



1  
00:00:16,770 --> 00:00:14,910  
[Music]

2  
00:00:29,220 --> 00:00:16,780  
do

3  
00:00:29,230 --> 00:00:35,910  
[Music]

4  
00:00:35,920 --> 00:00:51,740  
t-minus one minute

5  
00:01:13,640 --> 00:00:58,630  
[Music]

6  
00:01:19,429 --> 00:01:13,650  
t-minus 30 seconds

7  
00:01:21,180 --> 00:01:19,439  
[Music]

8  
00:01:25,109 --> 00:01:21,190  
we are go for launch

9  
00:01:32,789 --> 00:01:28,950  
t-minus 10 9 8

10  
00:01:35,990 --> 00:01:32,799  
7 6 5 4

11  
00:01:37,510 --> 00:01:36,000  
3 2 1.

12  
00:02:20,830 --> 00:01:37,520  
next up we're showing you the commercial

13  
00:02:25,270 --> 00:02:22,150

so

14

00:02:25,670 --> 00:02:25,280

good morning folks welcome back day

15

00:02:28,229 --> 00:02:25,680

three

16

00:02:29,830 --> 00:02:28,239

it is launch day and we are so excited

17

00:02:32,309 --> 00:02:29,840

about what's gonna happen today

18

00:02:33,990 --> 00:02:32,319

about seven and a half hours from now we

19

00:02:36,229 --> 00:02:34,000

will be launching our astronauts from

20

00:02:38,550 --> 00:02:36,239

american soil on an american rocket

21

00:02:40,550 --> 00:02:38,560

and that's a lot to be excited about

22

00:02:42,070 --> 00:02:40,560

okay so thank you for bearing with us

23

00:02:43,670 --> 00:02:42,080

for the last three days

24

00:02:45,509 --> 00:02:43,680

for the last couple days i should say

25

00:02:46,790 --> 00:02:45,519

i'm introducing you to all the speakers

26

00:02:47,589 --> 00:02:46,800

and all the knowledge that they had

27

00:02:48,710 --> 00:02:47,599

their leadership

28

00:02:51,030 --> 00:02:48,720

everything that they had to share with

29

00:02:54,150 --> 00:02:51,040

us about what goes on behind the scenes

30

00:02:57,509 --> 00:02:54,160

as we prepare for such a momentous

31

00:02:59,270 --> 00:02:57,519

epidemic super fabulous awesome

32

00:03:01,190 --> 00:02:59,280

thing that's about to happen today all

33

00:03:02,630 --> 00:03:01,200

right again i am yves lamothe i am the

34

00:03:04,470 --> 00:03:02,640

com systems project manager for

35

00:03:06,470 --> 00:03:04,480

exploration ground systems and with me

36

00:03:07,509 --> 00:03:06,480

today is my road dog philip how's it

37

00:03:08,949 --> 00:03:07,519

going today

38

00:03:10,790 --> 00:03:08,959

it's going great really excited to be

39

00:03:13,030 --> 00:03:10,800

here yes we we made it all

40

00:03:15,030 --> 00:03:13,040

kinds of excitement going on today so

41

00:03:17,030 --> 00:03:15,040

all right so what we got going on today

42

00:03:18,470 --> 00:03:17,040

sure so uh just to introduce myself my

43

00:03:20,229 --> 00:03:18,480

name is phillip hargrove from the launch

44

00:03:21,110 --> 00:03:20,239

services program i'm really excited to

45

00:03:23,110 --> 00:03:21,120

be here

46

00:03:24,710 --> 00:03:23,120

and you know normally we are able to

47

00:03:26,470 --> 00:03:24,720

have you all here on center

48

00:03:27,750 --> 00:03:26,480

for these nasa socials and unfortunately

49

00:03:29,750 --> 00:03:27,760

we're not able to do that

50

00:03:31,350 --> 00:03:29,760

but we really want you to still engage

51  
00:03:31,750 --> 00:03:31,360  
with us and really have a feel like

52  
00:03:35,509 --> 00:03:31,760  
you're

53  
00:03:36,949 --> 00:03:35,519  
submit questions uh ask questions of our

54  
00:03:37,509 --> 00:03:36,959  
special guests we're going to be showing

55  
00:03:39,910 --> 00:03:37,519  
you

56  
00:03:41,509 --> 00:03:39,920  
some tours some 3d tours so we can be as

57  
00:03:42,149 --> 00:03:41,519  
close as possible to you actually being

58  
00:03:44,390 --> 00:03:42,159  
in these

59  
00:03:45,910 --> 00:03:44,400  
really cool places that you know the

60  
00:03:47,270 --> 00:03:45,920  
astronauts and the launch vehicle and

61  
00:03:49,190 --> 00:03:47,280  
the spacecraft went through

62  
00:03:50,390 --> 00:03:49,200  
uh to prepare for you know this

63  
00:03:51,750 --> 00:03:50,400

momentous occasion

64

00:03:54,470 --> 00:03:51,760

so uh we're going to show you just some

65

00:03:56,789 --> 00:03:54,480

small tidbits uh some small

66

00:03:57,830 --> 00:03:56,799

portions of some extended videos that we

67

00:03:59,190 --> 00:03:57,840

have online

68

00:04:01,429 --> 00:03:59,200

so we'll tell you more about how you can

69

00:04:02,869 --> 00:04:01,439

find them later on but we'll be

70

00:04:04,869 --> 00:04:02,879

showing the videos and then you'll see

71

00:04:05,350 --> 00:04:04,879

the star of the video uh in just a

72

00:04:07,509 --> 00:04:05,360

moment

73

00:04:09,750 --> 00:04:07,519

sounds like a plan that is so awesome if

74

00:04:10,470 --> 00:04:09,760

you do have a pair of virtual reality

75

00:04:12,470 --> 00:04:10,480

goggles

76  
00:04:13,910 --> 00:04:12,480  
that might make the experience a whole

77  
00:04:14,710 --> 00:04:13,920  
lot better when you go check out those

78  
00:04:16,710 --> 00:04:14,720  
videos

79  
00:04:18,390 --> 00:04:16,720  
but to talk about them today our special

80  
00:04:20,390 --> 00:04:18,400  
guests we have rachel power

81  
00:04:22,150 --> 00:04:20,400  
rachel power's going to be joining us on

82  
00:04:24,070 --> 00:04:22,160  
video so she's going to be live

83  
00:04:25,270 --> 00:04:24,080  
of course again this is all virtual and

84  
00:04:26,710 --> 00:04:25,280  
we're trying to keep it clean we're

85  
00:04:28,710 --> 00:04:26,720  
trying to keep it safe

86  
00:04:30,070 --> 00:04:28,720  
and healthy so um rachel will you please

87  
00:04:31,510 --> 00:04:30,080  
introduce yourself tell us a little bit

