



1  
00:00:00,580 --> 00:00:06,230

[Music]

2  
00:00:10,709 --> 00:00:08,710

welcome to watch this space i'm nasa

3  
00:00:12,310 --> 00:00:10,719

administrator jim bridenstine and today

4  
00:00:14,230 --> 00:00:12,320

we're going to be talking about a new

5  
00:00:16,550 --> 00:00:14,240

program in fact

6  
00:00:19,189 --> 00:00:16,560

a program that nasa is very proud of we

7  
00:00:21,750 --> 00:00:19,199

are on the brink of launching american

8  
00:00:24,470 --> 00:00:21,760

astronauts on american rockets from

9  
00:00:26,790 --> 00:00:24,480

american soil for the first time since

10  
00:00:29,109 --> 00:00:26,800

2011 the retirements of the space

11  
00:00:30,390 --> 00:00:29,119

shuttles and so this is an exciting time

12  
00:00:32,389 --> 00:00:30,400

we have two

13  
00:00:35,030 --> 00:00:32,399

providers for this new capability we

14

00:00:37,590 --> 00:00:35,040

call it commercial crew the idea being

15

00:00:40,069 --> 00:00:37,600

that nasa is not purchasing owning and

16

00:00:42,549 --> 00:00:40,079

operating its own rockets this time in

17

00:00:45,190 --> 00:00:42,559

fact we're going to buy access to space

18

00:00:48,069 --> 00:00:45,200

in a way that we've never done it before

19

00:00:51,350 --> 00:00:48,079

we helped two partners namely boeing and

20

00:00:54,069 --> 00:00:51,360

spacex develop capability to fly our

21

00:00:56,950 --> 00:00:54,079

astronauts into space with the hopes

22

00:00:58,389 --> 00:00:56,960

that nasa could become one customer of

23

00:01:01,670 --> 00:00:58,399

many customers

24

00:01:03,670 --> 00:01:01,680

driving down our cost of access to space

25

00:01:06,550 --> 00:01:03,680

and having multiple providers and those

26  
00:01:09,350 --> 00:01:06,560  
providers competing on both innovation

27  
00:01:11,350 --> 00:01:09,360  
and cost again giving nasa more

28  
00:01:13,750 --> 00:01:11,360  
opportunity to do more things than we've

29  
00:01:14,630 --> 00:01:13,760  
ever been able to do before and here we

30  
00:01:17,190 --> 00:01:14,640  
are

31  
00:01:19,030 --> 00:01:17,200  
about a year away from sending our first

32  
00:01:21,910 --> 00:01:19,040  
astronauts to the international space

33  
00:01:24,710 --> 00:01:21,920  
station on our commercial crew partners

34  
00:01:26,469 --> 00:01:24,720  
so this is an exciting time for nasa

35  
00:01:29,749 --> 00:01:26,479  
and we are here today with some very

36  
00:01:33,590 --> 00:01:29,759  
special guests in fact these are some of

37  
00:01:36,469 --> 00:01:33,600  
our first pilots on the boeing starliner

38  
00:01:38,870 --> 00:01:36,479

which is a spacecraft that nasa helped

39

00:01:40,390 --> 00:01:38,880

develop that ultimately we'll be taking

40

00:01:42,550 --> 00:01:40,400

our american astronauts to the

41

00:01:44,950 --> 00:01:42,560

international space station so with us

42

00:01:47,190 --> 00:01:44,960

we have chris ferguson who is a

43

00:01:48,550 --> 00:01:47,200

not only a nasa astronaut but he's a

44

00:01:51,350 --> 00:01:48,560

shuttle commander

45

00:01:53,990 --> 00:01:51,360

by trade and in fact he flew uh the last

46

00:01:56,310 --> 00:01:54,000

space shuttle that that we had

47

00:01:58,789 --> 00:01:56,320

fly the space shuttle atlantis back in

48

00:02:00,709 --> 00:01:58,799

2011. and of course we also have sunny

49

00:02:02,230 --> 00:02:00,719

williams who has done a number of

50

00:02:04,870 --> 00:02:02,240

missions to the international space

51  
00:02:07,910 --> 00:02:04,880  
station she's a navy pilot by trade as

52  
00:02:09,749 --> 00:02:07,920  
they they are both navy pilots by trade

53  
00:02:11,350 --> 00:02:09,759  
and in fact they are both from the test

54  
00:02:13,510 --> 00:02:11,360  
community so we're very excited to have

55  
00:02:15,589 --> 00:02:13,520  
you both here and and i'll start with

56  
00:02:17,750 --> 00:02:15,599  
you chris tell me

57  
00:02:20,390 --> 00:02:17,760  
you have been announced as

58  
00:02:23,270 --> 00:02:20,400  
one of the crews for our first flights

59  
00:02:24,869 --> 00:02:23,280  
of the boeing starliner commercial crew

60  
00:02:26,710 --> 00:02:24,879  
spacecraft

61  
00:02:28,390 --> 00:02:26,720  
you were involved in the development of

62  
00:02:30,229 --> 00:02:28,400  
this capability

63  
00:02:32,390 --> 00:02:30,239

tell me what have you been doing since

64  
00:02:35,030 --> 00:02:32,400  
you've been announced as a crew member

65  
00:02:37,509 --> 00:02:35,040  
well my my life has changed slightly

66  
00:02:39,990 --> 00:02:37,519  
i've been involved as you probably know

67  
00:02:41,990 --> 00:02:40,000  
since 2012 in in constructing this

68  
00:02:43,750 --> 00:02:42,000  
shortly after i left nasa uh boeing

69  
00:02:44,790 --> 00:02:43,760  
brought me on to help uh finish the

70  
00:02:46,790 --> 00:02:44,800  
design

71  
00:02:49,350 --> 00:02:46,800  
and and take the the starliner all the

72  
00:02:51,670 --> 00:02:49,360  
way uh to fruition and ultimately into

73  
00:02:53,350 --> 00:02:51,680  
space so uh but in the last couple

74  
00:02:55,589 --> 00:02:53,360  
months uh since i knew i was going to be

75  
00:02:58,229 --> 00:02:55,599  
a part of this mission uh my

76

00:03:00,229 --> 00:02:58,239

uh my trajectory has changed a little

77

00:03:02,630 --> 00:03:00,239

bit i'm a lot more into training and

78

00:03:04,630 --> 00:03:02,640

what it's going to take to get sunny and

79

00:03:06,630 --> 00:03:04,640

the rest of the boeing team up to speed

80

00:03:08,630 --> 00:03:06,640

on how the software works how the crew

81

00:03:10,149 --> 00:03:08,640

interface works how we're going to live

82

00:03:11,589 --> 00:03:10,159

and work in space

83

00:03:12,790 --> 00:03:11,599

it's a it's a brand new vehicle the

84

00:03:14,470 --> 00:03:12,800

first time we've done this it's the

85

00:03:16,869 --> 00:03:14,480

first time we've really brought a new

86

00:03:20,070 --> 00:03:16,879

human-rated spacecraft to launch from

87

00:03:21,990 --> 00:03:20,080

u.s soil online in almost 35 years so

88

00:03:23,350 --> 00:03:22,000

it's an exciting time for us and it's

89

00:03:25,270 --> 00:03:23,360

great to be back into crew training

90

00:03:27,270 --> 00:03:25,280

again i mean there is nothing better

91

00:03:29,750 --> 00:03:27,280

than training with a group of people who

92

00:03:32,550 --> 00:03:29,760

are like-minded and love spacecraft so

93

00:03:36,229 --> 00:03:32,560

tell me this uh each of you have

94

00:03:40,149 --> 00:03:38,229

yet yours says boeing

95

00:03:41,270 --> 00:03:40,159

it doesn't say nasa tell me about that

96

00:03:43,190 --> 00:03:41,280

why is that

97

00:03:44,949 --> 00:03:43,200

so this is this is going to be a first

98

00:03:46,949 --> 00:03:44,959

as you had mentioned

99

00:03:49,589 --> 00:03:46,959

when when when this is all complete and

100

00:03:52,149 --> 00:03:49,599

nasa purchases services to go back and

101  
00:03:53,910 --> 00:03:52,159  
forth to low earth orbit the partner the

102  
00:03:56,229 --> 00:03:53,920  
partner companies that mentioned spacex

103  
00:03:57,750 --> 00:03:56,239  
and boeing will all own the intellectual

104  
00:03:59,990 --> 00:03:57,760  
property that it took to develop this

105  
00:04:00,949 --> 00:04:00,000  
capability with the idea of marketing it

106  
00:04:02,070 --> 00:04:00,959  
elsewhere

107  
00:04:04,229 --> 00:04:02,080  
so

108  
00:04:06,149 --> 00:04:04,239  
