
THE NORTH FACE

1
00:00:06,950 --> 00:00:05,670
good morning welcome to nasa's kennedy

2
00:00:09,750 --> 00:00:06,960
space center

3
00:00:11,990 --> 00:00:09,760
we're a day before launch of the orbital

4
00:00:13,990 --> 00:00:12,000
atk cygnus going to the international

5
00:00:15,110 --> 00:00:14,000
space station carrying cargo

6
00:00:17,349 --> 00:00:15,120
we're going to do a little bit of a deep

7
00:00:19,429 --> 00:00:17,359
dive today into it in order to explore

8
00:00:20,550 --> 00:00:19,439
what's on board how we're launching it

9
00:00:22,310 --> 00:00:20,560
what the launch tomorrow night is

10
00:00:23,750 --> 00:00:22,320
looking tomorrow afternoon is looking

11
00:00:25,349 --> 00:00:23,760
forward to

12
00:00:26,710 --> 00:00:25,359
and also some of the other items that

13
00:00:28,150 --> 00:00:26,720

are going on on the international space

14
00:00:29,349 --> 00:00:28,160
station

15
00:00:31,029 --> 00:00:29,359
for those of you who are joining us

16
00:00:32,630 --> 00:00:31,039
online we invite you to follow along on

17
00:00:36,150 --> 00:00:32,640
the conversation during today's nasa

18
00:00:37,990 --> 00:00:36,160
social using the hashtag nasasocial

19
00:00:40,310 --> 00:00:38,000
you can also follow along on at nasa

20
00:00:42,150 --> 00:00:40,320
during live launch coverage tomorrow and

21
00:00:43,510 --> 00:00:42,160
you can follow at nasa social to follow

22
00:00:44,869 --> 00:00:43,520
along with the entire event as we'll be

23
00:00:46,950 --> 00:00:44,879
highlighting some of the best social

24
00:00:48,310 --> 00:00:46,960
media posts from our social media

25
00:00:51,029 --> 00:00:48,320
followers who are here in the audience

26
00:00:54,470 --> 00:00:53,029
tomorrow night for launch coverage you

27
00:00:56,549 --> 00:00:54,480
can follow along using the hashtag

28
00:00:59,349 --> 00:00:56,559
cygnus and you can also follow our

29
00:01:02,310 --> 00:00:59,359
partners who are launching at ula launch

30
00:01:04,070 --> 00:01:02,320
and at orbital atk

31
00:01:05,509 --> 00:01:04,080
during today's briefing if you have a

32
00:01:07,350 --> 00:01:05,519
question that you'd like to ask of

33
00:01:11,990 --> 00:01:07,360
anyone here on the panel please ask it

34
00:01:13,429 --> 00:01:12,000
using the hashtag ask nasa

35
00:01:15,270 --> 00:01:13,439
without further ado though we'll jump

36
00:01:17,190 --> 00:01:15,280
right into it and we'll get started with

37
00:01:18,870 --> 00:01:17,200
a briefing from the weather officer from

38
00:01:23,429 --> 00:01:18,880

the 45th weather squadron of the united

39
00:01:27,749 --> 00:01:24,830
good morning

40
00:01:31,030 --> 00:01:27,759
everyone weather is kind of a good news

41
00:01:32,469 --> 00:01:31,040
bad news good news story so starting off

42
00:01:34,310 --> 00:01:32,479
with the good news

43
00:01:36,630 --> 00:01:34,320
we've had high pressure over the top of

44
00:01:37,590 --> 00:01:36,640
us for the last several days

45
00:01:39,270 --> 00:01:37,600
we've had

46
00:01:40,710 --> 00:01:39,280
rain showers moving through that

47
00:01:42,550 --> 00:01:40,720
easterly flow pattern with a high

48
00:01:44,469 --> 00:01:42,560
pressure up to our north so maybe a

49
00:01:47,030 --> 00:01:44,479
scattered shower here there the last few

50
00:01:49,429 --> 00:01:47,040
days overall great conditions

51
00:01:50,870 --> 00:01:49,439
the bad news is kind of coming though at

52
00:01:52,310 --> 00:01:50,880
this time the high pressure's starting

53
00:01:54,310 --> 00:01:52,320
to retreat it's going to retreat

54
00:01:55,910 --> 00:01:54,320
throughout the day and we got a frontal

55
00:01:57,830 --> 00:01:55,920
boundary that's extending from the ohio

56
00:01:58,950 --> 00:01:57,840
valley region in fact if we take a look

57
00:02:00,389 --> 00:01:58,960
at the satellite we can bring it up and

58
00:02:02,149 --> 00:02:00,399
kind of take a look at it it looks

59
00:02:03,749 --> 00:02:02,159
pretty ominous you can see that frontal

60
00:02:05,429 --> 00:02:03,759
boundary and all the clouds associated

61
00:02:07,030 --> 00:02:05,439
with it extending from

62
00:02:09,510 --> 00:02:07,040
the ohio valley region down through

63
00:02:11,510 --> 00:02:09,520

texas all the yellows and reds are all

64
00:02:13,110 --> 00:02:11,520
the real high clouds and a lot of

65
00:02:15,030 --> 00:02:13,120
thunderstorms and heavy rain showers

66
00:02:16,070 --> 00:02:15,040
that are associated with that system so

67
00:02:17,750 --> 00:02:16,080
you can see those showers and

68
00:02:20,070 --> 00:02:17,760
thunderstorms kind of extending down

69
00:02:22,229 --> 00:02:20,080
through the louisiana area and right now

70
00:02:24,550 --> 00:02:22,239
louisiana has quite a few thunderstorms

71
00:02:26,390 --> 00:02:24,560
and rain showers going on as far as

72
00:02:28,550 --> 00:02:26,400
florida we're still underneath that high

73
00:02:30,309 --> 00:02:28,560
pressure system brief shower in cocoa

74
00:02:32,390 --> 00:02:30,319
beach this morning but overall we're

75
00:02:34,229 --> 00:02:32,400
under high pressure yet and still pretty

76
00:02:36,550 --> 00:02:34,239
decent conditions just some scattered

77
00:02:38,390 --> 00:02:36,560
clouds out there as that as the day

78
00:02:40,390 --> 00:02:38,400