88  
00:04:34,870 --> 00:04:31,520

about what we're going to have going on

89

00:04:36,310 --> 00:04:34,880

for today thanks eves thanks phillip i

90

00:04:38,070 --> 00:04:36,320

wish i could be there with you guys we

91

00:04:38,310 --> 00:04:38,080

have a really cool spot to hang out but

92

00:04:49,510 --> 00:04:38,320

i

93

00:04:52,310 --> 00:04:49,520

project called next

94

00:04:53,110 --> 00:04:52,320

gen stem and we create educational

95

00:04:55,510 --> 00:04:53,120

content for

96

00:04:57,030 --> 00:04:55,520

students and teachers from kindergarten

97

00:04:59,350 --> 00:04:57,040

all the way through high school

98

00:05:01,110 --> 00:04:59,360

but of course these videos are available

99

00:05:02,469 --> 00:05:01,120

for anybody to view they're they're fun

100

00:05:05,029 --> 00:05:02,479

for the whole family

101  
00:05:06,790 --> 00:05:05,039  
any age group but this content is geared

102  
00:05:08,870 --> 00:05:06,800  
towards commercial crew program

103  
00:05:10,390 --> 00:05:08,880  
and it helps to kind of tell the story

104  
00:05:12,230 --> 00:05:10,400  
of how these

105  
00:05:13,430 --> 00:05:12,240  
rockets come together how astronauts

106  
00:05:15,590 --> 00:05:13,440  
train permissions

107  
00:05:16,629 --> 00:05:15,600  
and it's really a behind the scenes look

108  
00:05:18,950 --> 00:05:16,639  
because you get to go

109  
00:05:20,070 --> 00:05:18,960  
inside the facilities we thought you

110  
00:05:21,670 --> 00:05:20,080  
know we wish we could take

111  
00:05:23,350 --> 00:05:21,680  
students to some of these really

112  
00:05:26,469 --> 00:05:23,360  
interesting places these

113  
00:05:28,150 --> 00:05:26,479

um these laboratories these these places

114

00:05:29,670 --> 00:05:28,160

where rockets are being built but

115

00:05:32,070 --> 00:05:29,680

you know we can't do that so the next

116

00:05:33,909 --> 00:05:32,080

best thing is a virtual field trip

117

00:05:35,110 --> 00:05:33,919

so that's what these 360 videos are all

118

00:05:36,870 --> 00:05:35,120

about is taking

119

00:05:38,950 --> 00:05:36,880

folks inside the facilities where the

120

00:05:41,430 --> 00:05:38,960

work is actually getting done

121

00:05:43,270 --> 00:05:41,440

all right so are you guys ready for that

122

00:05:45,270 --> 00:05:43,280

virtual field trip because i know i

123

00:05:47,350 --> 00:05:45,280

am so like why don't we get right into

124

00:05:51,270 --> 00:05:47,360

it

125

00:05:54,790 --> 00:05:51,280

each falcon 9

126  
00:05:57,110 --> 00:05:54,800  
packs over 1.7 million pounds of thrust

127  
00:05:58,710 --> 00:05:57,120  
we love redundancy and that's a huge

128  
00:06:00,629 --> 00:05:58,720  
plus for this configuration

129  
00:06:03,990 --> 00:06:00,639  
as they're able to experience up to two

130  
00:06:06,070 --> 00:06:04,000  
engine shutdowns and still succeed

131  
00:06:07,430 --> 00:06:06,080  
after launch once the first stage is

132  
00:06:09,590 --> 00:06:07,440  
depleted of fuel

133  
00:06:11,189 --> 00:06:09,600  
it will separate and return to earth

134  
00:06:13,350 --> 00:06:11,199  
releasing the second stage

135  
00:06:15,749 --> 00:06:13,360  
which has its own merlin vacuum engine

136  
00:06:17,430 --> 00:06:15,759  
to continue on to orbit

137  
00:06:20,070 --> 00:06:17,440  
for fuel both the first and second

138  
00:06:22,309 --> 00:06:20,080

stages use rocket-grade kerosene

139

00:06:24,230 --> 00:06:22,319

and both stages carry supercooled liquid

140

00:06:27,029 --> 00:06:24,240

oxygen as their oxidizer

141

00:06:28,070 --> 00:06:27,039

since there's no oxygen in space the

142

00:06:30,469 --> 00:06:28,080

falcon boosters

143

00:06:32,150 --> 00:06:30,479

have the ability to land and be reused

144

00:06:34,550 --> 00:06:32,160

and to assist with reusability they have

145

00:06:36,870 --> 00:06:34,560

a few special features the first

146

00:06:38,469 --> 00:06:36,880

is the hypersonic grid fin there are

147

00:06:40,469 --> 00:06:38,479

four of them that will mount towards

148

00:06:42,309 --> 00:06:40,479

the top of the rocket and those help

149

00:06:43,510 --> 00:06:42,319

steer as it re-enters the earth's

150

00:06:45,189 --> 00:06:43,520

atmosphere

151  
00:06:47,110 --> 00:06:45,199  
there's also the carbon fiber landing

152  
00:06:48,550 --> 00:06:47,120  
legs there's two on the floor behind you

153  
00:06:50,070 --> 00:06:48,560  
those will be installed near the bottom

154  
00:06:52,150 --> 00:06:50,080  
of the rocket and they deploy just

155  
00:06:54,629 --> 00:06:52,160  
before landing

156  
00:06:56,469 --> 00:06:54,639  
reusability goes a really long way to

157  
00:06:57,909 --> 00:06:56,479  
helping reduce the cost of access to

158  
00:07:00,309 --> 00:06:57,919  
space

159  
00:07:01,510 --> 00:07:00,319  
but recovering a booster is always

160  
00:07:03,189 --> 00:07:01,520  
secondary

161  
00:07:04,950 --> 00:07:03,199  
underwater those suits have to be

162  
00:07:06,790 --> 00:07:04,960  
airtight to prevent the water from

163  
00:07:09,909 --> 00:07:06,800

flooding inside

164

00:07:11,430 --> 00:07:09,919

in space a similar hazard exists just

165

00:07:12,550 --> 00:07:11,440

like water takes the shape of its

166

00:07:15,270 --> 00:07:12,560

container

167

00:07:16,070 --> 00:07:15,280

gas does the same and spreads to fill

168

00:07:18,870 --> 00:07:16,080

all the space

169

00:07:19,670 --> 00:07:18,880

available so the gas in a spacesuit

170

00:07:22,070 --> 00:07:19,680

needs to stay

171

00:07:24,469 --> 00:07:22,080