if you had to extrapolate this this

109  
00:04:07,670 --> 00:04:06,159  
could perhaps be the beginning of a

110  
00:04:09,509 --> 00:04:07,680  
space line

111  
00:04:11,990 --> 00:04:09,519  
boeing builds many airplanes that they

112  
00:04:13,350 --> 00:04:12,000  
supply to airlines now we look at a

113  
00:04:15,830 --> 00:04:13,360

potential business where we build

114

00:04:17,749 --> 00:04:15,840

spacecraft to provide a transportation

115

00:04:19,909 --> 00:04:17,759

service to low earth orbit for

116

00:04:21,349 --> 00:04:19,919

businesses for perhaps other countries

117

00:04:22,390 --> 00:04:21,359

that are interested in a program of

118

00:04:24,150 --> 00:04:22,400

their own

119

00:04:25,670 --> 00:04:24,160

for tourism is always an option in

120

00:04:28,390 --> 00:04:25,680

addition of course to the prime nasa

121

00:04:30,550 --> 00:04:28,400

customer awesome and sonny tell me about

122

00:04:32,150 --> 00:04:30,560

your a day in the life of sunny since

123

00:04:33,990 --> 00:04:32,160

you've been selected as a commercial

124

00:04:35,830 --> 00:04:34,000

crew partner yeah it's been a little bit

125

00:04:37,030 --> 00:04:35,840

crazy but fun i have to say that

126

00:04:39,430 --> 00:04:37,040

anything you're doing in the space

127

00:04:40,629 --> 00:04:39,440

business is fun um previously there was

128

00:04:43,110 --> 00:04:40,639

four of us who were selected for the

129

00:04:44,870 --> 00:04:43,120

commercial cadre nasa astronauts and we

130

00:04:46,870 --> 00:04:44,880

divided our time between both companies

131

00:04:48,469 --> 00:04:46,880

spacex and boeing and now since the

132

00:04:50,230 --> 00:04:48,479

announcement two of us have come over to

133

00:04:53,189 --> 00:04:50,240

the boeing side and the other two to the

134

00:04:54,550 --> 00:04:53,199

spacex side so we've got to focus our

135

00:04:56,629 --> 00:04:54,560

training and attention on this

136

00:04:59,030 --> 00:04:56,639

spacecraft and not only this training

137

00:05:00,230 --> 00:04:59,040

chris is um underestimating the other

138

00:05:01,990 --> 00:05:00,240

amount of things that we're doing we're

139

00:05:03,110 --> 00:05:02,000

also doing a lot of testing sort of like

140

00:05:04,629 --> 00:05:03,120

he was mentioning this is a new

141

00:05:07,430 --> 00:05:04,639

spacecraft so there's still a lot of

142

00:05:09,029 --> 00:05:07,440

things um to look at inside the cockpit

143

00:05:10,629 --> 00:05:09,039

and how people live in there and how

144

00:05:12,150 --> 00:05:10,639

actually we're going to operate it

145

00:05:14,469 --> 00:05:12,160

that's the next step after the

146

00:05:17,430 --> 00:05:14,479

development so a day in the life of

147

00:05:19,990 --> 00:05:17,440

might be um to get back to your question

148

00:05:22,150 --> 00:05:20,000

is maybe going to the the simulator and

149

00:05:23,510 --> 00:05:22,160

um trying out some manual piloting

150

00:05:25,749 --> 00:05:23,520

techniques which you might get a chance

151  
00:05:27,350 --> 00:05:25,759  
to try in here uh or talking through the

152  
00:05:28,790 --> 00:05:27,360  
procedures and you're telling me in a

153  
00:05:31,270 --> 00:05:28,800  
few minutes we might be able to jump in

154  
00:05:34,469 --> 00:05:31,280  
this thing and uh and give it a whirl

155  
00:05:35,830 --> 00:05:34,479  
i look forward to doing that yes

156  
00:05:38,469 --> 00:05:35,840  
you know what it's like

157  
00:05:40,629 --> 00:05:38,479  
so some of that or maybe it's going into

158  
00:05:42,710 --> 00:05:40,639  
the the static simulator that we have in

159  
00:05:45,189 --> 00:05:42,720  
building 9 and looking at how the

160  
00:05:46,790 --> 00:05:45,199  
cockpit is laid out how the seats are

161  
00:05:48,390 --> 00:05:46,800  
fitted how the hatch is going to open

162  
00:05:49,590 --> 00:05:48,400  
where you're going to position some of

163  
00:05:51,270 --> 00:05:49,600

your stuff

164

00:05:52,710 --> 00:05:51,280

that you stuff you're going to take or

165

00:05:53,990 --> 00:05:52,720

stuff that you might have to change out

166

00:05:56,230 --> 00:05:54,000

like

167

00:05:57,430 --> 00:05:56,240

carbon dioxide removal so there's a

168

00:05:59,749 --> 00:05:57,440

there's a ton of things that we have to

169

00:06:01,270 --> 00:05:59,759

do and we get to do another thing we get

170

00:06:03,110 --> 00:06:01,280

to do sometimes is go down to kennedy

171

00:06:05,029 --> 00:06:03,120

space center you know the launch pad is

172

00:06:06,469 --> 00:06:05,039

there and so we work with the folks that

173

00:06:08,950 --> 00:06:06,479

are working on the launch pad and the

174

00:06:11,430 --> 00:06:08,960

crew access arm and the emergency escape

175

00:06:13,189 --> 00:06:11,440

system so it's a abundance of a lot of

176

00:06:15,830 --> 00:06:13,199

fun things to do so it's it's pretty

177

00:06:17,990 --> 00:06:15,840

crazy but a lot of fun so uh you have

178

00:06:20,629 --> 00:06:18,000

both been involved in the development of

179

00:06:22,309 --> 00:06:20,639

the starliner is that correct at some

180

00:06:24,390 --> 00:06:22,319

level and um

181

00:06:26,629 --> 00:06:24,400

how is it i mean obviously you guys are

182

00:06:29,510 --> 00:06:26,639

both experienced with with space shuttle

183

00:06:30,469 --> 00:06:29,520

flights uh and of course soyuz flights

184

00:06:32,070 --> 00:06:30,479

as well

185

00:06:33,510 --> 00:06:32,080

how is this let's just start with the

186

00:06:35,510 --> 00:06:33,520

space shuttle how is this different than

187

00:06:36,870 --> 00:06:35,520

the space shuttle and why is it designed

188

00:06:39,510 --> 00:06:36,880

so differently chris we'll start with

189

00:06:42,070 --> 00:06:39,520

you so it's a it's a simpler mission um

190

00:06:45,430 --> 00:06:42,080

the space shuttle was uh 14 to 16 days

191

00:06:47,430 --> 00:06:45,440

in space it was like camping really

192

00:06:49,510 --> 00:06:47,440

and it had all the outside the comforts

193

00:06:51,589 --> 00:06:49,520

of home uh this is really sort of a

194

00:06:53,430 --> 00:06:51,599

point mission so we'll launch and dock

195

00:06:56,070 --> 00:06:53,440

with the space station within about 24

196

00:06:58,710 --> 00:06:56,080

hours so uh the sort of the home

197

00:07:01,350 --> 00:06:58,720

creature comforts are really not a part

198

00:07:03,589 --> 00:07:01,360

of the mission um so we'll dock

199

00:07:05,909 --> 00:07:03,599

within 24 hours of launching will stay

200

00:07:07,430 --> 00:07:05,919

docked to provide a capability for the

201  
00:07:09,589 --> 00:07:07,440  
crew to come home quickly if they need

202  
00:07:11,430 --> 00:07:09,599  
to and then after the the crew's

203  
00:07:13,589 --> 00:07:11,440  
increment mission is over uh we'll bring

204  
00:07:16,469 --> 00:07:13,599  
them back and be on the ground within

205  
00:07:18,710 --> 00:07:16,479  
about six hours so we like the space

206  
00:07:20,629 --> 00:07:18,720  
shuttle do land on land uh however we

207  
00:07:22,629 --> 00:07:20,639  
don't do it on wheels we actually have

208  
00:07:24,230 --> 00:07:22,639  
parachutes and we have airbags to

209  
00:07:26,950 --> 00:07:24,240  
cushion the final landing and we'll land

210  
00:07:28,710 --> 00:07:26,960  
in one of five uh selected landing sites

211  
00:07:29,990 --> 00:07:28,720  
in the western united states

212  
00:07:31,510 --> 00:07:30,000  