wears on that high pressure system is

79
00:02:42,229 --> 00:02:40,400
going to retreat the frontal boundary is

80
00:02:44,070 --> 00:02:42,239
going to move through our area and we're

81
00:02:45,350 --> 00:02:44,080
expecting that to move through us

82
00:02:47,350 --> 00:02:45,360
sometime around the mornings when the

83
00:02:48,790 --> 00:02:47,360
surface front will actually move through

84
00:02:50,390 --> 00:02:48,800
so the surface front comes through here

85
00:02:52,470 --> 00:02:50,400
early morning thursday morning somewhere

86
00:02:54,470 --> 00:02:52,480
around the 4 o'clock in the morning time

87
00:02:56,309 --> 00:02:54,480
frame as it does we're going to

88
00:02:58,869 --> 00:02:56,319

transition from this high pressure nice

89
00:03:01,110 --> 00:02:58,879
conditions to more cloudy skies and some

90
00:03:02,390 --> 00:03:01,120
rain showers the good news part of the

91
00:03:04,470 --> 00:03:02,400
good news story

92
00:03:06,229 --> 00:03:04,480
is that during roll this morning we're

93
00:03:07,670 --> 00:03:06,239
looking at favorable conditions so the

94
00:03:09,830 --> 00:03:07,680
winds are going to be out of the south

95
00:03:11,750 --> 00:03:09,840
rather light and we're not expecting any

96
00:03:13,670 --> 00:03:11,760
shower activity or thunderstorm activity

97
00:03:14,949 --> 00:03:13,680
for the roll over the next couple hours

98
00:03:16,869 --> 00:03:14,959
so that's not going to affect the role

99
00:03:18,229 --> 00:03:16,879
whatsoever but somewhere around the 3

100
00:03:20,309 --> 00:03:18,239
o'clock time frame we'll start to see

101
00:03:21,750 --> 00:03:20,319
those showers work their way in maybe an

102
00:03:23,270 --> 00:03:21,760
isolated thunderstorm i think most of

103
00:03:24,309 --> 00:03:23,280
the thunderstorms are going to be kind

104
00:03:25,910 --> 00:03:24,319
of up to the north and they're going to

105
00:03:27,110 --> 00:03:25,920
be late in the day so i think we're

106
00:03:28,949 --> 00:03:27,120
going to kind of stay away from the

107
00:03:30,710 --> 00:03:28,959
thunderstorm activity but we will have

108
00:03:32,309 --> 00:03:30,720
some showers move through the area i

109
00:03:33,830 --> 00:03:32,319
think around two o'clock three o'clock

110
00:03:35,350 --> 00:03:33,840
in the morning we'll start to see it

111
00:03:37,350 --> 00:03:35,360
clear up so that's kind of the bad news

112
00:03:38,229 --> 00:03:37,360
part of the story back to a good news

113
00:03:40,390 --> 00:03:38,239

part

114
00:03:42,550 --> 00:03:40,400
uh tomorrow is going to look favorable

115
00:03:44,309 --> 00:03:42,560
uh this the front will move to the south

116
00:03:47,030 --> 00:03:44,319
of the the launch area we're expecting

117
00:03:48,470 --> 00:03:47,040
it somewhere around the lake okeechobee

118
00:03:49,670 --> 00:03:48,480
region somewhere in there

119
00:03:51,430 --> 00:03:49,680
and we're just going to be dealing with

120
00:03:52,789 --> 00:03:51,440
some residual moisture the upper level

121
00:03:54,229 --> 00:03:52,799
part of the system will still be off to

122
00:03:55,910 --> 00:03:54,239
our west and that's kind of what's

123
00:03:57,110 --> 00:03:55,920
keeping it from a really really good

124
00:03:59,350 --> 00:03:57,120
story

125
00:04:01,270 --> 00:03:59,360
that upper level trough out to the west

126
00:04:03,190 --> 00:04:01,280
and the front down to our south we'll

127
00:04:04,630 --> 00:04:03,200
have some clouds in the area so we're

128
00:04:06,630 --> 00:04:04,640
looking at scattered clouds in the low

129
00:04:08,869 --> 00:04:06,640
levels some broken clouds in the mid

130
00:04:10,470 --> 00:04:08,879
levels and some broken conditions in the

131
00:04:12,470 --> 00:04:10,480
upper level so we'll have some cloudy

132
00:04:13,350 --> 00:04:12,480
conditions and maybe some showers around

133
00:04:15,110 --> 00:04:13,360
especially if you're looking at the

134
00:04:16,550 --> 00:04:15,120
radar tomorrow they're going to be down

135
00:04:19,349 --> 00:04:16,560
to the south so we're going to kind of

136
00:04:20,949 --> 00:04:19,359
keep an eye on that as a result of that

137
00:04:23,350 --> 00:04:20,959
we're looking at three rules that we're

138
00:04:25,030 --> 00:04:23,360

evaluating the disturbed weather rule

139
00:04:26,629 --> 00:04:25,040
the cumulus cloud rule and the thick

140
00:04:28,550 --> 00:04:26,639
cloud rule those are our main rules that

141
00:04:30,629 --> 00:04:28,560
we're concerned with for violating

142
00:04:32,629 --> 00:04:30,639
launch constraints tomorrow and right

143
00:04:34,629 --> 00:04:32,639
now we're at a 40 percent chance of

144
00:04:36,150 --> 00:04:34,639
violating launch constraints so we've

145
00:04:37,830 --> 00:04:36,160
got a 60 percent chance to go that's

146
00:04:40,230 --> 00:04:37,840
what's the good story part is we're

147
00:04:41,670 --> 00:04:40,240
above 50 that's good so we're going to

148
00:04:43,350 --> 00:04:41,680
kind of keep an eye on that and watch

149
00:04:45,350 --> 00:04:43,360
that front move through tonight we'll

150
00:04:47,430 --> 00:04:45,360
see the showers move in start to clear

151
00:04:49,189 --> 00:04:47,440
in the morning time frame watch it all

152
00:04:50,870 --> 00:04:49,199