inside for the astronaut to breathe so

172

00:07:26,309 --> 00:07:24,479

it has to be airtight

173

00:07:27,749 --> 00:07:26,319

you'll also notice that the astronaut is

174

00:07:30,710 --> 00:07:27,759

not alone

175

00:07:31,270 --> 00:07:30,720

for safety and support a team of divers

176  
00:07:34,309 --> 00:07:31,280  
assist

177  
00:07:35,510 --> 00:07:34,319  
each astronaut with relocations safety

178  
00:07:38,950 --> 00:07:35,520  
concerns

179  
00:07:39,749 --> 00:07:38,960  
and documenting their work those giant

180  
00:07:42,070 --> 00:07:39,759  
structures

181  
00:07:43,990 --> 00:07:42,080  
you see they're full-size replicas of

182  
00:07:45,909 --> 00:07:44,000  
the space station

183  
00:07:47,270 --> 00:07:45,919  
since any station astronaut could be

184  
00:07:48,309 --> 00:07:47,280  
called on to fix something on the

185  
00:07:50,869 --> 00:07:48,319  
outside

186  
00:07:51,749 --> 00:07:50,879  
they all practice here underwater many

187  
00:07:54,950 --> 00:07:51,759  
times

188  
00:07:57,749 --> 00:07:54,960

to be ready for the real thing

189

00:07:58,469 --> 00:07:57,759

welcome back since you've had a chance

190

00:08:00,790 --> 00:07:58,479

to see how

191

00:08:02,390 --> 00:08:00,800

massive those structures are you now

192

00:08:05,110 --> 00:08:02,400

know why

193

00:08:06,629 --> 00:08:05,120

that is most definitely a teaser i just

194

00:08:07,909 --> 00:08:06,639

wanted to keep watching and watching and

195

00:08:09,430 --> 00:08:07,919

watching so rachel why don't you tell us

196

00:08:10,550 --> 00:08:09,440

a little bit about those facilities that

197

00:08:13,749 --> 00:08:10,560

you guys visited

198

00:08:16,150 --> 00:08:13,759

and what they're all about yeah so the

199

00:08:17,670 --> 00:08:16,160

first one you saw that was hangar 39a

200

00:08:20,070 --> 00:08:17,680

and there was a

201

00:08:22,070 --> 00:08:20,080

a falcon 9 rocket laid out that actually

202

00:08:23,350 --> 00:08:22,080

has had flown in space before which is

203

00:08:25,029 --> 00:08:23,360

really cool to see

204

00:08:26,710 --> 00:08:25,039

you can see some of the scorch marks on

205

00:08:29,029 --> 00:08:26,720

the side and

206

00:08:30,390 --> 00:08:29,039

joshua mentioned in that first part of

207

00:08:32,070 --> 00:08:30,400

this of the video about

208

00:08:33,430 --> 00:08:32,080

the fact that there's redundancy and

209

00:08:34,469 --> 00:08:33,440

just you know for some of the students

210

00:08:36,949 --> 00:08:34,479

watching out there

211

00:08:37,909 --> 00:08:36,959

what that means is that they uh

212

00:08:40,310 --> 00:08:37,919

purposefully

213

00:08:42,149 --> 00:08:40,320

engineer and build components extra

214

00:08:42,949 --> 00:08:42,159

components in case there's a failure so

215

00:08:45,030 --> 00:08:42,959

parts that

216

00:08:46,550 --> 00:08:45,040

hopefully will never have to get used

217

00:08:48,230 --> 00:08:46,560

but they're there as a backup and that's

218

00:08:50,070 --> 00:08:48,240

part of the safety measures

219

00:08:52,470 --> 00:08:50,080

that take place in order to protect the

220

00:08:54,470 --> 00:08:52,480

astronauts as they launch into space

221

00:08:57,030 --> 00:08:54,480

the second part of the video the neutral

222

00:08:58,630 --> 00:08:57,040

buoyancy lab or nbl

223

00:09:00,310 --> 00:08:58,640

i was kind of a little bit disappointed

224

00:09:01,509 --> 00:09:00,320

that was one of the few places i didn't

225

00:09:03,190 --> 00:09:01,519

actually get to go

226

00:09:05,430 --> 00:09:03,200

that was inside the actual pool they

227

00:09:07,190 --> 00:09:05,440

wouldn't let us in but that's because

228

00:09:08,630 --> 00:09:07,200

it's a working facility and they were

229

00:09:09,190 --> 00:09:08,640

actually doing some training there were

230

00:09:12,949 --> 00:09:09,200

some

231

00:09:14,389 --> 00:09:12,959

we were filming so

232

00:09:16,310 --> 00:09:14,399

it was a really cool experience to get

233

00:09:18,230 --> 00:09:16,320

to be there i hope that you guys

234

00:09:20,710 --> 00:09:18,240

go back and watch the whole video and

235

00:09:22,550 --> 00:09:20,720

and feel what it's like in the virtual

236

00:09:24,230 --> 00:09:22,560

reality headset to be underwater with

237

00:09:26,150 --> 00:09:24,240

the astronauts

238

00:09:28,310 --> 00:09:26,160

awesome so rachel we already have some

239

00:09:30,070 --> 00:09:28,320

questions coming in from uh online

240

00:09:31,269 --> 00:09:30,080

so what inspired you to be an educator

241

00:09:32,870 --> 00:09:31,279

and how did you get into this kind of

242

00:09:35,110 --> 00:09:32,880

work

243

00:09:37,350 --> 00:09:35,120

well i had some really amazing educators

244

00:09:38,949 --> 00:09:37,360

myself growing up and so when i started

245

00:09:40,870 --> 00:09:38,959

thinking about careers

246

00:09:42,710 --> 00:09:40,880

um what inspired me were with the

247

00:09:45,430 --> 00:09:42,720

teachers that i had

248

00:09:47,350 --> 00:09:45,440

going through kindergarten all the way

249

00:09:47,670 --> 00:09:47,360

through high school and so i decided you

250

00:09:49,990 --> 00:09:47,680

know

251

00:09:52,550 --> 00:09:50,000

i wanted to do the same for other for

252

00:09:54,150 --> 00:09:52,560

children and to be an inspiration

253

00:09:57,110 --> 00:09:54,160

and so i taught high school math and

254

00:09:59,590 --> 00:09:57,120

physics for about nine years before i

255

00:10:01,670 --> 00:09:59,600

ended up here at kennedy space center

256

00:10:03,269 --> 00:10:01,680

