396

00:16:59,430 --> 00:16:56,959

space exploration to to be the next big

397

00:17:01,350 --> 00:16:59,440

thing and and that was super satisfying

398

00:17:02,150 --> 00:17:01,360

and fulfilling to me and to the team as

399

00:17:03,749 --> 00:17:02,160

well

400

00:17:05,829 --> 00:17:03,759

building this software for these

401
00:17:07,110 --> 00:17:05,839
displays is like giving the crew members

402
00:17:08,710 --> 00:17:07,120
superpowers

403
00:17:11,110 --> 00:17:08,720
and that's something that i love about

404
00:17:12,470 --> 00:17:11,120
it but also getting to engage with

405
00:17:15,590 --> 00:17:12,480
academia

406
00:17:19,189 --> 00:17:15,600
and the talent that we have

407
00:17:21,189 --> 00:17:19,199
in academia and in universities that's

408
00:17:23,750 --> 00:17:21,199
what we need to see

409
00:17:26,069 --> 00:17:23,760
and the creativity that comes from it to

410
00:17:26,500 --> 00:17:26,079
make these tools the best that they can

411
00:17:28,230 --> 00:17:26,510
be

412
00:17:30,390 --> 00:17:28,240
[Music]

413
00:17:31,830 --> 00:17:30,400

with nasa suits we want to see your

414

00:17:36,150 --> 00:17:31,840

vision

415

00:17:37,430 --> 00:17:36,160

with massachusetts we want to see your

416

00:17:42,390 --> 00:17:37,440

vision

417

00:17:44,580 --> 00:17:42,400

this is nasa suits and we want to see

418

00:17:48,549 --> 00:17:44,590

your vision

419

00:17:49,870 --> 00:17:48,559

[Music]

420

00:17:51,510 --> 00:17:49,880

visit

421

00:17:53,669 --> 00:17:51,520

stem.nasa.gov

422

00:17:55,430 --> 00:17:53,679

artemis and see how you can join one of

423

00:17:57,870 --> 00:17:55,440

nasa's mission related student

424

00:18:11,270 --> 00:17:57,880

challenges

425

00:18:15,110 --> 00:18:13,270

international space station crew members

426

00:18:17,750 --> 00:18:15,120

spend some of their time on station

427

00:18:20,070 --> 00:18:17,760

maintenance some on science activities

428

00:18:22,310 --> 00:18:20,080

and some of it sharing the experience of

429

00:18:24,470 --> 00:18:22,320

flying in space with folks on earth

430

00:18:26,870 --> 00:18:24,480

including students studying the fields

431

00:18:27,750 --> 00:18:26,880

of science technology engineering and

432

00:18:29,990 --> 00:18:27,760

math

433

00:18:32,310 --> 00:18:30,000

in this news demonstrations video

434

00:18:34,549 --> 00:18:32,320

expedition 65's shane kimbrough

435

00:18:37,430 --> 00:18:34,559

describes how crew members use their

436

00:18:40,950 --> 00:18:37,440

senses in space and how those senses

437

00:19:05,040 --> 00:18:40,960

adapt to being in weightlessness

438

00:19:05,050 --> 00:19:11,590

[Music]