slide to the south and then we'll see

153
00:04:52,390 --> 00:04:50,880
how much those clouds are left over by

154
00:04:53,590 --> 00:04:52,400
the time we get to launch time tomorrow

155
00:04:55,350 --> 00:04:53,600
afternoon

156
00:04:57,830 --> 00:04:55,360
in the event we do happen to slip for

157
00:05:00,150 --> 00:04:57,840
whatever reason and it goes further the

158
00:05:01,670 --> 00:05:00,160
front will go further south in into

159
00:05:04,070 --> 00:05:01,680
southern florida and maybe even into the

160
00:05:06,310 --> 00:05:04,080
bahamas by the time we get uh to the

161
00:05:07,909 --> 00:05:06,320
friday time frame but we got some upper

162
00:05:10,469 --> 00:05:07,919
level impulses kind of moving through

163
00:05:11,749 --> 00:05:10,479

the flow as we go through friday so

164
00:05:13,189 --> 00:05:11,759
we're going to see some more shower

165
00:05:15,189 --> 00:05:13,199
activity and still some clouds in the

166
00:05:17,670 --> 00:05:15,199
area so i think we're going to see about

167
00:05:19,670 --> 00:05:17,680
a probability of violation of 60 percent

168
00:05:21,670 --> 00:05:19,680
as we go through friday for violating

169
00:05:23,110 --> 00:05:21,680
launch constraints on friday afternoon

170
00:05:25,189 --> 00:05:23,120
and it's the same rules disturbed

171
00:05:26,870 --> 00:05:25,199
weather rule the thick cloud rule and

172
00:05:29,749 --> 00:05:26,880
the cumulus cloud rule will be our main

173
00:05:31,510 --> 00:05:29,759
concerns so overall it's a good news bad

174
00:05:33,590 --> 00:05:31,520
news good news story i think we got a

175
00:05:34,710 --> 00:05:33,600
great chance weather-wise to launch

176
00:05:36,310 --> 00:05:34,720
tomorrow and we'll just watch those

177
00:05:38,550 --> 00:05:36,320
three rules and see

178
00:05:39,909 --> 00:05:38,560
how the atmosphere reacts over the next

179
00:05:42,070 --> 00:05:39,919
few days

180
00:05:42,950 --> 00:05:42,080
any questions

181
00:05:46,710 --> 00:05:42,960
just raise your hand if you have a

182
00:05:50,310 --> 00:05:48,950
oh this is an easy crowd thanks

183
00:05:52,230 --> 00:05:50,320
one question down here there we go

184
00:05:53,830 --> 00:05:52,240
you're gonna ruin it what percentage do

185
00:05:55,590 --> 00:05:53,840
you guys start considering uh

186
00:05:57,749 --> 00:05:55,600
rescheduling the launch

187
00:05:59,830 --> 00:05:57,759
well normally that's up to the launch uh

188
00:06:01,350 --> 00:05:59,840

directors and launch authorities uh we

189
00:06:02,230 --> 00:06:01,360
provide them the weather

190
00:06:03,350 --> 00:06:02,240
and

191
00:06:04,950 --> 00:06:03,360
it kind of depends on the weather

192
00:06:06,629 --> 00:06:04,960
situation most of the time we go into

193
00:06:07,270 --> 00:06:06,639
the count even if we're high probability

194
00:06:09,270 --> 00:06:07,280
of

195
00:06:10,870 --> 00:06:09,280
violating launch constraints sometimes

196
00:06:12,230 --> 00:06:10,880
you know how the weather is

197
00:06:13,749 --> 00:06:12,240
sometimes it can be kind of fickle we

198
00:06:15,670 --> 00:06:13,759
can find that hole where we're not

199
00:06:16,550 --> 00:06:15,680
violating the constraints and we can

200
00:06:18,790 --> 00:06:16,560
actually

201
00:06:21,270 --> 00:06:18,800
maybe get a window just long enough to

202
00:06:23,990 --> 00:06:21,280
launch so most of the time we actually

203
00:06:25,590 --> 00:06:24,000
go and start the count and we wind down

204
00:06:27,430 --> 00:06:25,600
and see how the weather's reacting as we

205
00:06:29,029 --> 00:06:27,440
go through the count and then the launch

206
00:06:30,469 --> 00:06:29,039
decision authority will

207
00:06:32,230 --> 00:06:30,479
make the decision as we're going through

208
00:06:34,309 --> 00:06:32,240
the count we've had opportunities where

209
00:06:36,629 --> 00:06:34,319
we've had tropical storms in the region

210
00:06:38,790 --> 00:06:36,639
and we come in higher probability of

211
00:06:40,390 --> 00:06:38,800
violating constraints the weather's bad

212
00:06:42,550 --> 00:06:40,400
and you can just tell that it's not not

213
00:06:44,230 --> 00:06:42,560

going to lift and they'll they'll stop

214
00:06:46,390 --> 00:06:44,240
the launch or stop the countdown early

215
00:06:47,749 --> 00:06:46,400
and we'll scrub to another day

216
00:06:49,029 --> 00:06:47,759
other times we'll go all the way down to

217
00:06:50,870 --> 00:06:49,039
the count and see if we can get that

218
00:06:52,710 --> 00:06:50,880
that launch opportunity and get that

219
00:06:55,110 --> 00:06:52,720
hole in the weather so it'll all depend

220
00:06:57,110 --> 00:06:55,120
on on how the weather plays out and what

221
00:06:59,029 --> 00:06:57,120
the launch authorities decide as we go

222
00:07:02,550 --> 00:06:59,039
through the count

223
00:07:03,830 --> 00:07:02,560
excellent one more question here

224
00:07:05,909 --> 00:07:03,840
so what sort of tools are at your

225
00:07:07,510 --> 00:07:05,919
disposal for the localized forecasting i

226
00:07:08,790 --> 00:07:07,520
know you have a general regional

227
00:07:10,950 --> 00:07:08,800
forecast but

228
00:07:14,070 --> 00:07:10,960
it's local really important for this so

229
00:07:15,270 --> 00:07:14,080
yes yes we have a very wide array of