sunny do you have anything to add about

213  
00:07:33,430 --> 00:07:31,520

how it's different than your space

214

00:07:34,950 --> 00:07:33,440

shuttle flights well chris mentioned how

215

00:07:36,790 --> 00:07:34,960

it is different from shuttle but it's

216

00:07:38,629 --> 00:07:36,800

actually very similar to soyuz in its

217

00:07:39,990 --> 00:07:38,639

mission and what it's supposed to do so

218

00:07:41,589 --> 00:07:40,000

while it's docked to the space station

219

00:07:43,749 --> 00:07:41,599

over that six months time it's also a

220

00:07:45,749 --> 00:07:43,759

lifeboat so the vehicle needs to be

221

00:07:47,510 --> 00:07:45,759

capable to be in space for that long

222

00:07:49,029 --> 00:07:47,520

where whereas the shuttle was only a

223

00:07:50,950 --> 00:07:49,039

couple weeks this is going to be six

224

00:07:52,309 --> 00:07:50,960

months onboard the space station in case

225

00:07:53,830 --> 00:07:52,319

there's any problems while the folks are

226

00:07:55,670 --> 00:07:53,840

living up there they can jump into the

227

00:07:57,990 --> 00:07:55,680

spacecraft and make their way back to

228

00:08:00,150 --> 00:07:58,000

earth and that's a that's a really

229

00:08:01,589 --> 00:08:00,160

needed capability for sustaining people

230

00:08:03,510 --> 00:08:01,599

living on this international space

231

00:08:04,790 --> 00:08:03,520

station it's like the soyuz in its

232

00:08:07,110 --> 00:08:04,800

mission it's a lot different from the

233

00:08:09,350 --> 00:08:07,120

soyuz on the inside of it the soyuz you

234

00:08:11,510 --> 00:08:09,360

know is a heritage vehicle from the

235

00:08:13,189 --> 00:08:11,520

1960s has a lot of upgrades in the

236

00:08:14,629 --> 00:08:13,199

number of years but it's still

237

00:08:16,629 --> 00:08:14,639

maintained that shape

238

00:08:18,710 --> 00:08:16,639

this is a brand new spacecraft design

239

00:08:20,950 --> 00:08:18,720

brand new with new technologies and new

240

00:08:22,950 --> 00:08:20,960

manufacturing techniques to put this and

241

00:08:24,710 --> 00:08:22,960

its rocket together and so it's it's a

242

00:08:26,629 --> 00:08:24,720

big step in technology so it's gonna

243

00:08:28,390 --> 00:08:26,639

it's it's more capable

244

00:08:31,589 --> 00:08:28,400

and it's it's gonna be a little nicer to

245

00:08:33,990 --> 00:08:31,599

fly i think so when um

246

00:08:36,230 --> 00:08:34,000

when these spacecraft are certified the

247

00:08:37,829 --> 00:08:36,240

starliner is fully certified

248

00:08:40,949 --> 00:08:37,839

how many

249

00:08:43,029 --> 00:08:40,959

astronauts and or passengers

250

00:08:44,949 --> 00:08:43,039

would a starliner be able to carry to

251

00:08:47,829 --> 00:08:44,959

the international space station

252

00:08:49,990 --> 00:08:47,839

so right now we can accommodate five

253

00:08:51,350 --> 00:08:50,000

nasa's requirement what they've asked us

254

00:08:52,710 --> 00:08:51,360

for is four

255

00:08:54,150 --> 00:08:52,720

so we can

256

00:08:55,110 --> 00:08:54,160

order and trade on what you want to do

257

00:08:56,949 --> 00:08:55,120

with the fifth seat there's

258

00:08:59,430 --> 00:08:56,959

opportunities out there for like i said

259

00:09:01,190 --> 00:08:59,440

tourism or perhaps business uh if need

260

00:09:03,269 --> 00:09:01,200

be we have actually we built it

261

00:09:05,350 --> 00:09:03,279

originally to accommodate seven and with

262

00:09:07,190 --> 00:09:05,360

uh some minor modifications we could

263

00:09:09,269 --> 00:09:07,200

carry up to seven it really depends on

264

00:09:10,710 --> 00:09:09,279

the destination right now we have one

265

00:09:12,630 --> 00:09:10,720

destination up there the international

266

00:09:14,870 --> 00:09:12,640

space station which is a vibrant and

267

00:09:16,310 --> 00:09:14,880

living place uh we'd really like to see

268

00:09:18,150 --> 00:09:16,320

other destinations in low earth orbit

269

00:09:20,310 --> 00:09:18,160

however perhaps commercial manufacturing

270

00:09:21,829 --> 00:09:20,320

facilities to give us other places to go

271

00:09:24,710 --> 00:09:21,839

absolutely and of course that's a big

272

00:09:26,949 --> 00:09:24,720

piece of why we're doing commercial crew

273

00:09:29,350 --> 00:09:26,959

we want to see in general low earth

274

00:09:31,750 --> 00:09:29,360

orbit be commercialized in a way that

275

00:09:34,310 --> 00:09:31,760

enables nasa to use its resources

276

00:09:36,550 --> 00:09:34,320

enables nasa to use taxpayer resources

277

00:09:38,150 --> 00:09:36,560

to do things in environments for you

278

00:09:40,150 --> 00:09:38,160

know for which there is not yet a

279

00:09:42,470 --> 00:09:40,160

commercial capability right so we want

280

00:09:44,949 --> 00:09:42,480

to use our assets to go to deep space go

281

00:09:46,949 --> 00:09:44,959

to the moon go to mars uh where there is

282

00:09:49,590 --> 00:09:46,959

no commercial capability but in low

283

00:09:51,829 --> 00:09:49,600

earth orbit um you know if if we can get

284

00:09:54,630 --> 00:09:51,839

to a day where boeing can take

285

00:09:57,190 --> 00:09:54,640

passengers and that can help offset the

286

00:09:58,949 --> 00:09:57,200

costs and then not just passengers but

287

00:10:00,230 --> 00:09:58,959

also industry and there's things

288

00:10:02,310 --> 00:10:00,240

happening on the international space

289

00:10:03,829 --> 00:10:02,320

station right now that are amazing and

290

00:10:06,310 --> 00:10:03,839

if we can transition to commercial

291

00:10:07,430 --> 00:10:06,320

operations to to include the idea that

292

00:10:09,430 --> 00:10:07,440

we can use

293

00:10:12,150 --> 00:10:09,440

adult stem cells

294

00:10:14,069 --> 00:10:12,160

uh to create human organs

295

00:10:15,590 --> 00:10:14,079

that can then be used to extend people's

296

00:10:16,949 --> 00:10:15,600

lives i mean that's a capability right

297

00:10:19,110 --> 00:10:16,959

now under development that could be

298

00:10:20,790 --> 00:10:19,120

absolutely game-changing

299

00:10:23,350 --> 00:10:20,800

for the microgravity environment which

300

00:10:25,190 --> 00:10:23,360

is only available in space

301  
00:10:27,590 --> 00:10:25,200  
and if we can if we can commercialize

302  
00:10:29,190 --> 00:10:27,600  
that and so when we talk about taking

303  
00:10:31,430 --> 00:10:29,200  
passengers into space we're talking

304  
00:10:32,550 --> 00:10:31,440  
about taking folks that are scientists

305  
00:10:35,190 --> 00:10:32,560  
that are

306  
00:10:36,870 --> 00:10:35,200  
maybe you know bio engineers people that

307  
00:10:38,310 --> 00:10:36,880  
can do things that are unique and never

308  
00:10:39,910 --> 00:10:38,320  
been done before

309  
00:10:42,550 --> 00:10:39,920  
to commercialize low earth orbit and

310  
00:10:44,389 --> 00:10:42,560  
then we can use nasa's resources to do

311  
00:10:46,150 --> 00:10:44,399  
things that you know commercial isn't

312  
00:10:48,230 --> 00:10:46,160  
ready for yet which is really an amazing

313  
00:10:50,230 --> 00:10:48,240

capability and so we're very excited

314

00:10:52,710 --> 00:10:50,240

about what what boeing is doing and what

315

00:10:55,030 --> 00:10:52,720

starliner is and of course what spacex

316

00:10:58,230 --> 00:10:55,040

is doing with the dragon as well just so

317

00:11:00,069 --> 00:10:58,240

many so many opportunities sunny you uh