439

00:19:15,270 --> 00:19:13,350

hello my name is shane kimbrough and i'm

440

00:19:17,510 --> 00:19:15,280

an astronaut living and working up here

441

00:19:19,110 --> 00:19:17,520

on the international space station

442

00:19:21,350 --> 00:19:19,120

in this demonstration i'll be talking

443

00:19:23,669 --> 00:19:21,360

about the five main senses we have and

444

00:19:27,830 --> 00:19:23,679

how we use them up here on the station

445

00:19:32,549 --> 00:19:30,150

as humans we have five senses that let

446

00:19:35,510 --> 00:19:32,559

us observe the world around us

447

00:19:37,590 --> 00:19:35,520

these senses are sight taste smell

448

00:19:39,830 --> 00:19:37,600

hearing and touch

449

00:19:42,549 --> 00:19:39,840

our senses help us determine whether or

450

00:19:45,029 --> 00:19:42,559

not we like something but they also warn

451

00:19:47,110 --> 00:19:45,039

us if something is wrong

452

00:19:48,950 --> 00:19:47,120

sometimes our senses pick up very good

453

00:19:52,630 --> 00:19:48,960

things like the smell of fresh baked

454

00:19:54,870 --> 00:19:52,640

cookies or the taste of yummy pizza

455

00:19:56,390 --> 00:19:54,880

other times our senses may warn us of

456

00:19:59,350 --> 00:19:56,400

danger like the smell of something

457

00:20:00,950 --> 00:19:59,360

burning or the feeling of something hot

458

00:20:03,430 --> 00:20:00,960

let's go through the five senses and

459

00:20:06,789 --> 00:20:03,440

talk about what we may observe with them

460

00:20:09,270 --> 00:20:06,799

up here on the station

461

00:20:13,029 --> 00:20:09,280

site the sense of sight allows us to see

462

00:20:14,630 --> 00:20:13,039

the world around us or in my case space

463

00:20:16,470 --> 00:20:14,640

here on the station one way we use our

464

00:20:18,630 --> 00:20:16,480

sense of sight is to see different

465

00:20:21,430 --> 00:20:18,640

experiments we are working on so we can

466

00:20:23,110 --> 00:20:21,440

report the results back to earth

467

00:20:24,789 --> 00:20:23,120

some astronauts have noticed that their

468

00:20:27,029 --> 00:20:24,799

site changes a little after living in

469

00:20:28,789 --> 00:20:27,039

microgravity aboard the station

470

00:20:30,710 --> 00:20:28,799

scientists are helping to fix this by

471

00:20:32,870 --> 00:20:30,720

conducting research up here on

472

00:20:35,350 --> 00:20:32,880

astronauts like me

473

00:20:38,230 --> 00:20:35,360

[Music]

474

00:20:40,230 --> 00:20:38,240

our sense of taste comes from our tongue

475

00:20:41,750 --> 00:20:40,240

and it tells our brain what kind of food

476

00:20:42,710 --> 00:20:41,760

and nutrients we are putting into our

477

00:20:44,230 --> 00:20:42,720

body

478

00:20:47,430 --> 00:20:44,240

we can tell when something is super

479

00:20:48,950 --> 00:20:47,440

sweet or very salty because of this

480

00:20:51,350 --> 00:20:48,960

because of fluid shifts on a space

481

00:20:53,830 --> 00:20:51,360

station sometimes our noses can be a bit

482

00:20:54,950 --> 00:20:53,840

stuffy and it can be harder to taste

483

00:20:56,070 --> 00:20:54,960

food

484

00:20:58,470 --> 00:20:56,080

so

485

00:21:03,510 --> 00:20:58,480

lots of us love to add hot sauce to many

486

00:21:08,230 --> 00:21:06,310

smell just like with taste sometimes our

487

00:21:10,310 --> 00:21:08,240

sense of smell can change up here in

488

00:21:11,909 --> 00:21:10,320

microgravity as the liquids in our body

489

00:21:13,350 --> 00:21:11,919

move around

490

00:21:15,270 --> 00:21:13,360

once our bodies have adjusted to

491

00:21:16,650 --> 00:21:15,280

microgravity the space station has a

492

00:21:19,669 --> 00:21:16,660

very distinct smell

493

00:21:21,990 --> 00:21:19,679

[Music]