and uh and now i get to do it in a

257

00:10:04,790 --> 00:10:03,279

in a really cool environment where i get

258

00:10:06,150 --> 00:10:04,800

to learn new things every day and meet

259

00:10:08,710 --> 00:10:06,160

some amazing people

260

00:10:10,470 --> 00:10:08,720

so i get to continue to inspire kids and

261

00:10:13,110 --> 00:10:10,480

that's what i love to do

262

00:10:14,630 --> 00:10:13,120

wow so speaking of inspiration why don't

263

00:10:17,990 --> 00:10:14,640

we take a tour of another

264

00:10:19,670 --> 00:10:18,000

another facility game capsule must

265

00:10:21,110 --> 00:10:19,680

also be used to bring the astronauts

266

00:10:23,750 --> 00:10:21,120

home safely

267

00:10:25,269 --> 00:10:23,760

one of the final steps in preparation is

268

00:10:28,310 --> 00:10:25,279

installing the boeing

269

00:10:29,350 --> 00:10:28,320

lightweight ablator a specially designed

270

00:10:31,990 --> 00:10:29,360

heat shield

271

00:10:33,750 --> 00:10:32,000

used to disperse the heat by going

272

00:10:34,630 --> 00:10:33,760

through a phase change from solid to

273

00:10:36,870 --> 00:10:34,640

liquid

274

00:10:37,670 --> 00:10:36,880

this creates a buffer from the high

275

00:10:39,829 --> 00:10:37,680

temperatures

276

00:10:41,430 --> 00:10:39,839

of re-entry which can reach up to 4000

277

00:10:43,590 --> 00:10:41,440

degrees fahrenheit

278

00:10:45,670 --> 00:10:43,600

the heat shield will not be reusable but

279

00:10:48,710 --> 00:10:45,680

it does protect the capsule

280

00:10:50,550 --> 00:10:48,720

and everything and everyone inside

281

00:10:53,190 --> 00:10:50,560

after it goes through the hottest part

282

00:10:55,670 --> 00:10:53,200

of reentry the space capsule has

283

00:10:57,110 --> 00:10:55,680

slowed considerably from its initial

284

00:11:00,310 --> 00:10:57,120

speed of almost 17

285

00:11:01,829 --> 00:11:00,320

000 miles per hour then a series of

286

00:11:04,550 --> 00:11:01,839

parachutes will deploy

287

00:11:06,389 --> 00:11:04,560

designed to gradually slow the descent

288

00:11:10,069 --> 00:11:06,399

to about the speed of a

289

00:11:14,150 --> 00:11:10,079

descending elevator the final stage

290

00:11:16,230 --> 00:11:14,160

of landing is inflating giant airbags

291

00:11:17,590 --> 00:11:16,240

the ones behind you which will help to

292

00:11:21,190 --> 00:11:17,600

cushion the landing

293

00:11:23,350 --> 00:11:21,200

even further once the astronaut crew is

294

00:11:25,110 --> 00:11:23,360

safely on the ground at one of our five

295

00:11:26,470 --> 00:11:25,120

landing locations across the western

296

00:11:28,630 --> 00:11:26,480

united states

297

00:11:29,990 --> 00:11:28,640

crews will drive out to help them safely

298

00:11:31,190 --> 00:11:30,000

if you've seen what the outside of the

299

00:11:33,269 --> 00:11:31,200

starliner looks like

300

00:11:34,389 --> 00:11:33,279

we are sitting inside boeing's mission

301

00:11:36,150 --> 00:11:34,399

simulator

302

00:11:39,110 --> 00:11:36,160

part of the realistic atmosphere is you

303

00:11:41,350 --> 00:11:39,120

may hear reaction control jets firing

304

00:11:43,590 --> 00:11:41,360

as technology advances on earth it

305

00:11:46,230 --> 00:11:43,600

doesn't space as well

306

00:11:48,230 --> 00:11:46,240

a touch screen has never been used on a

307

00:11:48,790 --> 00:11:48,240

spacecraft as a major instrument in the

308

00:11:51,190 --> 00:11:48,800

past

309

00:11:52,790 --> 00:11:51,200

and it certainly is a modern approach

310

00:11:54,230 --> 00:11:52,800

but you'll also notice there are still

311

00:11:56,069 --> 00:11:54,240

physical controls

312

00:11:57,430 --> 00:11:56,079

and these are used for critical systems

313

00:11:58,790 --> 00:11:57,440

that you wouldn't want to rely on a

314

00:12:01,190 --> 00:11:58,800

digital screen for

315

00:12:02,710 --> 00:12:01,200

especially in case of emergency now

316

00:12:04,710 --> 00:12:02,720

while the astronauts do receive plenty

317

00:12:06,389 --> 00:12:04,720

of training on the systems here

318

00:12:08,790 --> 00:12:06,399

each astronaut will also receive

319

00:12:10,629 --> 00:12:08,800

extensive training on the speed

320

00:12:12,389 --> 00:12:10,639

now that's definitely one that i want to

321

00:12:13,350 --> 00:12:12,399

check out i'd love to be able to sit in

322

00:12:15,670 --> 00:12:13,360

that simulator

323

00:12:17,430 --> 00:12:15,680

and pretend like i'm flying uh the the

324

00:12:18,150 --> 00:12:17,440

capsule in space that would be so

325

00:12:19,910 --> 00:12:18,160

awesome

326

00:12:21,590 --> 00:12:19,920

and it's amazing that they're you know

327

00:12:23,590 --> 00:12:21,600

it's touch screen everyone is so used to

328

00:12:23,990 --> 00:12:23,600

phones and ipads and things of that

329

00:12:25,269 --> 00:12:24,000

nature

330

00:12:27,750 --> 00:12:25,279

and they're incorporating that

331

00:12:29,829 --> 00:12:27,760

technology into what we're doing

332

00:12:31,269 --> 00:12:29,839

uh in space these days um can you

333

00:12:33,030 --> 00:12:31,279

elaborate on that a little bit for us

334

00:12:35,190 --> 00:12:33,040

rachel

335

00:12:36,710 --> 00:12:35,200

yeah i mean if you think about prior to

336

00:12:39,030 --> 00:12:36,720

um these brand new rockets that are

337

00:12:41,190 --> 00:12:39,040

being built the the previous

338

00:12:42,230 --> 00:12:41,200

launch vehicle was a space shuttle and

339

00:12:45,030 --> 00:12:42,240

then that was built

340

00:12:46,710 --> 00:12:45,040