318

00:11:01,750 --> 00:11:00,079

tell me how long you've you've spent a

319

00:11:03,350 --> 00:11:01,760

lot of time in space

320

00:11:05,990 --> 00:11:03,360

how much time have you spent in space a

321

00:11:09,509 --> 00:11:06,000

little over 320 days a little over 320

322

00:11:11,509 --> 00:11:09,519

days so this time when you go back

323

00:11:13,350 --> 00:11:11,519

how long are you planning to stay

324

00:11:14,790 --> 00:11:13,360

um probably six months another six

325

00:11:16,310 --> 00:11:14,800

months yeah six months and i hope we get

326

00:11:17,990 --> 00:11:16,320

to fill up the other two seats with some

327

00:11:19,670 --> 00:11:18,000

of our international partners so sort of

328

00:11:21,509 --> 00:11:19,680

like you were talking about and fill out

329

00:11:22,790 --> 00:11:21,519

the compliment to make us seven people

330

00:11:24,790 --> 00:11:22,800

on the international space station like

331

00:11:26,790 --> 00:11:24,800

it was designed for that's amazing get a

332

00:11:29,030 --> 00:11:26,800

lot of work done so when you when you

333

00:11:30,790 --> 00:11:29,040

think about your time that you've spent

334

00:11:31,670 --> 00:11:30,800

in space which is an amazing amount of

335

00:11:34,310 --> 00:11:31,680

time

336

00:11:36,150 --> 00:11:34,320

different

337

00:11:38,389 --> 00:11:36,160

um well like you mentioned right the

338

00:11:40,550 --> 00:11:38,399

international space station is complete

339

00:11:41,590 --> 00:11:40,560

and my last mission it was as well but

340

00:11:43,509 --> 00:11:41,600

this will

341

00:11:44,870 --> 00:11:43,519

be an additional person to be up there

342

00:11:47,190 --> 00:11:44,880

to be working and doing some of the

343

00:11:49,110 --> 00:11:47,200

science that we've been uh that that

344

00:11:50,710 --> 00:11:49,120

station is capable of and i think we're

345

00:11:53,670 --> 00:11:50,720

going to be able to deliver a whole

346

00:11:55,030 --> 00:11:53,680

bunch more stuff um science back to to

347

00:11:57,350 --> 00:11:55,040

earth so i think that's going to be

348

00:11:59,350 --> 00:11:57,360

different and this of course the major

349

00:12:00,870 --> 00:11:59,360

part is the the vehicle that's taken me

350

00:12:03,030 --> 00:12:00,880

up and taken me back is going to be

351  
00:12:04,870 --> 00:12:03,040  
different um it will be docked at a

352  
00:12:06,629 --> 00:12:04,880  
different docking port and the space

353  
00:12:08,470 --> 00:12:06,639  
station has four docking ports in the

354  
00:12:10,389 --> 00:12:08,480  
aft and for the russian vehicles and

355  
00:12:11,910 --> 00:12:10,399  
we'll have two docking ports in the in

356  
00:12:13,350 --> 00:12:11,920  
the forward and for manned vehicles and

357  
00:12:15,829 --> 00:12:13,360  
then two docking ports for cargo

358  
00:12:17,829 --> 00:12:15,839  
vehicles also in the forward end so it's

359  
00:12:19,190 --> 00:12:17,839  
a busy busy space station and it's going

360  
00:12:20,949 --> 00:12:19,200  
to get more busy with all of these

361  
00:12:23,910 --> 00:12:20,959  
vehicles so it's going to be exciting

362  
00:12:26,710 --> 00:12:23,920  
and exciting time so uh so sonny you you

363  
00:12:30,470 --> 00:12:26,720

have had the experience of

364

00:12:31,910 --> 00:12:30,480

landing in a capsule on land before

365

00:12:33,269 --> 00:12:31,920

and now you're gonna do it again and

366

00:12:35,670 --> 00:12:33,279

chris this will be new to you because

367

00:12:37,990 --> 00:12:35,680

you've always landed on wheels

368

00:12:39,590 --> 00:12:38,000

which of course was very very nice but

369

00:12:41,350 --> 00:12:39,600

in this particular case

370

00:12:44,629 --> 00:12:41,360

you're you're gonna both are you're

371

00:12:47,430 --> 00:12:44,639

gonna land on land without wheels um

372

00:12:49,110 --> 00:12:47,440

don't be afraid yeah still it'll work

373

00:12:51,829 --> 00:12:49,120

share with me what what is the

374

00:12:54,470 --> 00:12:51,839

experience like uh and and uh what is

375

00:12:56,710 --> 00:12:54,480

the process yeah so um i could talk to

376

00:12:57,750 --> 00:12:56,720

soyuz i can sort of talk to starliner

377

00:12:59,350 --> 00:12:57,760

maybe i'll let chris talk a little bit

378

00:13:01,190 --> 00:12:59,360

more about it but it's a bunch of

379

00:13:03,750 --> 00:13:01,200

controlled explosions as you're coming

380

00:13:05,190 --> 00:13:03,760

back into earth orbit and then landing

381

00:13:06,949 --> 00:13:05,200

um of course you have to slow down a

382

00:13:08,629 --> 00:13:06,959

little bit so the vehicle will turn

383

00:13:10,710 --> 00:13:08,639

itself so it can slow down and start

384

00:13:12,710 --> 00:13:10,720

entering the atmosphere

385

00:13:14,310 --> 00:13:12,720

after that um

386

00:13:15,750 --> 00:13:14,320

or before depends on the vehicle you're

387

00:13:17,350 --> 00:13:15,760

going to get rid of parts of the

388

00:13:19,350 --> 00:13:17,360

spacecraft because you want the the

389

00:13:21,030 --> 00:13:19,360

descent module to be the the key place

390

00:13:22,949 --> 00:13:21,040

that's carrying you and holding you and

391

00:13:24,870 --> 00:13:22,959

bringing you back safe and so the

392

00:13:26,310 --> 00:13:24,880

explosions in the soyuz go on above you

393

00:13:28,230 --> 00:13:26,320

and below you and you can feel it you

394

00:13:29,509 --> 00:13:28,240

can hear it it's pretty dynamic you're

395

00:13:31,030 --> 00:13:29,519

happy when it happens because that's

396

00:13:32,230 --> 00:13:31,040

what's supposed to happen

397

00:13:33,670 --> 00:13:32,240

the next thing

398

00:13:35,990 --> 00:13:33,680

we have a nice big window in this

399

00:13:38,389 --> 00:13:36,000

vehicle also we had a couple windows in

400

00:13:39,829 --> 00:13:38,399

the soyuz you can see the plasma right

401  
00:13:41,350 --> 00:13:39,839  
next to your head in the soyuz when

402  
00:13:43,110 --> 00:13:41,360  
you're on the left seat it's right here

403  
00:13:44,870 --> 00:13:43,120  
and it's pretty shocking to see it's

404  
00:13:46,790 --> 00:13:44,880  
only a couple inches away from your head

405  
00:13:48,310 --> 00:13:46,800  
but we have trust in these spacecraft

406  
00:13:49,590 --> 00:13:48,320  
this one will be the same and we will

407  
00:13:51,910 --> 00:13:49,600  
probably be able to see it from in the

408  
00:13:53,590 --> 00:13:51,920  
big window here and then as you finally

409  
00:13:54,870 --> 00:13:53,600  
as you slow down then the parachute

410  
00:13:56,310 --> 00:13:54,880  
opens up

411  
00:13:58,230 --> 00:13:56,320  
for starlander there's a couple other

412  
00:14:00,550 --> 00:13:58,240  
little explosions too to make sure that

413  
00:14:03,189 --> 00:14:00,560

the parachute cover is off and then the

414

00:14:05,030 --> 00:14:03,199

parachute can come out and you are in

415

00:14:07,030 --> 00:14:05,040

this capsule at the end of the parachute

416

00:14:09,269 --> 00:14:07,040

and of course it's ripping out just like

417

00:14:11,110 --> 00:14:09,279

a normal parachute would and that tends

418

00:14:13,030 --> 00:14:11,120

to make the vehicle move around quite a

419

00:14:14,790 --> 00:14:13,040

bit so you're nice and tight in your

420

00:14:16,230 --> 00:14:14,800

seat as you're coming in you're getting

421

00:14:17,269 --> 00:14:16,240

feeling gravity you want to pull your

422

00:14:19,269 --> 00:14:17,279