230
00:07:19,350 --> 00:07:15,280
weather systems

231
00:07:20,870 --> 00:07:19,360
issue here is lightning so in the

232
00:07:23,510 --> 00:07:20,880
summertime

233
00:07:26,070 --> 00:07:23,520
we have lightning here at ksc 50 of the

234
00:07:27,830 --> 00:07:26,080
time so on monday you have lightning on

235
00:07:28,790 --> 00:07:27,840
tuesday it's probably about 10 miles

236
00:07:30,710 --> 00:07:28,800
away

237
00:07:32,629 --> 00:07:30,720
so most of our unique equipment is

238
00:07:33,990 --> 00:07:32,639

focused on lightning so we have a

239
00:07:36,309 --> 00:07:34,000
three-dimensional lightning mapping

240
00:07:38,070 --> 00:07:36,319
array system that we can actually see

241
00:07:40,629 --> 00:07:38,080
inter-cloud lightning and we have our

242
00:07:41,990 --> 00:07:40,639
own cloud-to-ground system also that

243
00:07:44,070 --> 00:07:42,000
shows us where the the actual

244
00:07:46,710 --> 00:07:44,080
cloud-to-ground lightning strokes hit

245
00:07:49,110 --> 00:07:46,720
the land and and where they occur

246
00:07:51,189 --> 00:07:49,120
we also have a field mill system it's an

247
00:07:52,469 --> 00:07:51,199
electric field mill system it actually

248
00:07:54,710 --> 00:07:52,479
measures the

249
00:07:55,909 --> 00:07:54,720
electric field in the atmosphere

250
00:07:58,469 --> 00:07:55,919
one thing that we're worried about is

251
00:08:00,070 --> 00:07:58,479
natural lightning of course but when a

252
00:08:02,150 --> 00:08:00,080
lot of folks don't realize is we also

253
00:08:03,749 --> 00:08:02,160
worry about triggered lightning so the

254
00:08:05,189 --> 00:08:03,759
electric field mills tell us when the

255
00:08:07,110 --> 00:08:05,199
electric field in the atmosphere gets

256
00:08:09,110 --> 00:08:07,120
high enough and it's high enough not to

257
00:08:10,230 --> 00:08:09,120
cause a natural lightning strike or

258
00:08:12,629 --> 00:08:10,240
stroke

259
00:08:13,909 --> 00:08:12,639
but it actually is high enough that once

260
00:08:15,430 --> 00:08:13,919
you introduce a rocket into that

261
00:08:17,589 --> 00:08:15,440
atmosphere it will trigger a lightning

262
00:08:19,189 --> 00:08:17,599
stroke and you actually get a lightning

263
00:08:21,270 --> 00:08:19,199

stroke that hits the rocket and damages

264
00:08:23,189 --> 00:08:21,280
the rocket so we have a field mill

265
00:08:24,830 --> 00:08:23,199
system that's very unique to us also

266
00:08:26,950 --> 00:08:24,840
that provides us that

267
00:08:29,029 --> 00:08:26,960
information excellent we've got time for

268
00:08:30,950 --> 00:08:29,039
one more question here

269
00:08:33,430 --> 00:08:30,960
hi uh i have a question coming in from

270
00:08:35,430 --> 00:08:33,440
my audience uh brett walsh wants to know

271
00:08:37,670 --> 00:08:35,440
how many launches there were already

272
00:08:39,430 --> 00:08:37,680
this year

273
00:08:42,310 --> 00:08:39,440
i'm going to have to defer that one i'm

274
00:08:44,389 --> 00:08:42,320
not sure exactly the the count as far as

275
00:08:46,710 --> 00:08:44,399
launches this year um sorry i don't have

276
00:08:47,910 --> 00:08:46,720
the answer to that one

277
00:08:50,070 --> 00:08:47,920
not a problem we'll work to get you an

278
00:08:51,430 --> 00:08:50,080
answer here so

279
00:08:53,190 --> 00:08:51,440
all right so we're hoping for a good

280
00:08:54,630 --> 00:08:53,200
news story tomorrow with the weather and

281
00:08:56,230 --> 00:08:54,640
those good news are hopefully going to

282
00:08:58,389 --> 00:08:56,240
become even more good news as the day

283
00:09:05,590 --> 00:08:58,399
goes on tomorrow so definitely thank you

284
00:09:08,230 --> 00:09:06,870
up next here we're going to hear from

285
00:09:09,590 --> 00:09:08,240
the deputy chief scientist for the

286
00:09:10,870 --> 00:09:09,600
international space station here to tell

287
00:09:12,710 --> 00:09:10,880
us a little about the international

288
00:09:14,310 --> 00:09:12,720

space station program and some of the

289
00:09:16,470 --> 00:09:14,320
science that's going to be uh you know

290
00:09:18,630 --> 00:09:16,480
going up this time on the cygnus

291
00:09:21,670 --> 00:09:18,640
spacecraft so without any further ado

292
00:09:25,350 --> 00:09:21,680
here is dr kurt costello welcome

293
00:09:29,990 --> 00:09:27,430
is this on okay great

294
00:09:30,949 --> 00:09:30,000
hello everybody how are you doing today

295
00:09:32,070 --> 00:09:30,959
good

296
00:09:33,829 --> 00:09:32,080
um

297
00:09:36,870 --> 00:09:33,839
first of all i'm here to talk about the

298
00:09:37,829 --> 00:09:36,880
iss and the iss is an interesting nasa

299
00:09:40,790 --> 00:09:37,839
vehicle

300
00:09:41,750 --> 00:09:40,800
nasa is in the game of space exploration

301
00:09:43,590 --> 00:09:41,760
and

302
00:09:46,070 --> 00:09:43,600
the iss is an interesting vehicle

303
00:09:47,750 --> 00:09:46,080
because it's one of the only vehicles

304
00:09:49,030 --> 00:09:47,760
we've designed that really has multiple

305
00:09:50,949 --> 00:09:49,040
missions

306
00:09:53,509 --> 00:09:50,959
it's not just there to further our

307
00:09:55,750 --> 00:09:53,519
exploration goals but it's also there as

308
00:09:58,070 --> 00:09:55,760
a national laboratory so what that means