in the 70s and early 80s so i mean that

341

00:12:49,430 --> 00:12:46,720

technology wasn't available yet

342

00:12:51,350 --> 00:12:49,440

but here we are you know in in 2020 and

343

00:12:53,509 --> 00:12:51,360

so we're able to incorporate all of the

344

00:12:54,710 --> 00:12:53,519

the cool features that you find even in

345

00:12:56,389 --> 00:12:54,720

your cell phone but

346

00:12:58,629 --> 00:12:56,399

what's really more amazing is a lot of

347

00:13:00,949 --> 00:12:58,639

that technology that we use

348

00:13:02,069 --> 00:13:00,959

you know in our everyday lives actually

349

00:13:04,470 --> 00:13:02,079

comes from

350

00:13:05,509 --> 00:13:04,480

the space program so it's it's spin-off

351  
00:13:08,790 --> 00:13:05,519  
technology that

352  
00:13:10,870 --> 00:13:08,800  
was used and designed to help further

353  
00:13:11,829 --> 00:13:10,880  
our progress in space but we get to use

354  
00:13:13,829 --> 00:13:11,839  
it at home

355  
00:13:15,910 --> 00:13:13,839  
which is awesome and so i really

356  
00:13:17,990 --> 00:13:15,920  
appreciate the the technology

357  
00:13:20,150 --> 00:13:18,000  
that not only is the kind of the fun

358  
00:13:22,230 --> 00:13:20,160  
stuff like the cell phones and smart tvs

359  
00:13:25,190 --> 00:13:22,240  
and stuff but also the things that help

360  
00:13:26,310 --> 00:13:25,200  
you know people in the medical field um

361  
00:13:28,150 --> 00:13:26,320  
to filter water

362  
00:13:29,750 --> 00:13:28,160  
for for people around the world that

363  
00:13:31,910 --> 00:13:29,760

don't have that the

364

00:13:33,269 --> 00:13:31,920

the luxury of having clean water come

365

00:13:35,110 --> 00:13:33,279

out of their faucets so

366

00:13:36,550 --> 00:13:35,120

there's so many really cool things if

367

00:13:37,190 --> 00:13:36,560

you check out the website i know that

368

00:13:38,829 --> 00:13:37,200

they

369

00:13:40,629 --> 00:13:38,839

put it up in the lower thirds or the

370

00:13:41,509 --> 00:13:40,639

spinoff.nasa.gov but it's a really cool

371

00:13:43,750 --> 00:13:41,519

resource

372

00:13:47,030 --> 00:13:43,760

to learn more about what technology from

373

00:13:48,550 --> 00:13:47,040

the space program you use every day

374

00:13:50,389 --> 00:13:48,560

awesome so that's a really great segue

375

00:13:52,310 --> 00:13:50,399

into another question that we got online

376

00:13:53,670 --> 00:13:52,320

so people are asking you know in the

377

00:13:55,590 --> 00:13:53,680

current state of the world right now you

378

00:13:57,030 --> 00:13:55,600

know it's not necessarily always going

379

00:13:59,110 --> 00:13:57,040

to be safe to go to museums and do

380

00:14:01,590 --> 00:13:59,120

things as engaging as you might

381

00:14:02,230 --> 00:14:01,600

like to do ideally so what are some ways

382

00:14:04,870 --> 00:14:02,240

that you think

383

00:14:06,550 --> 00:14:04,880

kids can maintain their excitement about

384

00:14:08,629 --> 00:14:06,560

space and space flight and

385

00:14:10,230 --> 00:14:08,639

nasa and and maybe be able to learn

386

00:14:11,430 --> 00:14:10,240

about things that nasa was a part of

387

00:14:12,389 --> 00:14:11,440

even from home you talked about the

388

00:14:13,269 --> 00:14:12,399

spin-offs and

389

00:14:14,949 --> 00:14:13,279

you know things that you wouldn't

390

00:14:16,629 --> 00:14:14,959

necessarily know were related to the

391

00:14:18,150 --> 00:14:16,639

space program can you give us some

392

00:14:20,310 --> 00:14:18,160

insight into some of those things that's

393

00:14:23,110 --> 00:14:20,320

a great question

394

00:14:23,509 --> 00:14:23,120

yeah so there's a really great website

395

00:14:26,230 --> 00:14:23,519

that

396

00:14:27,110 --> 00:14:26,240

kids can go to and parents as well it's

397

00:14:30,150 --> 00:14:27,120

the nasa

398

00:14:31,509 --> 00:14:30,160

at home website these are stem stem

399

00:14:33,829 --> 00:14:31,519

stands for science technology

400

00:14:34,230 --> 00:14:33,839

engineering and math activities that can

401  
00:14:36,069 --> 00:14:34,240  
be done

402  
00:14:37,590 --> 00:14:36,079  
in your household and just using

403  
00:14:39,990 --> 00:14:37,600  
everyday materials there's

404  
00:14:41,910 --> 00:14:40,000  
all kinds of interactive tools as well

405  
00:14:44,389 --> 00:14:41,920  
so you can kind of

406  
00:14:46,230 --> 00:14:44,399  
explore and become part of the the

407  
00:14:48,949 --> 00:14:46,240  
science and engineering activity

408  
00:14:49,670 --> 00:14:48,959  
or build your own spacecraft or build

409  
00:14:51,670 --> 00:14:49,680  
your own

410  
00:14:53,030 --> 00:14:51,680  
uh water filtration device at home

411  
00:14:55,350 --> 00:14:53,040  
there's lots of really cool

412  
00:14:56,829 --> 00:14:55,360  
activities to do and so those are all

413  
00:15:00,310 --> 00:14:56,839

available at

414

00:15:03,509 --> 00:15:00,320

www.nasa forward slash stem

415

00:15:05,030 --> 00:15:03,519

s-t-e-m awesome and yeah you mentioned

416

00:15:05,990 --> 00:15:05,040

the interactive nature of those things

417

00:15:07,590 --> 00:15:06,000

so i just wanted to

418

00:15:09,430 --> 00:15:07,600

do one more plug for those videos that

419

00:15:10,949 --> 00:15:09,440

we're showing so in the videos you know

420

00:15:12,710 --> 00:15:10,959

again we're just showing a small snippet

421

00:15:13,590 --> 00:15:12,720

of it and we're kind of panning around

422

00:15:15,269 --> 00:15:13,600

you can tell that

423

00:15:16,710 --> 00:15:15,279

you can see you know up and down left