straps pretty good because you're going

423

00:14:20,629 --> 00:14:19,279

to be bouncing around quite a bit just

424

00:14:22,150 --> 00:14:20,639

on the parachute and then once it

425

00:14:23,829 --> 00:14:22,160

settles down

426

00:14:24,790 --> 00:14:23,839

don't stick your tooth your tongue out

427

00:14:26,870 --> 00:14:24,800

between your teeth because you're going

428

00:14:28,710 --> 00:14:26,880

to be ready for that that landing and

429

00:14:30,870 --> 00:14:28,720

the landing for starliner is going to be

430

00:14:31,910 --> 00:14:30,880

on some airbags on the russian vehicle

431

00:14:33,910 --> 00:14:31,920

there's a couple different things that

432

00:14:35,590 --> 00:14:33,920

they did the seat stroked and then there

433

00:14:37,189 --> 00:14:35,600

were soft landing jets that fired right

434

00:14:39,350 --> 00:14:37,199

before landing here we'll have the

435

00:14:40,629 --> 00:14:39,360

airbags come open and then we'll know

436

00:14:42,389 --> 00:14:40,639

we're pretty close to the ground get

437

00:14:44,230 --> 00:14:42,399

ready just sort of get in your seat and

438

00:14:45,910 --> 00:14:44,240

huddle down get ready so when i watch

439

00:14:48,949 --> 00:14:45,920

we'll be okay

440

00:14:51,750 --> 00:14:48,959

when i watch a soyuz capsule return

441

00:14:53,750 --> 00:14:51,760

uh that last burst that last rocket fire

442

00:14:57,189 --> 00:14:53,760

right before it touches down

443

00:14:58,790 --> 00:14:57,199

um i've seen it start fires oh yeah

444

00:15:00,550 --> 00:14:58,800

and of course if if you're not used to

445

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

seeing it it's pretty startling you

446

00:15:04,710 --> 00:15:02,240

think something went wrong but in in

447

00:15:06,230 --> 00:15:04,720

fact it's it's supposed to happen right

448

00:15:09,750 --> 00:15:06,240

in this particular case there's going to

449

00:15:10,710 --> 00:15:09,760

be airbags rather than a rocket burst is

450

00:15:13,430 --> 00:15:10,720

that right

451  
00:15:15,350 --> 00:15:13,440  
so the idea of starting a fire goes down

452  
00:15:17,430 --> 00:15:15,360  
i hope so so if we see a fire now

453  
00:15:19,509 --> 00:15:17,440  
something's been something's gone wrong

454  
00:15:21,910 --> 00:15:19,519  
we always all of our landing sites are

455  
00:15:22,710 --> 00:15:21,920  
dry lake beds so there's very little to

456  
00:15:24,710 --> 00:15:22,720  
burn

457  
00:15:25,430 --> 00:15:24,720  
but at the same time you had mentioned

458  
00:15:27,829 --> 00:15:25,440  
air

459  
00:15:29,829 --> 00:15:27,839  
uh what we do at about 3000 feet off the

460  
00:15:31,590 --> 00:15:29,839  
ground is we jettison the heat shield

461  
00:15:33,430 --> 00:15:31,600  
that just protected us from the heat of

462  
00:15:35,030 --> 00:15:33,440  
reentry so hold on right there because

463  
00:15:36,870 --> 00:15:35,040

she mentioned the plasma you were able

464

00:15:38,949 --> 00:15:36,880

to see the plasma when you talk about

465

00:15:41,670 --> 00:15:38,959

plasma you're talking about

466

00:15:43,269 --> 00:15:41,680

subatomic particles that have come off

467

00:15:45,269 --> 00:15:43,279

of that heat shield is that right which

468

00:15:47,990 --> 00:15:45,279

is ultimately what protects the

469

00:15:50,150 --> 00:15:48,000

astronauts inside so that they call it

470

00:15:51,509 --> 00:15:50,160

an ablative heat shield in other words

471

00:15:53,430 --> 00:15:51,519

the heat shield

472

00:15:55,509 --> 00:15:53,440

is not it's intended

473

00:15:57,590 --> 00:15:55,519

um to not not come apart but it's

474

00:15:59,670 --> 00:15:57,600

intended to to shed

475

00:16:00,790 --> 00:15:59,680

to burn off its skin

476

00:16:02,710 --> 00:16:00,800

and then that

477

00:16:04,710 --> 00:16:02,720

that skin ultimately protects you from

478

00:16:06,389 --> 00:16:04,720

heat and friction and ultimately

479

00:16:07,389 --> 00:16:06,399

crushing the capsule is that right right

480

00:16:09,749 --> 00:16:07,399

it's about

481

00:16:11,829 --> 00:16:09,759

2500 degrees give or take a couple

482

00:16:14,150 --> 00:16:11,839

hundred degrees but it it is you

483

00:16:16,069 --> 00:16:14,160

mentioned the plasma it is uh we have a

484

00:16:18,710 --> 00:16:16,079

a vehicle that's traveling about five

485

00:16:20,470 --> 00:16:18,720

miles per second and you literally slam

486

00:16:22,550 --> 00:16:20,480

into the atmosphere and when you do that

487

00:16:24,790 --> 00:16:22,560

you take those air molecules that were

488

00:16:27,430 --> 00:16:24,800

formerly things like nitrogen gas and

489

00:16:29,030 --> 00:16:27,440

oxygen and and you disassociate them and

490

00:16:31,030 --> 00:16:29,040

you turn them into just

491

00:16:33,030 --> 00:16:31,040

it's plasma gas it's just sort of free

492

00:16:35,189 --> 00:16:33,040

atoms yeah and they they rapidly

493

00:16:36,710 --> 00:16:35,199

disassociate and they create heat that

494

00:16:38,949 --> 00:16:36,720

heat is carried away by the ablative

495

00:16:40,470 --> 00:16:38,959

heat shield and then they reassociate uh

496

00:16:42,470 --> 00:16:40,480

back over the vehicle it's really an

497

00:16:45,030 --> 00:16:42,480

amazing process but you have you do have

498

00:16:46,710 --> 00:16:45,040

that thermal protection beneath you but

499

00:16:48,470 --> 00:16:46,720

once you get down below about a hundred

500

00:16:50,790 --> 00:16:48,480

thousand feet of altitude uh you won't

501  
00:16:52,310 --> 00:16:50,800  
need it anymore it's cool enough and as

502  
00:16:54,230 --> 00:16:52,320  
i mentioned we'll eventually jettison

503  
00:16:56,470 --> 00:16:54,240  
that heat shield to expose those airbags

504  
00:16:57,430 --> 00:16:56,480  
that will cushion our final landing so

505  
00:16:59,430 --> 00:16:57,440  
how do you

506  
00:17:01,910 --> 00:16:59,440  
when you say jettison is it is it uh

507  
00:17:04,630 --> 00:17:01,920  
burst off by rockets uh there's actually

508  
00:17:05,909 --> 00:17:04,640  
uh six explosive bolts so sonny had

509  
00:17:08,069 --> 00:17:05,919  
mentioned there's plenty of explosive

510  
00:17:09,990 --> 00:17:08,079  
devices that occur on the way down uh

511  
00:17:12,069 --> 00:17:10,000  
it's going to be a cacophony and it's

512  
00:17:14,470 --> 00:17:12,079  
going to sound like uh like a

513  
00:17:16,069 --> 00:17:14,480

you know the 1812 overture i'm sure for

514

00:17:18,069 --> 00:17:16,079

a period of time there

515

00:17:20,230 --> 00:17:18,079

but there are six bolts that hold both

516

00:17:22,870 --> 00:17:20,240

the service module the the bottom part

517

00:17:24,470 --> 00:17:22,880

that we need on orbit to the crew module

518

00:17:26,069 --> 00:17:24,480

we'll jettison that before we de-orbit

519

00:17:27,669 --> 00:17:26,079

and then finally there's six more bolts

520

00:17:30,070 --> 00:17:27,679

that will release the base heat shield

521

00:17:32,230 --> 00:17:30,080

as we get close to the ground awesome

522

00:17:35,029 --> 00:17:32,240

so um the other day i had the

523

00:17:37,669 --> 00:17:35,039

opportunity to to go out to huntsville

524

00:17:39,270 --> 00:17:37,679

and i was able to see the components for

525

00:17:41,190 --> 00:17:39,280

the space launch system which of course

526  
00:17:43,510 --> 00:17:41,200  
is our deep space rocket

527  
00:17:45,510 --> 00:17:43,520  