309
00:10:01,190 --> 00:09:58,080
for us is we want to get the science

310
00:10:03,509 --> 00:10:01,200
there to be able to capitalize on

311
00:10:05,670 --> 00:10:03,519
the opportunities in that special

312
00:10:08,069 --> 00:10:05,680
environment of low earth orbit

313
00:10:09,590 --> 00:10:08,079

and perform that science get the results

314
00:10:11,990 --> 00:10:09,600
back down to the ground so they can

315
00:10:14,790 --> 00:10:12,000
benefit us here on earth

316
00:10:16,389 --> 00:10:14,800
so again we've got multiple reasons

317
00:10:18,470 --> 00:10:16,399
for the iss

318
00:10:20,949 --> 00:10:18,480
one we want to use it to advance our

319
00:10:22,949 --> 00:10:20,959
human space flight exploration goals

320
00:10:25,670 --> 00:10:22,959
two we want to use it as a national

321
00:10:29,030 --> 00:10:25,680
laboratory to benefit us here on earth

322
00:10:31,269 --> 00:10:29,040
we want to establish a lower earth orbit

323
00:10:32,550 --> 00:10:31,279
marketplace for the follow-on for

324
00:10:34,230 --> 00:10:32,560
station

325
00:10:35,910 --> 00:10:34,240
and we also

326
00:10:37,750 --> 00:10:35,920
want to use it to help foster those

327
00:10:39,590 --> 00:10:37,760
international relationships that we have

328
00:10:41,670 --> 00:10:39,600
aboard space station

329
00:10:43,590 --> 00:10:41,680
and one of the best examples although

330
00:10:45,910 --> 00:10:43,600
not international of that coming up in

331
00:10:48,710 --> 00:10:45,920
this oa4 launch is we even have two

332
00:10:50,230 --> 00:10:48,720
college rivals flying together

333
00:10:53,110 --> 00:10:50,240
we've got

334
00:10:56,790 --> 00:10:53,120
texas a m and all and

335
00:10:59,190 --> 00:10:56,800
ut flying a satellite together so that

336
00:11:02,069 --> 00:10:59,200
that's an amazing thing right there so

337
00:11:02,870 --> 00:11:02,079
who knows what can happen in space

338
00:11:04,630 --> 00:11:02,880

so

339
00:11:06,550 --> 00:11:04,640
i want to talk a little bit about

340
00:11:08,230 --> 00:11:06,560
exploration and science because there

341
00:11:09,990 --> 00:11:08,240
are two

342
00:11:12,389 --> 00:11:10,000
tasks and goals that are really tied

343
00:11:13,750 --> 00:11:12,399
well to another to one another if you

344
00:11:15,590 --> 00:11:13,760
think about it

345
00:11:18,069 --> 00:11:15,600
you can look at it in a context of

346
00:11:19,829 --> 00:11:18,079
maritime exploration if you go back to

347
00:11:23,190 --> 00:11:19,839
the days of captain cook around the

348
00:11:25,509 --> 00:11:23,200
1780s he was sailing the south pacific

349
00:11:28,150 --> 00:11:25,519
discovering south pacific islands that's

350
00:11:30,069 --> 00:11:28,160
really a discovery phase he's out there

351
00:11:32,389 --> 00:11:30,079
exploring the unknown charting it and

352
00:11:35,350 --> 00:11:32,399
bringing it back it took another 50

353
00:11:36,550 --> 00:11:35,360
years before charles darwin then flew

354
00:11:38,230 --> 00:11:36,560
and then

355
00:11:40,069 --> 00:11:38,240
took his ship

356
00:11:42,150 --> 00:11:40,079
to the galapagos islands and that's

357
00:11:43,990 --> 00:11:42,160
where he got a lot of his theory behind

358
00:11:45,990 --> 00:11:44,000
the theory of evolution

359
00:11:49,269 --> 00:11:46,000
so science usually follows on

360
00:11:52,150 --> 00:11:49,279
exploration but it does take some time

361
00:11:53,990 --> 00:11:52,160
the iss is a great example of that nasa

362
00:11:56,310 --> 00:11:54,000
has been creating space vehicles to do

363
00:11:58,310 --> 00:11:56,320

its exploring for years and now we

364
00:12:00,710 --> 00:11:58,320
finally have a full-fledged laboratory

365
00:12:03,350 --> 00:12:00,720
in space it's a multi-disciplinary

366
00:12:06,230 --> 00:12:03,360
laboratory and its capabilities are like

367
00:12:09,269 --> 00:12:06,240
no national lab on earth

368
00:12:11,590 --> 00:12:09,279
we go into space for a couple reasons

369
00:12:13,269 --> 00:12:11,600
primarily we're there in low earth orbit

370
00:12:14,629 --> 00:12:13,279
looking at the microgravity environment

371
00:12:17,030 --> 00:12:14,639
things happen differently in the

372
00:12:19,670 --> 00:12:17,040
microgravity environment when you null

373
00:12:21,509 --> 00:12:19,680
out the acceleration due to gravity

374
00:12:23,829 --> 00:12:21,519
you get rid of things like buoyancy

375
00:12:26,629 --> 00:12:23,839
driven convection that changes the way

376
00:12:28,470 --> 00:12:26,639
fluids and air flow

377
00:12:31,350 --> 00:12:28,480
that's important in everything from

378
00:12:33,350 --> 00:12:31,360
living cells to the human body and into

379
00:12:35,430 --> 00:12:33,360
materials processing and fluid

380
00:12:37,350 --> 00:12:35,440
processing later on you'll be hearing

381
00:12:39,590 --> 00:12:37,360
from dr model who'll talk about a little

382
00:12:42,310 --> 00:12:39,600
bit of the fluid processing that we're

383
00:12:43,430 --> 00:12:42,320
doing on space station

384
00:12:46,069 --> 00:12:43,440
so

385
00:12:49,030 --> 00:12:46,079
we go there to remove the gravity vector

386
00:12:51,350 --> 00:12:49,040
it makes it easier to model systems when

387
00:12:53,430 --> 00:12:51,360
you take away forces that lead to

388
00:12:55,750 --> 00:12:53,440