424

00:15:18,470 --> 00:15:16,720

and right when you actually look at

425

00:15:20,069 --> 00:15:18,480

those videos on youtube you can do that

426

00:15:20,629 --> 00:15:20,079

panning yourself you can zoom in you can

427

00:15:22,069 --> 00:15:20,639

zoom out

428

00:15:23,829 --> 00:15:22,079

you can focus on different areas so

429

00:15:25,509 --> 00:15:23,839

that's a really interesting

430

00:15:27,110 --> 00:15:25,519

you know feature of the videos and again

431

00:15:28,710 --> 00:15:27,120

i don't have a vr set myself

432

00:15:30,870 --> 00:15:28,720

but if you have those goggles it makes

433

00:15:32,550 --> 00:15:30,880

it apparently just you know 10 times the

434

00:15:34,230 --> 00:15:32,560

experience so definitely encourage you

435

00:15:36,230 --> 00:15:34,240

all to check that out if you can

436

00:15:37,829 --> 00:15:36,240

absolutely so and thank you for sharing

437

00:15:38,629 --> 00:15:37,839

that resource there rachel because it

438

00:15:40,389 --> 00:15:38,639

sounds like

439

00:15:43,030 --> 00:15:40,399

i know my kids will be doing this summer

440

00:15:44,550 --> 00:15:43,040

as far as projects so

441

00:15:46,230 --> 00:15:44,560

it's always great to be able to share

442

00:15:49,030 --> 00:15:46,240

that so why don't we dive

443

00:15:50,150 --> 00:15:49,040

right into another video another virtual

444

00:15:51,749 --> 00:15:50,160

tour if you will

445

00:15:53,749 --> 00:15:51,759

of some of the facilities that you guys

446

00:15:55,590 --> 00:15:53,759

visited

447

00:15:57,350 --> 00:15:55,600

we've made our way inside to the factory

448

00:15:58,470 --> 00:15:57,360

floor and the first thing i can't

449

00:16:01,350 --> 00:15:58,480

emphasize enough

450

00:16:03,350 --> 00:16:01,360

is how massive and busy this facility is

451  
00:16:05,990 --> 00:16:03,360  
we're here to talk about the crew dragon

452  
00:16:08,150 --> 00:16:06,000  
but there's so much going on there are

453  
00:16:10,150 --> 00:16:08,160  
areas dedicated to the falcon boosters

454  
00:16:11,189 --> 00:16:10,160  
which will launch the spacecraft the

455  
00:16:12,949 --> 00:16:11,199  
merlin engines

456  
00:16:15,189 --> 00:16:12,959  
which will propel the first and second

457  
00:16:18,069 --> 00:16:15,199  
stages the spacecraft itself

458  
00:16:19,430 --> 00:16:18,079  
which we'll look at in a minute and a 3d

459  
00:16:20,870 --> 00:16:19,440  
printing lab that we're here in front of

460  
00:16:22,629 --> 00:16:20,880  
now

461  
00:16:25,110 --> 00:16:22,639  
through 3d printing or additive

462  
00:16:26,949 --> 00:16:25,120  
manufacturing robust and high performing

463  
00:16:28,870 --> 00:16:26,959

rocket parts can be created

464

00:16:31,030 --> 00:16:28,880

and offer improvements over traditional

465

00:16:33,189 --> 00:16:31,040

manufacturing methods

466

00:16:35,269 --> 00:16:33,199

spacex uses 3d printing for a variety of

467

00:16:37,670 --> 00:16:35,279

its rocket and spacecraft parts

468

00:16:38,870 --> 00:16:37,680

including most notably the super draco

469

00:16:40,470 --> 00:16:38,880

engines

470

00:16:42,150 --> 00:16:40,480

the super dracos function as an

471

00:16:43,670 --> 00:16:42,160

emergency abort system

472

00:16:45,269 --> 00:16:43,680

and each crew dragon will be equipped

473

00:16:47,509 --> 00:16:45,279

with eight of them

474

00:16:49,430 --> 00:16:47,519

together they can produce a hundred and

475

00:16:50,870 --> 00:16:49,440

twenty thousand pounds of axial thrust

476  
00:16:52,629 --> 00:16:50,880  
in under a second

477  
00:16:53,910 --> 00:16:52,639  
that's enough force to transport the

478  
00:16:56,069 --> 00:16:53,920  
crew dragon

479  
00:16:57,749 --> 00:16:56,079  
almost 100 meters in two seconds and

480  
00:16:59,030 --> 00:16:57,759  
over half a kilometer in about five

481  
00:17:02,069 --> 00:16:59,040  
seconds

482  
00:17:03,749 --> 00:17:02,079  
if an emergency situation was detected

483  
00:17:06,470 --> 00:17:03,759  
even during liftoff or on the way to

484  
00:17:09,669 --> 00:17:06,480  
orbit those super

485  
00:17:11,189 --> 00:17:09,679  
whoa i mean wow you know that's that's

486  
00:17:13,350 --> 00:17:11,199  
just uh incredible

487  
00:17:14,309 --> 00:17:13,360  
um what they do so um rachel why don't

488  
00:17:17,110 --> 00:17:14,319

we talk about

489

00:17:18,549 --> 00:17:17,120

the you know a lot of people think that

490

00:17:21,350 --> 00:17:18,559

this stuff just happens

491

00:17:23,110 --> 00:17:21,360

right or maybe it's it's just um

492

00:17:24,630 --> 00:17:23,120

geniuses are born into this world and

493

00:17:25,189 --> 00:17:24,640

then they just kind of think this stuff

494

00:17:26,630 --> 00:17:25,199

up

495

00:17:28,549 --> 00:17:26,640

um why don't you tell us a little bit

496

00:17:31,990 --> 00:17:28,559

about the importance of

497

00:17:33,430 --> 00:17:32,000

stem and why it and what it takes

498

00:17:35,029 --> 00:17:33,440

you know to really get to that level

499

00:17:36,630 --> 00:17:35,039

where you can build these things

500

00:17:38,789 --> 00:17:36,640

you can manifest manufacture these

501

00:17:40,789 --> 00:17:38,799

things because our future

502

00:17:43,669 --> 00:17:40,799

essentially is is going to include you

503

00:17:45,430 --> 00:17:43,679

know being able to sustain life in space

504

00:17:47,830 --> 00:17:45,440

so um can you please tell us a little

505

00:17:48,549 --> 00:17:47,840

bit about why it's so important for us

506

00:17:51,510 --> 00:17:48,559

to

507

00:17:54,470 --> 00:17:51,520