um and i was fascinated and of course

528  
00:17:46,630 --> 00:17:45,520  
both of you are involved in

529  
00:17:48,789 --> 00:17:46,640  
being a

530  
00:17:51,590 --> 00:17:48,799  
test for the united states navy

531  
00:17:53,909 --> 00:17:51,600  
i was fascinated with how the technology

532  
00:17:56,150 --> 00:17:53,919  
for avionics ultimately compares to that

533  
00:17:58,070 --> 00:17:56,160  
of an aircraft there's there's an

534  
00:18:00,549 --> 00:17:58,080  
inertial navigation system that's on

535  
00:18:02,470 --> 00:18:00,559  
board and it's constantly measuring

536  
00:18:04,549 --> 00:18:02,480  
tiny little movements and so your

537  
00:18:07,110 --> 00:18:04,559  
aircraft in this case in in this case

538  
00:18:09,110 --> 00:18:07,120

your spacecraft or your rocket

539

00:18:11,750 --> 00:18:09,120

always knows where it is latitude

540

00:18:14,710 --> 00:18:11,760

longitude altitude yaw pitch roll

541

00:18:16,789 --> 00:18:14,720

trajectory velocity all of this data

542

00:18:17,990 --> 00:18:16,799

is being collected real time

543

00:18:21,029 --> 00:18:18,000

and then it and then your your

544

00:18:23,270 --> 00:18:21,039

spacecraft or your rocket is comparing

545

00:18:24,710 --> 00:18:23,280

all of that data to where your rocket

546

00:18:26,710 --> 00:18:24,720

actually should be

547

00:18:28,390 --> 00:18:26,720

so if there is a difference in where it

548

00:18:30,549 --> 00:18:28,400

is and where it should be

549

00:18:31,669 --> 00:18:30,559

it then creates a solution to that

550

00:18:33,510 --> 00:18:31,679

difference

551  
00:18:35,590 --> 00:18:33,520  
and maneuvers the rocket nozzles to get

552  
00:18:37,029 --> 00:18:35,600  
the rocket headed the right direction or

553  
00:18:39,110 --> 00:18:37,039  
the spacecraft headed the right

554  
00:18:42,630 --> 00:18:39,120  
direction

555  
00:18:43,990 --> 00:18:42,640  
and and seeing how it all relates to

556  
00:18:45,110 --> 00:18:44,000  
you know these are the same type of

557  
00:18:47,029 --> 00:18:45,120  
things when you think about what an

558  
00:18:48,470 --> 00:18:47,039  
autopilot is on an airplane

559  
00:18:49,830 --> 00:18:48,480  
it's all the same kind of technique

560  
00:18:51,669 --> 00:18:49,840  
you've got flight control computers

561  
00:18:54,310 --> 00:18:51,679  
there's redundancy built in

562  
00:18:55,590 --> 00:18:54,320  
so share with me and and really for the

563  
00:18:58,230 --> 00:18:55,600

audience

564

00:18:59,669 --> 00:18:58,240

how has uh flying test

565

00:19:01,350 --> 00:18:59,679

in the navy

566

00:19:03,270 --> 00:19:01,360

ultimately prepared me for this when i

567

00:19:05,510 --> 00:19:03,280

was i'm a navy pilot by trade i'm not a

568

00:19:07,909 --> 00:19:05,520

test pilot but a navy pilot by trade and

569

00:19:10,150 --> 00:19:07,919

i was astonished at how similar

570

00:19:12,070 --> 00:19:10,160

the technology is so so share with us

571

00:19:13,669 --> 00:19:12,080

you know your view on on how you were

572

00:19:15,510 --> 00:19:13,679

prepared and trained and

573

00:19:16,789 --> 00:19:15,520

you know how it relates so you know i

574

00:19:18,870 --> 00:19:16,799

think the first thing is to design a

575

00:19:20,549 --> 00:19:18,880

good test you know make sure that the

576

00:19:21,830 --> 00:19:20,559

the intent of the test accomplishes what

577

00:19:23,110 --> 00:19:21,840

you need and you know what a new

578

00:19:25,430 --> 00:19:23,120

astronauts need in space they need a

579

00:19:27,270 --> 00:19:25,440

vehicle that's safe that holds the air

580

00:19:29,350 --> 00:19:27,280

that gets it from point a to point b

581

00:19:32,070 --> 00:19:29,360

that knows where it is all the time that

582

00:19:33,750 --> 00:19:32,080

has a system of uh flight management and

583

00:19:35,669 --> 00:19:33,760

systems management computers that can

584

00:19:38,230 --> 00:19:35,679

help the pilot along the way

585

00:19:39,830 --> 00:19:38,240

and and we mentioned sort of the the the

586

00:19:42,150 --> 00:19:39,840

comparison between older and newer

587

00:19:43,830 --> 00:19:42,160

spacecraft newer spacecraft are designed

588

00:19:46,150 --> 00:19:43,840

to be completely autonomous a matter of

589

00:19:48,789 --> 00:19:46,160

fact that is one of our requirements

590

00:19:50,710 --> 00:19:48,799

that we work to so the astronaut is

591

00:19:53,110 --> 00:19:50,720

really a systems monitor

592

00:19:55,029 --> 00:19:53,120

so it sort of has turned the test pilot

593

00:19:57,270 --> 00:19:55,039

role into more of a

594

00:19:58,630 --> 00:19:57,280

i i need to watch everything make sure

595

00:20:00,230 --> 00:19:58,640

it's doing what it's supposed to do and

596

00:20:03,029 --> 00:20:00,240

if i need to intervene i can but

597

00:20:05,430 --> 00:20:03,039

generally i don't anticipate doing so

598

00:20:07,909 --> 00:20:05,440

so i mentioned within 24 hours with very

599

00:20:09,750 --> 00:20:07,919

little pilot intervention uh we expect

600

00:20:12,310 --> 00:20:09,760

to see our vehicle dock and it can fly

601  
00:20:15,110 --> 00:20:12,320  
with a crew or without a crew

602  
00:20:16,549 --> 00:20:15,120  
so test has changed quite a bit but you

603  
00:20:18,950 --> 00:20:16,559  
know a lot of it's still the same is the

604  
00:20:20,710 --> 00:20:18,960  
vehicle safe does it sustain human life

605  
00:20:21,909 --> 00:20:20,720  
does it get me where i need to be you

606  
00:20:25,029 --> 00:20:21,919  
know does it does it give me the

607  
00:20:26,549 --> 00:20:25,039  
situational awareness i need so i know

608  
00:20:29,190 --> 00:20:26,559  
where i am and i don't inadvertently

609  
00:20:30,630 --> 00:20:29,200  
take over manually so in this particular

610  
00:20:32,149 --> 00:20:30,640  
case we're gonna we're gonna get in the

611  
00:20:34,390 --> 00:20:32,159  
spacecraft here in a few minutes and

612  
00:20:36,710 --> 00:20:34,400  
we're gonna we're gonna fly it um are we

613  
00:20:38,070 --> 00:20:36,720

gonna dock it we are we're you're going

614

00:20:39,990 --> 00:20:38,080

to dock i'm going to dock you're going

615

00:20:41,590 --> 00:20:40,000

to doug now

616

00:20:44,070 --> 00:20:41,600

if we were to dock

617

00:20:46,070 --> 00:20:44,080

in real life um would it be automated or

618

00:20:48,710 --> 00:20:46,080

would it be manually flown

619

00:20:51,350 --> 00:20:48,720

uh yes we could do both the design is is

620

00:20:53,190 --> 00:20:51,360

automation uh but you mentioned about

621

00:20:55,270 --> 00:20:53,200

guidance navigation and control do i

622

00:20:57,110 --> 00:20:55,280

know exactly where i am one of the what

623

00:20:59,270 --> 00:20:57,120

i always think is a miraculous thing of

624

00:21:00,549 --> 00:20:59,280

space flight is the ability of our

625

00:21:03,029 --> 00:21:00,559

sensors

626  
00:21:05,029 --> 00:21:03,039  
to take vehicles that are traveling five

627  
00:21:06,230 --> 00:21:05,039  
miles per second relative to one another

628  
00:21:08,310 --> 00:21:06,240  
and when they bring them together at

629  
00:21:10,070 --> 00:21:08,320  
docking they're traveling

630  
00:21:12,070 --> 00:21:10,080  
relative to one another of about two

631  
00:21:14,070 --> 00:21:12,080  
inches per second and that is all

632  
00:21:15,990 --> 00:21:14,080  
through just a series of small orbital

633  
00:21:17,350 --> 00:21:16,000  
burns but we can bring it in for a