turbidity

389
00:12:57,990 --> 00:12:55,760
and other errors that are very difficult

390
00:13:02,069 --> 00:12:58,000
to calculate in in

391
00:13:06,389 --> 00:13:04,150
for the particular vantage point that

392
00:13:08,629 --> 00:13:06,399
the station gives us

393
00:13:10,870 --> 00:13:08,639
so from low earth orbit we cover about

394
00:13:12,230 --> 00:13:10,880
95 percent of the populated surface of

395
00:13:13,110 --> 00:13:12,240
the earth

396
00:13:15,190 --> 00:13:13,120
and

397
00:13:17,670 --> 00:13:15,200
from that vantage point we have a very

398
00:13:20,069 --> 00:13:17,680
good uh platform to look down at the

399
00:13:21,670 --> 00:13:20,079
earth and also to look out at the stars

400
00:13:24,230 --> 00:13:21,680
so we have a number of external

401
00:13:26,629 --> 00:13:24,240
experiments going on all the time

402
00:13:28,710 --> 00:13:26,639
some of them are focused down on the

403
00:13:29,590 --> 00:13:28,720
earth trying to determine things like

404
00:13:31,990 --> 00:13:29,600
weather

405
00:13:34,629 --> 00:13:32,000
carbon dioxide absorption

406
00:13:36,389 --> 00:13:34,639
other factors that play into our

407
00:13:39,670 --> 00:13:36,399
environment

408
00:13:42,470 --> 00:13:39,680
so the iss can benefit us on the ground

409
00:13:44,870 --> 00:13:42,480
in terms of disaster response

410
00:13:47,509 --> 00:13:44,880
being able to image areas because we do

411
00:13:49,750 --> 00:13:47,519
fly over them typically once every three

412
00:13:52,949 --> 00:13:49,760
days or so

413
00:13:56,069 --> 00:13:52,959

and it can also help us because it has a

414
00:13:57,910 --> 00:13:56,079
platform that provides power data other

415
00:13:59,750 --> 00:13:57,920
services that normally would be

416
00:14:01,590 --> 00:13:59,760
extremely expensive for a satellite

417
00:14:04,550 --> 00:14:01,600
developer to come up with

418
00:14:06,069 --> 00:14:04,560
and fl fly those on a free flying

419
00:14:08,470 --> 00:14:06,079
telescope say

420
00:14:10,949 --> 00:14:08,480
we can have external payloads attached

421
00:14:13,030 --> 00:14:10,959
to our external payload sites hook up

422
00:14:14,310 --> 00:14:13,040
the to those utilities and then be able

423
00:14:16,310 --> 00:14:14,320
to fly

424
00:14:17,670 --> 00:14:16,320
experimental packages much cheaper than

425
00:14:19,509 --> 00:14:17,680
you can if you have to develop the

426
00:14:21,269 --> 00:14:19,519
entire platform

427
00:14:24,069 --> 00:14:21,279
so again what we're trying to do is open

428
00:14:26,629 --> 00:14:24,079
up the station not only to the

429
00:14:30,310 --> 00:14:26,639
traditional nasa exploration

430
00:14:32,710 --> 00:14:30,320
goals but also the commercial and and

431
00:14:35,590 --> 00:14:32,720
independent goals for research that

432
00:14:37,509 --> 00:14:35,600
benefits here on earth

433
00:14:38,790 --> 00:14:37,519
okay

434
00:14:41,509 --> 00:14:38,800
so i just want to leave you with a

435
00:14:44,069 --> 00:14:41,519
couple examples of the the benefits that

436
00:14:46,629 --> 00:14:44,079
we're returning first comes from protein

437
00:14:49,269 --> 00:14:46,639
crystallization so again in the that

438
00:14:51,189 --> 00:14:49,279

fluid and phase change dynamic we're

439
00:14:53,269 --> 00:14:51,199
flying protein

440
00:14:56,310 --> 00:14:53,279
solutions to station

441
00:14:59,430 --> 00:14:56,320
and those solutions crystallize

442
00:15:01,189 --> 00:14:59,440
once they're left to to sit they do this

443
00:15:02,870 --> 00:15:01,199
more slowly in microgravity because

444
00:15:05,350 --> 00:15:02,880
again you don't have this convection

445
00:15:07,110 --> 00:15:05,360
driven buoyancy particles settle out

446
00:15:09,350 --> 00:15:07,120
more slowly and what that leads to are

447
00:15:11,829 --> 00:15:09,360
more perfect crystals because you don't

448
00:15:14,310 --> 00:15:11,839
include all the impurities in the

449
00:15:15,910 --> 00:15:14,320
crystal as it crystallizes this can lead

450
00:15:17,990 --> 00:15:15,920
to better resolution when we get the

451
00:15:20,150 --> 00:15:18,000
crystals back on the ground and do x-ray

452
00:15:21,910 --> 00:15:20,160
diffraction or neutron diffraction

453
00:15:23,670 --> 00:15:21,920
in one case this is leading to a

454
00:15:25,269 --> 00:15:23,680
potential therapy for duchenne's

455
00:15:27,350 --> 00:15:25,279
muscular dystrophy

456
00:15:30,790 --> 00:15:27,360
which is a disease that affects about

457
00:15:33,910 --> 00:15:30,800
one in five thousand boys born

458
00:15:36,389 --> 00:15:33,920
they're typically um bedridden or or in

459
00:15:38,790 --> 00:15:36,399
a wheelchair by age nine and typical

460
00:15:42,389 --> 00:15:38,800
life expectancy isn't more than twenty

461
00:15:44,550 --> 00:15:42,399
our ip partners at jaxa have come up

462
00:15:46,790 --> 00:15:44,560
with a potential therapy for this and

463
00:15:48,790 --> 00:15:46,800

they're now in phase 2 clinical trials

464
00:15:50,629 --> 00:15:48,800
and human testing if you're interested

465
00:15:52,230 --> 00:15:50,639
in that i'd suggest you go to their

466
00:15:54,069 --> 00:15:52,240
website if you know anybody with the

467
00:15:56,790 --> 00:15:54,079
disease they're looking for additional

468