indulge in in science technology

508

00:17:57,190 --> 00:17:54,480

engineering and math

509

00:17:57,590 --> 00:17:57,200

yeah so a lot of people forget that you

510

00:18:00,310 --> 00:17:57,600

know

511

00:18:01,590 --> 00:18:00,320

this the stem professionals that work

512

00:18:04,230 --> 00:18:01,600

here at nasa you know

513

00:18:06,150 --> 00:18:04,240

they were kids in a classroom you know

514

00:18:07,669 --> 00:18:06,160

at one point in their lives too

515

00:18:09,830 --> 00:18:07,679

they had to learn the things that

516

00:18:11,830 --> 00:18:09,840

they're doing um so it's not

517

00:18:13,669 --> 00:18:11,840

an unachievable dream to come work at

518

00:18:16,549 --> 00:18:13,679

nasa there's so many different ways

519

00:18:18,150 --> 00:18:16,559

to do it and as we talk more and more to

520

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

different folks that work out here

521

00:18:22,150 --> 00:18:20,320

at not only at kennedy space center but

522

00:18:25,110 --> 00:18:22,160

across the whole country in the stem

523

00:18:25,830 --> 00:18:25,120

fields it was just a passion that drove

524

00:18:28,549 --> 00:18:25,840

them

525

00:18:30,549 --> 00:18:28,559

and and they studied hard in school and

526

00:18:32,470 --> 00:18:30,559

they learned and they were able to get a

527

00:18:34,549 --> 00:18:32,480

degree in science technology engineering

528

00:18:36,630 --> 00:18:34,559

or math and now they use that

529

00:18:38,630 --> 00:18:36,640

to help solve problems in the world and

530

00:18:41,350 --> 00:18:38,640

that's what's really cool about stem

531

00:18:42,630 --> 00:18:41,360

is it's just a really a tool kit for you

532

00:18:44,710 --> 00:18:42,640

to use

533

00:18:46,789 --> 00:18:44,720

to solve problems and so whatever the

534

00:18:49,029 --> 00:18:46,799

problem might be maybe it's something

535

00:18:50,150 --> 00:18:49,039

that we haven't even thought about yet

536

00:18:52,390 --> 00:18:50,160

you could be

537

00:18:54,150 --> 00:18:52,400

someday being the the person who comes

538

00:18:54,549 --> 00:18:54,160

up with the idea to help solve one of

539

00:18:56,630 --> 00:18:54,559

our

540

00:18:58,230 --> 00:18:56,640

greatest problems in the world so i

541

00:18:59,350 --> 00:18:58,240

would encourage you if you're a student

542

00:19:00,789 --> 00:18:59,360

today

543

00:19:02,230 --> 00:19:00,799

that uh if you're trying to think about

544

00:19:03,430 --> 00:19:02,240

like what you might want to do when you

545

00:19:05,990 --> 00:19:03,440

grow up just

546

00:19:07,909 --> 00:19:06,000

be open to exploring different

547

00:19:09,669 --> 00:19:07,919

opportunities take different classes

548

00:19:10,950 --> 00:19:09,679

study as many different things as you

549

00:19:12,950 --> 00:19:10,960

can

550

00:19:14,950 --> 00:19:12,960

ask lots of questions because questions

551  
00:19:16,710 --> 00:19:14,960  
always are helpful to learn more

552  
00:19:18,950 --> 00:19:16,720  
and uh yeah and tune in we actually have

553  
00:19:21,029 --> 00:19:18,960  
a program called nasa stem stars

554  
00:19:22,310 --> 00:19:21,039  
that next gen stem does as a weekly

555  
00:19:24,549 --> 00:19:22,320  
event where you can

556  
00:19:26,310 --> 00:19:24,559  
talk to different stem professionals at

557  
00:19:28,150 --> 00:19:26,320  
nasa and ask them questions about their

558  
00:19:30,710 --> 00:19:28,160  
journey and how they got here

559  
00:19:32,150 --> 00:19:30,720  
so yeah thanks for that question because

560  
00:19:35,590 --> 00:19:32,160  
i think it's important

561  
00:19:36,310 --> 00:19:35,600  
obviously as an educator value education

562  
00:19:38,470 --> 00:19:36,320  
and

563  
00:19:39,750 --> 00:19:38,480

want people to keep learning even if

564

00:19:41,990 --> 00:19:39,760

they're out of school

565

00:19:43,590 --> 00:19:42,000

there's still plenty of learning to do

566

00:19:44,630 --> 00:19:43,600

awesome yeah thank you for that you made

567

00:19:46,150 --> 00:19:44,640

some really good points

568

00:19:48,070 --> 00:19:46,160

uh so just one more question online

569

00:19:49,990 --> 00:19:48,080

before we get to the last video and then

570

00:19:51,510 --> 00:19:50,000

and then you know head on out can you

571

00:19:53,510 --> 00:19:51,520

tell us what was the coolest

572

00:19:57,270 --> 00:19:53,520

facility that you went to or maybe what

573

00:20:00,630 --> 00:19:59,190

wow that's tough because all of them

574

00:20:03,029 --> 00:20:00,640

were super interesting and

575

00:20:04,310 --> 00:20:03,039

one of the things that i thought was so

576

00:20:06,549 --> 00:20:04,320

cool about it was

577

00:20:09,029 --> 00:20:06,559

these are actual real working facilities

578

00:20:11,110 --> 00:20:09,039

as you probably saw in just those little

579

00:20:12,870 --> 00:20:11,120

snippets that we were watching there's

580

00:20:13,669 --> 00:20:12,880

people walking around they're doing work

581

00:20:16,789 --> 00:20:13,679

like

582

00:20:17,830 --> 00:20:16,799

we're gonna just set up a camera here

583

00:20:19,029 --> 00:20:17,840

and we're gonna start filming and

584

00:20:20,630 --> 00:20:19,039

talking don't mind us

585

00:20:22,870 --> 00:20:20,640

but like just keep doing your work and

586

00:20:25,270 --> 00:20:22,880

that that's exactly what happened so

587

00:20:26,710 --> 00:20:25,280

when you go and watch these videos look

588

00:20:27,590 --> 00:20:26,720

around that's what's really cool about

589

00:20:30,710 --> 00:20:27,600

360.