634  
00:21:19,110 --> 00:21:17,360  
manual approach which is what you're

635  
00:21:21,029 --> 00:21:19,120  
going to get to try here shortly or we

636  
00:21:22,789 --> 00:21:21,039  
can give it i'm sure i'll rock it we can

637  
00:21:24,470 --> 00:21:22,799  
give it to hal and let hal fly it i'm

638  
00:21:26,310 --> 00:21:24,480

sure you'll rock it as well

639

00:21:28,070 --> 00:21:26,320

i would imagine as you guys go through

640

00:21:29,510 --> 00:21:28,080

training sonny

641

00:21:31,430 --> 00:21:29,520

while there is a lot of automation you

642

00:21:33,190 --> 00:21:31,440

you don't train for the automation you

643

00:21:35,350 --> 00:21:33,200

train for something else right and and

644

00:21:37,590 --> 00:21:35,360

part of that uh that whole getting the

645

00:21:39,190 --> 00:21:37,600

autopilot ready to work not only just

646

00:21:40,630 --> 00:21:39,200

flying but how the whole system works

647

00:21:42,149 --> 00:21:40,640

other sensors it's turning on other

648

00:21:45,190 --> 00:21:42,159

systems is turning on when it needs to

649

00:21:47,190 --> 00:21:45,200

turn on for heating cooling air

650

00:21:48,549 --> 00:21:47,200

carbon dioxide removal all of that we

651  
00:21:49,990 --> 00:21:48,559  
have to ask the right questions to make

652  
00:21:51,750 --> 00:21:50,000  
sure that autopilot does the right

653  
00:21:54,630 --> 00:21:51,760  
things i think that's that's a big part

654  
00:21:56,870 --> 00:21:54,640  
of it and you know nasa came in a little

655  
00:21:58,549 --> 00:21:56,880  
while after boeing started designing the

656  
00:22:00,230 --> 00:21:58,559  
spacecraft and our role as the cadre i

657  
00:22:01,750 --> 00:22:00,240  
was mentioning beforehand was to come in

658  
00:22:03,669 --> 00:22:01,760  
and start asking all those questions so

659  
00:22:05,270 --> 00:22:03,679  
how does it do this how does it do this

660  
00:22:07,110 --> 00:22:05,280  
and that the things that we would expect

661  
00:22:08,470 --> 00:22:07,120  
a spacecraft to do and you know some of

662  
00:22:09,669 --> 00:22:08,480  
these things in both companies are a

663  
00:22:11,510 --> 00:22:09,679

little bit different than the way we've

664

00:22:12,789 --> 00:22:11,520

done them in the past and that's good

665

00:22:14,149 --> 00:22:12,799

because that means it's an advancement

666

00:22:16,070 --> 00:22:14,159

in technology

667

00:22:17,830 --> 00:22:16,080

but you know we all train for also the

668

00:22:19,669 --> 00:22:17,840

backup plan so when something doesn't

669

00:22:20,950 --> 00:22:19,679

work by the automation how do you

670

00:22:22,630 --> 00:22:20,960

recognize that chris mentioned

671

00:22:24,230 --> 00:22:22,640

situational awareness so make sure you

672

00:22:26,310 --> 00:22:24,240

have good situational awareness and know

673

00:22:27,830 --> 00:22:26,320

how to automatically take over um to

674

00:22:30,630 --> 00:22:27,840

keep the crew and the in the vehicle

675

00:22:32,789 --> 00:22:30,640

safe that's that's amazing now uh when

676

00:22:34,549 --> 00:22:32,799

we walked in here we walked through an

677

00:22:35,750 --> 00:22:34,559

area where there were people sitting at

678

00:22:37,430 --> 00:22:35,760

computers

679

00:22:39,909 --> 00:22:37,440

and you mentioned that that this

680

00:22:42,630 --> 00:22:39,919

particular group of people were they

681

00:22:45,750 --> 00:22:42,640

they were by definition evil i think

682

00:22:47,669 --> 00:22:45,760

is the word that you use share with me

683

00:22:49,510 --> 00:22:47,679

tell me why that is what and i know

684

00:22:51,029 --> 00:22:49,520

you're just kidding but what what is

685

00:22:52,710 --> 00:22:51,039

that all about they are not evil they

686

00:22:54,710 --> 00:22:52,720

are wonderful people who are dedicated

687

00:22:56,789 --> 00:22:54,720

to the success of every space flight and

688

00:22:58,470 --> 00:22:56,799

uh you know astronauts may be the most

689

00:23:00,630 --> 00:22:58,480

visible part of the space program but

690

00:23:02,149 --> 00:23:00,640

really um you know to point a phrase

691

00:23:03,750 --> 00:23:02,159

we're standing on the shoulders of a lot

692

00:23:05,750 --> 00:23:03,760

of people who really make this happen

693

00:23:08,070 --> 00:23:05,760

day in and day out and not the least of

694

00:23:09,669 --> 00:23:08,080

which is the mission operations team who

695

00:23:11,669 --> 00:23:09,679

actually plan the mission to make sure

696

00:23:14,070 --> 00:23:11,679

we have all the consumables to execute

697

00:23:15,510 --> 00:23:14,080

it as the way we intend to the ones that

698

00:23:17,909 --> 00:23:15,520

train us to make sure that we know how

699

00:23:20,470 --> 00:23:17,919

to respond appropriately to uh to the

700

00:23:21,909 --> 00:23:20,480

malfunctions that occur and some of the

701  
00:23:23,190 --> 00:23:21,919  
veterans that you saw back there had

702  
00:23:25,029 --> 00:23:23,200  
been with us in the space shuttle

703  
00:23:26,950 --> 00:23:25,039  
program it's great to see them back for

704  
00:23:28,310 --> 00:23:26,960  
the you know phase two of you know

705  
00:23:31,190 --> 00:23:28,320  
what's human space flight going to look

706  
00:23:32,390 --> 00:23:31,200  
in the 2020s and um you know

707  
00:23:34,830 --> 00:23:32,400  
and one of them i'll even mention my

708  
00:23:37,190 --> 00:23:34,840  
name susan crippen has just been

709  
00:23:39,310 --> 00:23:37,200  
fantastic she uh she taught space

710  
00:23:41,750 --> 00:23:39,320  
shuttle pilots how to fly

711  
00:23:44,390 --> 00:23:41,760  
aborted missions in the space shuttle

712  
00:23:46,710 --> 00:23:44,400  
something we hoped we never had to do

713  
00:23:49,029 --> 00:23:46,720

and and every time susan walked into a

714

00:23:52,149 --> 00:23:49,039

room and she's this diminutive wonderful

715

00:23:54,310 --> 00:23:52,159

person she made the most macho astronaut

716

00:23:56,070 --> 00:23:54,320

shutter because he knew he was in for a

717

00:23:57,350 --> 00:23:56,080

hard day yeah and she's working as a

718

00:23:59,350 --> 00:23:57,360

part of our team today and it's just

719

00:24:00,950 --> 00:23:59,360

great so what they do there in that room

720

00:24:02,710 --> 00:24:00,960

is they'll they'll start the simulation

721

00:24:04,630 --> 00:24:02,720

for us not only us but also mission

722

00:24:06,870 --> 00:24:04,640

control so it's a quiz sort of for us

723

00:24:08,950 --> 00:24:06,880

and them and they'll put in malfunctions

724

00:24:10,710 --> 00:24:08,960

like something broke up in space one of

725

00:24:12,390 --> 00:24:10,720

the boxes some of the computer something

726

00:24:14,310 --> 00:24:12,400

broke and we have to figure out how to

727

00:24:16,549 --> 00:24:14,320

handle that how to continue the mission

728

00:24:18,710 --> 00:24:16,559

whether or not we take it offline or try

729

00:24:20,950 --> 00:24:18,720

to put it back in the in the set

730

00:24:23,350 --> 00:24:20,960

we work with mission control and they

731

00:24:25,269 --> 00:24:23,360

analyze us and evaluate us and see how

732

00:24:27,269 --> 00:24:25,279

we do all together and we do this we'll

733

00:24:29,110 --> 00:24:27,279

do this a lot and right now it's in the

734

00:24:30,549 --> 00:24:29,120

in the infancy the growing process as

735

00:24:32,710 --> 00:24:30,559

we're actually learning how all the

736

00:24:35,269 --> 00:24:32,720