494

00:21:24,230 --> 00:21:22,000

hearing in terms of hearing inside the

495

00:21:26,149 --> 00:21:24,240

space station there is constant noise

496

00:21:28,830 --> 00:21:26,159

coming from the different machines that

497

00:21:31,430 --> 00:21:28,840

keep our air flowing and the experiments

498

00:21:33,750 --> 00:21:31,440

running our sleeping quarters block some

499

00:21:36,710 --> 00:21:33,760

of the noise though so we're able to get

500

00:21:38,149 --> 00:21:36,720

a good night's sleep each night

501
00:21:40,390 --> 00:21:38,159
what do you think you would hear outside

502
00:21:42,230 --> 00:21:40,400
the space station well you better be

503
00:21:44,470 --> 00:21:42,240
wearing a spacesuit so you'd be hearing

504
00:21:46,470 --> 00:21:44,480
the fan noises inside the spacesuit

505
00:21:48,390 --> 00:21:46,480
but if somehow you were able to be

506
00:21:51,029 --> 00:21:48,400
outside of that spacesuit you would hear

507
00:21:53,350 --> 00:21:51,039
absolutely nothing because sound cannot

508
00:21:54,320 --> 00:21:53,360
travel in space because it has no air to

509
00:21:55,909 --> 00:21:54,330
travel through

510
00:21:57,669 --> 00:21:55,919
[Music]

511
00:21:59,750 --> 00:21:57,679
touch usually when you think of touch

512
00:22:01,990 --> 00:21:59,760
you think of observing how things feel

513
00:22:03,750 --> 00:22:02,000

with your fingers since we are floating

514

00:22:05,909 --> 00:22:03,760

we are constantly having to touch and

515

00:22:08,310 --> 00:22:05,919

grab onto objects either using our hands

516

00:22:10,710 --> 00:22:08,320

or our feet you can use your feet to

517

00:22:12,549 --> 00:22:10,720

walk up here if you carefully hook them

518

00:22:14,149 --> 00:22:12,559

under handrails as you go but this is

519

00:22:15,750 --> 00:22:14,159

fairly challenging so we like to use our

520

00:22:17,190 --> 00:22:15,760

hands more than our feet while we're up

521

00:22:18,789 --> 00:22:17,200

here

522

00:22:21,760 --> 00:22:18,799

we will often use our hands to move

523

00:22:27,830 --> 00:22:21,770

along and carry objects with our legs

524

00:22:29,510 --> 00:22:27,840

[Music]