590

00:20:31,350 --> 00:20:30,720

whether you're watching on a a computer

591

00:20:35,350 --> 00:20:31,360

or

592

00:20:37,590 --> 00:20:35,360

goggles you can

593

00:20:39,270 --> 00:20:37,600

pan around look all around you and you

594

00:20:40,310 --> 00:20:39,280

really truly get to see behind the

595

00:20:42,070 --> 00:20:40,320

scenes because

596

00:20:43,590 --> 00:20:42,080

with a 360 camera there's nothing to

597

00:20:46,070 --> 00:20:43,600

hide you can look in every

598

00:20:46,870 --> 00:20:46,080

every direction that there is but i will

599

00:20:49,990 --> 00:20:46,880

have to say i

600

00:20:51,029 --> 00:20:50,000

really um i don't know the nbl was

601  
00:20:55,270 --> 00:20:51,039

pretty cool

602  
00:20:57,590 --> 00:20:55,280

but um being inside the actual starliner

603  
00:20:58,950 --> 00:20:57,600

uh trainer and also inside the the crew

604  
00:21:01,669 --> 00:20:58,960

dragon trainer those

605  
00:21:01,990 --> 00:21:01,679

that was probably my favorite part wow

606  
00:21:04,310 --> 00:21:02,000

all right

607  
00:21:05,909 --> 00:21:04,320

so we we definitely want to end with a

608  
00:21:07,350 --> 00:21:05,919

little bit of a tease so we'll get into

609  
00:21:09,590 --> 00:21:07,360

the last video real quick

610  
00:21:10,870 --> 00:21:09,600

um just one more snippet before we get

611  
00:21:13,990 --> 00:21:10,880

ready to sign off here

612  
00:21:15,510 --> 00:21:14,000

control center down that way others will

613  
00:21:17,190 --> 00:21:15,520

be in houston texas

614

00:21:18,549 --> 00:21:17,200

at the johnson space center in mission

615

00:21:20,470 --> 00:21:18,559

control

616

00:21:21,750 --> 00:21:20,480

several hours prior to launch the entire

617

00:21:23,510 --> 00:21:21,760

area will be cleared of all personnel

618

00:21:25,510 --> 00:21:23,520

for fueling to take place

619

00:21:27,830 --> 00:21:25,520

the atlas 5 uses liquid oxygen and

620

00:21:29,270 --> 00:21:27,840

rocket grade kerosene as its fuel

621

00:21:31,430 --> 00:21:29,280

once that fueling is complete and it's

622

00:21:32,950 --> 00:21:31,440

safe to return here the astronauts will

623

00:21:33,750 --> 00:21:32,960

arrive and travel up an elevator and

624

00:21:35,830 --> 00:21:33,760

that tower

625

00:21:37,190 --> 00:21:35,840

to this level they'll walk across this

626  
00:21:38,789 --> 00:21:37,200  
the crew access arm

627  
00:21:40,549 --> 00:21:38,799  
the last place they'll set foot before

628  
00:21:42,070 --> 00:21:40,559  
blasting off into space

629  
00:21:44,630 --> 00:21:42,080  
a similar process was followed for the

630  
00:21:46,230 --> 00:21:44,640  
space shuttle program every launch pad

631  
00:21:48,390 --> 00:21:46,240  
on earth that launches humans

632  
00:21:49,909 --> 00:21:48,400  
has what's called a white room the white

633  
00:21:51,029 --> 00:21:49,919  
room here is actually through those

634  
00:21:52,470 --> 00:21:51,039  
double doors

635  
00:21:54,390 --> 00:21:52,480  
it's the part of the crew access arm

636  
00:21:55,909 --> 00:21:54,400  
that connects directly to the spacecraft

637  
00:21:58,149 --> 00:21:55,919  
and allows for easy access by the

638  
00:21:59,750 --> 00:21:58,159

astronauts and their support personnel

639

00:22:01,510 --> 00:21:59,760

it also is extremely clean to make sure

640

00:22:03,350 --> 00:22:01,520

we don't contaminate the vehicle

641

00:22:05,350 --> 00:22:03,360

once the astronauts are strapped in

642

00:22:07,110 --> 00:22:05,360

place and safe the entire area will

643

00:22:08,870 --> 00:22:07,120

again be cleared of all personnel

644

00:22:10,310 --> 00:22:08,880

except those on board of course this

645

00:22:11,990 --> 00:22:10,320

crew access arm will be swung

646

00:22:13,909 --> 00:22:12,000

out of the way of the rocket and a

647

00:22:17,190 --> 00:22:13,919

t-minus zero the engines ignite

648

00:22:18,870 --> 00:22:17,200

and we're off okay i was just about

649

00:22:21,270 --> 00:22:18,880

ready to jump out of my seat and go

650

00:22:23,830 --> 00:22:21,280

check out these videos myself

651  
00:22:25,510 --> 00:22:23,840  
it is it is so cool and i'm sure um

652  
00:22:27,350 --> 00:22:25,520  
being at the facility is much different

653  
00:22:28,470 --> 00:22:27,360  
but as you mentioned earlier this is the

654  
00:22:30,630 --> 00:22:28,480  
next best thing

655  
00:22:31,510 --> 00:22:30,640  
being able to um you know view these

656  
00:22:33,590 --> 00:22:31,520  
facilities

657  
00:22:35,510 --> 00:22:33,600  
at every at any angle that you would

658  
00:22:36,630 --> 00:22:35,520  
like to just for the experience and

659  
00:22:38,950 --> 00:22:36,640  
understanding

660  
00:22:39,990 --> 00:22:38,960  
um what all it's made up of as these

661  
00:22:41,750 --> 00:22:40,000  
guys work and

662  
00:22:44,230 --> 00:22:41,760  
and get ready to put this rocket

663  
00:22:46,149 --> 00:22:44,240

together to launch it so

664

00:22:47,990 --> 00:22:46,159

with that rachel um definitely want to

665

00:22:48,549 --> 00:22:48,000

thank you for um sitting down with us

666

00:22:49,990 --> 00:22:48,559

today

667

00:22:52,070 --> 00:22:50,000

and telling us about all these

668

00:22:54,390 --> 00:22:52,080

facilities that um that you visited

669

00:22:56,870 --> 00:22:54,400

obviously that little bug was excited as

670

00:22:58,870 --> 00:22:56,880

well flying across my face there

671

00:23:00,710 --> 00:22:58,880

um but in any case thank you um again

672

00:23:00,950 --> 00:23:00,720

for for sharing that experience with us

673

00:23:10,870 --> 00:23:00,960

and

674

00:23:12,870 --> 00:23:10,880

some of the things that nasa has going

675

00:23:13,830 --> 00:23:12,880

on behind the scenes that folks at home

676  
00:23:16,310 --> 00:23:13,840  
can get involved

677  
00:23:17,029 --> 00:23:16,320  
involved in so um definitely appreciate

678  
00:23:20,870 --> 00:23:17,039  
that

679  
00:23:22,549 --> 00:23:20,880  
and close it out

680  
00:23:24,710 --> 00:23:22,559  
folks um i want to remind you that at 10

681  
00:23:25,270 --> 00:23:24,720  
o'clock we do have our last show of the

682  
00:23:32,630 --> 00:23:25,280  
day

683  
00:23:35,190 --> 00:23:32,640  
um so in just a few hours from now we'll

684  
00:23:37,669 --> 00:23:35,200  
have an opportunity to view

685  
00:23:38,630 --> 00:23:37,679  
the launch um on of two american

686  
00:23:41,830 --> 00:23:38,640  
astronauts

687  
00:23:43,669 --> 00:23:41,840  
on an american space uh you know rocket

688  
00:23:45,510 --> 00:23:43,679

i'm launching from american soi uh

689

00:23:46,230 --> 00:23:45,520

american soil so thank you again for for

690

00:23:48,789 --> 00:23:46,240

joining us

691

00:23:50,070 --> 00:23:48,799

and philip thank you for riding along um

692

00:23:52,870 --> 00:23:50,080

and folks please keep your

693

00:23:53,110 --> 00:23:52,880

uh your questions coming in check out

694

00:24:02,630 --> 00:23:53,120

the

695

00:24:04,070 --> 00:24:02,640

and indulge you know really get to know

696

00:24:06,070 --> 00:24:04,080

and understand everything that we

697

00:24:07,350 --> 00:24:06,080

do and we thank you again for riding