00:16:00,230 --> 00:15:58,710
another potential benefit we're looking

469
00:16:01,590 --> 00:16:00,240
at why

470
00:16:03,509 --> 00:16:01,600
space flight

471
00:16:05,749 --> 00:16:03,519
participants our astronauts have vision

472
00:16:07,350 --> 00:16:05,759
changes over time this is crucial to

473
00:16:10,230 --> 00:16:07,360
understand as we go out further into

474
00:16:11,990 --> 00:16:10,240
into exploration what the impacts are

475
00:16:14,710 --> 00:16:12,000
going to be on our astronauts if they

476
00:16:15,829 --> 00:16:14,720
spend an extended period of time in

477
00:16:17,670 --> 00:16:15,839
micro g

478
00:16:19,430 --> 00:16:17,680
uh is it going to affect their eyesight

479
00:16:21,189 --> 00:16:19,440
to the point where vision becomes a

480
00:16:22,790 --> 00:16:21,199
problem on the surface of mars or an

481
00:16:24,870 --> 00:16:22,800
asteroid

482
00:16:26,550 --> 00:16:24,880
we're looking at investigations now that

483
00:16:28,389 --> 00:16:26,560
are trying to understand

484
00:16:30,550 --> 00:16:28,399
what are the causes for that is it

485
00:16:32,710 --> 00:16:30,560
related to the fluid shift that goes on

486
00:16:34,629 --> 00:16:32,720
in space because the fluid that normally

487
00:16:35,749 --> 00:16:34,639
collects in your legs

488
00:16:38,470 --> 00:16:35,759

moves

489
00:16:39,350 --> 00:16:38,480
upward in space with no gravity to pull

490
00:16:41,910 --> 00:16:39,360
it down

491
00:16:44,870 --> 00:16:41,920
and that can cause pressure on the

492
00:16:46,790 --> 00:16:44,880
in your skull and in the back your eyes

493
00:16:49,030 --> 00:16:46,800
so we're looking at causes for that and

494
00:16:50,870 --> 00:16:49,040
possible treatments for that one of the

495
00:16:53,509 --> 00:16:50,880
investigations we're doing now on the

496
00:16:55,590 --> 00:16:53,519
one-year crew is called fluid shifts and

497
00:16:56,870 --> 00:16:55,600
it's investigating not only the causes

498
00:16:59,829 --> 00:16:56,880
for this but also possible

499
00:17:04,549 --> 00:17:02,470
okay and last but not least i wanted to

500
00:17:06,710 --> 00:17:04,559
say again we've got those external

501
00:17:08,789 --> 00:17:06,720
investigations going on one of them

502
00:17:11,270 --> 00:17:08,799
right now is called rapidscat

503
00:17:13,350 --> 00:17:11,280
it's an ocean wind scatterometer and

504
00:17:16,309 --> 00:17:13,360
it's being used to track ocean winds

505
00:17:18,710 --> 00:17:16,319
particularly during hurricane season

506
00:17:20,309 --> 00:17:18,720
so we can get accurate mappings of the

507
00:17:22,549 --> 00:17:20,319
ocean wind vectors

508
00:17:24,789 --> 00:17:22,559
from space and those are being fed real

509
00:17:27,270 --> 00:17:24,799
time into noaa or near real time into

510
00:17:29,430 --> 00:17:27,280
know for hurricane prediction

511
00:17:33,110 --> 00:17:29,440
so again the space station is amazing

512
00:17:34,950 --> 00:17:33,120
place with multiple goals and uses and

513
00:17:37,350 --> 00:17:34,960

we encourage you if you know anybody who

514
00:17:39,190 --> 00:17:37,360
wants to use station to come approach us

515
00:17:40,630 --> 00:17:39,200
or our partners with the national lab

516
00:17:42,549 --> 00:17:40,640
cases

517
00:17:46,150 --> 00:17:42,559
thank you

518
00:17:49,430 --> 00:17:47,830
so who's got questions here if you're

519
00:17:51,350 --> 00:17:49,440
following along online you're welcome to

520
00:17:52,549 --> 00:17:51,360
ask a question using the hashtag asknasa

521
00:17:53,909 --> 00:17:52,559
and we've got someone here in the room

522
00:17:56,230 --> 00:17:53,919
who's gonna make sure that we get those

523
00:17:57,190 --> 00:17:56,240
up here to our panelists so uh first

524
00:17:58,230 --> 00:17:57,200
question we'll start down here in the

525
00:18:00,470 --> 00:17:58,240
front

526
00:18:02,950 --> 00:18:00,480
what type of progress is being made on

527
00:18:05,110 --> 00:18:02,960
uh sarcopenia and ostopine it's similar

528
00:18:06,789 --> 00:18:05,120
to the loss of vision

529
00:18:09,110 --> 00:18:06,799
mechanically i know that it's hard to

530
00:18:11,590 --> 00:18:09,120
exercise obviously in space and

531
00:18:13,270 --> 00:18:11,600
create a load on the on the skeletal

532
00:18:15,270 --> 00:18:13,280
system muscular system and i've been

533
00:18:17,270 --> 00:18:15,280
trying to read up on some of the online

534
00:18:18,950 --> 00:18:17,280
literature as to what progress is made

535
00:18:20,950 --> 00:18:18,960
there

536
00:18:23,510 --> 00:18:20,960
well as far as creating loads on the

537
00:18:25,750 --> 00:18:23,520
muscle system go we actually do have a

538
00:18:28,230 --> 00:18:25,760

device now called the a-red

539
00:18:30,230 --> 00:18:28,240
that is a resistive exercise device for

540
00:18:32,070 --> 00:18:30,240
the crew and it's actually extremely

541
00:18:34,710 --> 00:18:32,080
beneficial in their health regimen right

542
00:18:37,750 --> 00:18:34,720
now they exercise on it quite frequently

543
00:18:40,549 --> 00:18:37,760
and that is it has reduced

544
00:18:44,150 --> 00:18:40,559
almost to zero most of the issues that

545
00:18:47,190 --> 00:18:44,160
we have with muscle wasting and and bone

546
00:18:49,350 --> 00:18:47,200