software works but once we figure that

737

00:24:37,110 --> 00:24:35,279

all out those guys will be coming up

738

00:24:38,549 --> 00:24:37,120

with evil scenarios that stick in there

739

00:24:40,149 --> 00:24:38,559

that will make it very hard but those

740

00:24:41,750 --> 00:24:40,159

are those taxing scenarios that we all

741

00:24:43,590 --> 00:24:41,760

need to do so we understand the vehicle

742

00:24:45,909 --> 00:24:43,600

inside and out and to be prepared and to

743

00:24:48,149 --> 00:24:45,919

be prepared yep i uh a good friend of

744

00:24:50,549 --> 00:24:48,159

mine is another naval aviator john

745

00:24:52,549 --> 00:24:50,559

harrington uh first native american in

746

00:24:54,950 --> 00:24:52,559

space uh and of course from the great

747

00:24:56,789 --> 00:24:54,960

state of oklahoma which is my home

748

00:24:59,269 --> 00:24:56,799

so i used to run the tulsa air and space

749

00:25:01,190 --> 00:24:59,279

museum and uh he was very helpful to me

750

00:25:02,950 --> 00:25:01,200

in those in those days and

751  
00:25:05,269 --> 00:25:02,960  
one day he was talking to me about his

752  
00:25:06,630 --> 00:25:05,279  
his shuttle flight and and he said you

753  
00:25:08,149 --> 00:25:06,640  
know it was amazing because they had

754  
00:25:09,590 --> 00:25:08,159  
done all of this training for all of

755  
00:25:10,470 --> 00:25:09,600  
this time getting ready for the shuttle

756  
00:25:12,549 --> 00:25:10,480  
flight

757  
00:25:14,390 --> 00:25:12,559  
and then on the day of launch

758  
00:25:16,149 --> 00:25:14,400  
nothing went wrong

759  
00:25:18,230 --> 00:25:16,159  
and he said it was it was it was a

760  
00:25:19,830 --> 00:25:18,240  
little nerve-wracking because you expect

761  
00:25:21,029 --> 00:25:19,840  
something you got to be doing something

762  
00:25:23,750 --> 00:25:21,039  
you got to be busy and he said nothing

763  
00:25:25,430 --> 00:25:23,760

went wrong which means that

764

00:25:26,950 --> 00:25:25,440

obviously you guys are well prepared

765

00:25:29,350 --> 00:25:26,960

you've got a great crew of course we've

766

00:25:31,350 --> 00:25:29,360

got amazing engineers and scientists

767

00:25:33,990 --> 00:25:31,360

that are making it all come together

768

00:25:36,070 --> 00:25:34,000

and we're just so proud of you we're so

769

00:25:38,470 --> 00:25:36,080

grateful for your willing to step up in

770

00:25:41,110 --> 00:25:38,480

this new capacity after all both of you

771

00:25:42,710 --> 00:25:41,120

and all of the others have already done

772

00:25:44,789 --> 00:25:42,720

and of course this represents a great

773

00:25:47,830 --> 00:25:44,799

capability for the united states a lot

774

00:25:52,230 --> 00:25:49,909

launch is now an export for the united

775

00:25:53,909 --> 00:25:52,240

states it was only about five years ago

776

00:25:55,990 --> 00:25:53,919

we didn't have really any launch

777

00:25:58,549 --> 00:25:56,000

capability and now not only do we have

778

00:26:00,470 --> 00:25:58,559

domestic launch capability we have

779

00:26:01,990 --> 00:26:00,480

launch capabilities that we export to

780

00:26:03,830 --> 00:26:02,000

the rest of the world

781

00:26:06,070 --> 00:26:03,840

which uh you know

782

00:26:07,269 --> 00:26:06,080

it offsets the trade balance for our

783

00:26:09,350 --> 00:26:07,279

country

784

00:26:11,750 --> 00:26:09,360

and a lot of it is because of our

785

00:26:13,669 --> 00:26:11,760

development with commercial resupply to

786

00:26:15,750 --> 00:26:13,679

the international space station and

787

00:26:17,750 --> 00:26:15,760

getting those other customers on board

788

00:26:20,149 --> 00:26:17,760

for those specific rockets and

789

00:26:21,430 --> 00:26:20,159

spacecraft and and now we're going to go

790

00:26:23,590 --> 00:26:21,440

to the next step and it's not just

791

00:26:25,190 --> 00:26:23,600

resupply but it's commercial crew

792

00:26:27,029 --> 00:26:25,200

and uh and and

793

00:26:29,190 --> 00:26:27,039

and the two of you and so many others

794

00:26:31,430 --> 00:26:29,200

are involved in making this really an

795

00:26:32,870 --> 00:26:31,440

amazing capability for our country and

796

00:26:34,470 --> 00:26:32,880

it's not just about science and

797

00:26:37,830 --> 00:26:34,480

technology it's about

798

00:26:39,909 --> 00:26:37,840

um the american economy and exports and

799

00:26:41,510 --> 00:26:39,919

making available space to more people

800

00:26:42,549 --> 00:26:41,520

than ever before

801  
00:26:44,870 --> 00:26:42,559  
and that really is going to be

802  
00:26:46,230 --> 00:26:44,880  
transformative for all of humankind not

803  
00:26:48,390 --> 00:26:46,240  
just for the united states but for

804  
00:26:50,310 --> 00:26:48,400  
everybody so we're so grateful for you

805  
00:26:51,750 --> 00:26:50,320  
guys for for being here

806  
00:26:53,110 --> 00:26:51,760  
and i'm looking forward to getting in

807  
00:26:55,750 --> 00:26:53,120  
this simulator

808  
00:26:57,909 --> 00:26:55,760  
and uh seeing what it is and ultimately

809  
00:26:59,269 --> 00:26:57,919  
seeing if i can uh if i can dock with

810  
00:27:00,950 --> 00:26:59,279  
the international space station you

811  
00:27:03,350 --> 00:27:00,960  
won't have a problem you're ready ready

812  
00:27:05,190 --> 00:27:03,360  
to jump in ready to rock all right let's

813  
00:27:12,789 --> 00:27:05,200

do it

814

00:27:16,950 --> 00:27:14,470

you see these things like dice in the

815

00:27:19,430 --> 00:27:16,960

picture yeah they're actually our key

816

00:27:21,029 --> 00:27:19,440

targets that our cameras are looking at

817

00:27:23,669 --> 00:27:21,039

and you can actually see there's a green

818

00:27:25,990 --> 00:27:23,679

line that's surrounding one of the

819

00:27:28,630 --> 00:27:26,000

one of the marks on the dust

820

00:27:30,470 --> 00:27:28,640

like that i feel like i'm afraid that

821

00:27:32,870 --> 00:27:30,480

oh you're doing good you're doing good

822

00:27:35,029 --> 00:27:32,880

should i slow down nope closure looks

823

00:27:36,149 --> 00:27:35,039

good you don't want to go too slow

824

00:27:37,430 --> 00:27:36,159

either coming in because you want to

825

00:27:40,870 --> 00:27:37,440

make sure that

826

00:27:43,110 --> 00:27:40,880

your contact you're good at 0.44

827

00:27:43,670 --> 00:27:43,120

about 3.2 meters

828

00:27:45,909 --> 00:27:43,680

thank you

829

00:27:47,350 --> 00:27:45,919

[Music]

830

00:27:50,710 --> 00:27:47,360

oh

831

00:27:54,870 --> 00:27:50,720

again that's just your circle getting

832

00:27:59,510 --> 00:27:57,029

give it a little time yeah just let it

833

00:28:02,870 --> 00:27:59,520

react when it comes coming back

834

00:28:07,750 --> 00:28:02,880

closure still looks good there you go

835

00:28:07,760 --> 00:28:11,830

about two meters now looking real good

836

00:28:17,350 --> 00:28:13,590

you're good you're good

837

00:28:24,149 --> 00:28:17,360

remember you have that big magenta

838

00:28:24,159 --> 00:28:27,510

i think you got this one down

839

00:28:27,520 --> 00:28:31,430

1.2 meters

840

00:28:35,510 --> 00:28:33,510

really good

841

00:28:37,590 --> 00:28:35,520

that looks good

842

00:28:39,110 --> 00:28:37,600

about half a meter

843

00:28:41,590 --> 00:28:39,120

nice

844

00:28:56,389 --> 00:28:41,600

i don't want it to run away on me 1.6

845

00:29:00,630 --> 00:28:58,870

you're in