525

00:22:31,110 --> 00:22:29,520

thanks for learning about the five main

526

00:22:33,270 --> 00:22:31,120

senses with me today

527

00:22:35,190 --> 00:22:33,280

start thinking about your five senses

528

00:22:37,430 --> 00:22:35,200

and how they help you observe and adapt

529

00:22:40,200 --> 00:22:37,440

to your environment down on earth

530

00:22:56,070 --> 00:22:40,210

see you next time

531

00:23:00,390 --> 00:22:58,230

the international space station provides

532

00:23:02,390 --> 00:23:00,400

a spot to keep an eye on the changes

533

00:23:04,789 --> 00:23:02,400

occurring here on the planet but it

534

00:23:07,270 --> 00:23:04,799

turns out it does more than that

535

00:23:10,230 --> 00:23:07,280

cosmonauts sergey kriklyov a member of

536

00:23:13,270 --> 00:23:10,240

expedition 1 more than 20 years ago and

537

00:23:15,990 --> 00:23:13,280

later commander of expedition 11 says

538

00:23:18,390 --> 00:23:16,000

the more than 800 days spent in space

539

00:23:20,789 --> 00:23:18,400

over his whole career helped him develop

540

00:23:23,270 --> 00:23:20,799

his perspective on the power of human

541

00:23:25,990 --> 00:23:23,280

beings from all over the planet working

542

00:23:28,070 --> 00:23:26,000

together in space

543

00:23:29,590 --> 00:23:28,080

i read a lot of

544

00:23:34,630 --> 00:23:29,600

science fiction

545

00:23:36,549 --> 00:23:34,640

of that i thought well it that's

546

00:23:37,110 --> 00:23:36,559

probably interesting thing to spend my

547

00:23:49,510 --> 00:23:37,120

life on

548

00:23:53,909 --> 00:23:51,590

first on orbit you start to feel

549

00:23:57,269 --> 00:23:53,919

weightlessness and i remember first time

550

00:23:59,029 --> 00:23:57,279

looking outside i was amazed to see

551
00:24:00,230 --> 00:23:59,039
curved horizon because

552
00:24:03,029 --> 00:24:00,240
before that

553
00:24:05,190 --> 00:24:03,039
although we theoretically knew that we

554
00:24:07,430 --> 00:24:05,200
are on the globe but from orbit you

555
00:24:10,549 --> 00:24:07,440
already see curvature of the earth and

556
00:24:12,870 --> 00:24:10,559
that was first surprised again i knew it

557
00:24:14,070 --> 00:24:12,880
but to see with your own eyes that you

558
00:24:16,390 --> 00:24:14,080
have pretty

559
00:24:17,110 --> 00:24:16,400
thin layer of atmosphere that protecting

560
00:24:23,190 --> 00:24:17,120
us

561
00:24:27,269 --> 00:24:25,350
when you look down you have

562
00:24:29,669 --> 00:24:27,279
some kind of blue filter

563
00:24:30,710 --> 00:24:29,679

and this blue filter make all colors

564

00:24:32,390 --> 00:24:30,720

actually

565

00:24:33,669 --> 00:24:32,400

not so distinct

566

00:24:35,590 --> 00:24:33,679

so really

567

00:24:37,830 --> 00:24:35,600

green is not so green it's more like

568

00:24:40,870 --> 00:24:37,840

bluish green blue is more blue because

569

00:24:43,750 --> 00:24:40,880

again we have more blue from atmosphere

570

00:24:46,310 --> 00:24:43,760

and where we have really bright colors

571

00:24:48,870 --> 00:24:46,320

is on horizon especially during sunrise

572

00:25:05,190 --> 00:24:48,880

and sunset that's where we have a lot of

573

00:25:10,310 --> 00:25:07,750

when you look down i realize that little

574

00:25:11,909 --> 00:25:10,320

more difficult to find things on the

575

00:25:13,669 --> 00:25:11,919

surface than

576
00:25:16,070 --> 00:25:13,679
when you do it on the maps because on

577
00:25:18,630 --> 00:25:16,080
the maps you have borders but in space

578
00:25:19,990 --> 00:25:18,640
you have no borders and you have only

579
00:25:22,870 --> 00:25:20,000
natural

580
00:25:25,350 --> 00:25:22,880
rivers mountains beaches

581
00:25:27,830 --> 00:25:25,360
water and forests so you start to

582
00:25:29,029 --> 00:25:27,840
understand that in many cases our

583
00:25:31,269 --> 00:25:29,039
separation

584
00:25:32,630 --> 00:25:31,279
on the earth is more

585
00:25:34,149 --> 00:25:32,640
artificial

586
00:25:36,710 --> 00:25:34,159
naturally we are living in the same

587
00:25:45,510 --> 00:25:36,720
surface so you start to feel that we are

588
00:25:50,470 --> 00:25:47,430

on the ground we live in a different

589

00:25:53,110 --> 00:25:50,480

country with a different view on some

590

00:25:56,390 --> 00:25:53,120

things but being in space we

591

00:25:58,950 --> 00:25:56,400

we all exposed in harsh environment we

592

00:26:00,630 --> 00:25:58,960

all have about the same motivation to go

593

00:26:02,390 --> 00:26:00,640

up and

594

00:26:04,710 --> 00:26:02,400

majority of us and actually i would say

595

00:26:07,110 --> 00:26:04,720

all of us who was in space

596

00:26:09,990 --> 00:26:07,120

start to care about

597

00:26:12,390 --> 00:26:10,000

environment about earth about people on

598

00:26:13,670 --> 00:26:12,400

earth and you start to feel kind of

599

00:26:18,870 --> 00:26:13,680

brotherhood

600

00:26:23,430 --> 00:26:21,750

we live on the same earth with the same

601
00:26:25,909 --> 00:26:23,440
bigger than

602
00:26:28,070 --> 00:26:25,919
station but still spacecraft that are

603
00:26:29,110 --> 00:26:28,080
flying through the space

604
00:26:31,590 --> 00:26:29,120
and

605
00:26:34,230 --> 00:26:31,600
we have joined

606
00:26:36,390 --> 00:26:34,240
problems together environmental

607
00:26:38,470 --> 00:26:36,400
technical

608
00:26:41,190 --> 00:26:38,480
philosophical sometime but we need to

609
00:26:42,230 --> 00:26:41,200
solve these problems together and that's

610
00:26:52,230 --> 00:26:42,240
the best

611
00:26:56,470 --> 00:26:54,390
i think what we do in space what we do

612
00:26:57,510 --> 00:26:56,480
in space together is a good example how

613
00:26:59,110 --> 00:26:57,520

people

614

00:27:00,950 --> 00:26:59,120

need to live on the ground

615

00:27:02,230 --> 00:27:00,960

i know that people sometimes start to

616

00:27:03,909 --> 00:27:02,240

argue with

617

00:27:05,510 --> 00:27:03,919

no good reason for that

618

00:27:06,870 --> 00:27:05,520

but again especially when you're in

619

00:27:09,750 --> 00:27:06,880

harsh environment

620

00:27:12,470 --> 00:27:09,760

you rely on each other you try to help

621

00:27:14,070 --> 00:27:12,480

each other that's how we live in space

622

00:27:16,470 --> 00:27:14,080

and that's probably

623

00:27:19,269 --> 00:27:16,480

can be a good example for for people on

624

00:27:22,070 --> 00:27:19,279

the ground i'm happy that

625

00:27:24,630 --> 00:27:22,080

all this political turbulence doesn't

626

00:27:26,389 --> 00:27:24,640

affect us too much we try to keep this

627

00:27:29,190 --> 00:27:26,399

area protected and

628

00:27:31,669 --> 00:27:29,200

keep this good example to show

629

00:27:33,830 --> 00:27:31,679

maybe politicians and maybe other people

630

00:27:38,350 --> 00:27:33,840

in my country in your country showing

631

00:27:50,310 --> 00:27:38,360

that that's really how we need to live

632

00:27:54,470 --> 00:27:52,149

would you like another look at any of

633

00:27:56,630 --> 00:27:54,480

these stories well you can you can find

634

00:27:58,389 --> 00:27:56,640

them all on youtube and facebook along

635

00:28:00,950 --> 00:27:58,399

with a lot of other great features on a

636

00:28:02,549 --> 00:28:00,960

whole variety of nasa topics and if

637

00:28:04,630 --> 00:28:02,559

you're looking for good conversation

638

00:28:07,190 --> 00:28:04,640

about human space flight check out

639

00:28:09,350 --> 00:28:07,200

houston we have a podcast a weekly show

640

00:28:11,750 --> 00:28:09,360

with interviews about all aspects of

641

00:28:14,470 --> 00:28:11,760

human spaceflight and nasa's missions of

642

00:28:17,190 --> 00:28:14,480

exploration today gary jordan talks with

643

00:28:18,710 --> 00:28:17,200

a scientist working on an experiment now

644

00:28:20,710 --> 00:28:18,720

perched on the outside of the

645

00:28:23,430 --> 00:28:20,720

international space station that is

646

00:28:26,470 --> 00:28:23,440

measuring how the earth breathes

647

00:28:28,870 --> 00:28:26,480

go to nasa.gov podcast for this week's

648

00:28:30,950 --> 00:28:28,880

episode and all the previous episodes

649

00:28:33,029 --> 00:28:30,960

and the full library of all nasa

650

00:28:35,750 --> 00:28:33,039

podcasts which can also be found on