density loss over time that and diet

547
00:18:51,669 --> 00:18:49,360
have really helped in those areas so

548
00:18:53,909 --> 00:18:51,679
there are um there are counter measures

549
00:18:57,190 --> 00:18:53,919
on board that's currently the risk

550
00:18:59,510 --> 00:18:57,200
posture that our human research program

551
00:19:01,590 --> 00:18:59,520
takes is to investigate not only the

552
00:19:03,990 --> 00:19:01,600
risk but also to develop counter

553
00:19:05,990 --> 00:19:04,000
measures for space flight

554
00:19:07,590 --> 00:19:06,000
what we're looking at in some of the

555
00:19:09,750 --> 00:19:07,600
increments coming up will be how to

556
00:19:11,669 --> 00:19:09,760
miniaturize those devices how to make

557
00:19:13,669 --> 00:19:11,679
them smaller such that you might be able

558
00:19:16,950 --> 00:19:13,679
to take them into an exploration class

559
00:19:18,310 --> 00:19:16,960
vehicle like the orion

560
00:19:20,950 --> 00:19:18,320
all right next questions over on that

561
00:19:24,710 --> 00:19:23,430
hi i got a question from patrice mack

562
00:19:26,710 --> 00:19:24,720
from canada

563
00:19:29,190 --> 00:19:26,720

who wants to know how do you test for

564
00:19:32,470 --> 00:19:29,200
vision changes

565
00:19:34,150 --> 00:19:32,480
uh we have an oct device on orbit we

566
00:19:38,549 --> 00:19:34,160
also use ultrasound

567
00:19:40,390 --> 00:19:38,559
to look at the back of the eye

568
00:19:46,710 --> 00:19:40,400
those tests are performed we get the

569
00:19:50,950 --> 00:19:48,710
can you talk at all about the logistics

570
00:19:52,870 --> 00:19:50,960
how you plan to keep things going on

571
00:19:54,390 --> 00:19:52,880
orbit when the supply chain stops even

572
00:19:55,669 --> 00:19:54,400
though it's briefly not just supplies

573
00:19:56,950 --> 00:19:55,679
but science

574
00:19:58,710 --> 00:19:56,960
that's a really good question and i'll

575
00:20:00,870 --> 00:19:58,720
answer it from the science side because

576
00:20:01,909 --> 00:20:00,880
that's that's what we do so every

577
00:20:03,909 --> 00:20:01,919
increment

578
00:20:05,510 --> 00:20:03,919
we look at all the potential science

579
00:20:08,070 --> 00:20:05,520
that wants to be done and what we're

580
00:20:10,149 --> 00:20:08,080
finding out now is that we have much

581
00:20:12,549 --> 00:20:10,159
more demand than we have capability

582
00:20:14,310 --> 00:20:12,559
either through crew time

583
00:20:17,270 --> 00:20:14,320
not quite at mass yet but definitely in

584
00:20:19,510 --> 00:20:17,280
crew time so what we do is we plan for

585
00:20:21,990 --> 00:20:19,520
an entire regiment of science that can

586
00:20:24,870 --> 00:20:22,000
be done in the prime crew time and then

587
00:20:27,990 --> 00:20:24,880
a very healthy list of reserve science

588
00:20:29,510 --> 00:20:28,000

so a science that is lower priority but

589
00:20:31,669 --> 00:20:29,520
we can get there because we have the up

590
00:20:33,029 --> 00:20:31,679
mass to do it and it can be operated if

591
00:20:35,430 --> 00:20:33,039
something happens

592
00:20:38,070 --> 00:20:35,440
that way if there ever is a skip cycle

593
00:20:39,990 --> 00:20:38,080
where we miss a launch or or can't get

594
00:20:42,310 --> 00:20:40,000
science to the station we still have

595
00:20:44,390 --> 00:20:42,320
science on board to continue and again a

596
00:20:46,149 --> 00:20:44,400
large part of our science is being done

597
00:20:48,630 --> 00:20:46,159
on the crew members

598
00:20:50,549 --> 00:20:48,640
they are the participants the subjects

599
00:20:52,310 --> 00:20:50,559
in a lot of these studies and as long as

600
00:20:55,350 --> 00:20:52,320
they're there there is significant

601
00:20:57,190 --> 00:20:55,360
science we can continue to do

602
00:21:00,149 --> 00:20:57,200
good great question

603
00:21:02,310 --> 00:21:00,159
yes hi eric brown with cosmic cafe show

604
00:21:04,310 --> 00:21:02,320
my question is with the international

605
00:21:06,470 --> 00:21:04,320
space station has there been talks or

606
00:21:07,430 --> 00:21:06,480
negotiations with china and their space

607
00:21:08,230 --> 00:21:07,440
program

608
00:21:13,110 --> 00:21:08,240
to

609
00:21:14,230 --> 00:21:13,120
thank you for your answer

610
00:21:16,230 --> 00:21:14,240
okay

611
00:21:19,669 --> 00:21:16,240
i will have to officially defer this one

612
00:21:22,230 --> 00:21:19,679
to headquarters but uh we don't have

613
00:21:24,149 --> 00:21:22,240

current uh negotiations with china going

614
00:21:25,190 --> 00:21:24,159
on right now

615
00:21:28,549 --> 00:21:25,200
all right we're gonna take a question

616
00:21:33,909 --> 00:21:29,909
uh what do we hope to learn from the

617
00:21:37,590 --> 00:21:35,990
the sable that

618
00:21:39,190 --> 00:21:37,600
sorry i'm i'm going to go into a little

619
00:21:42,070 --> 00:21:39,200
acronym ease there

620
00:21:44,789 --> 00:21:42,080
the sable is actually an incubator so it

621
00:21:46,870 --> 00:21:44,799
is a facility class device that we're

622
00:21:50,390 --> 00:21:46,880
sending up to the space station and it's

623
00:21:52,470 --> 00:21:50,400
going to enable future investigations so

624
00:21:54,390 --> 00:21:52,480
what that means is it's an incubator we

625
00:21:56,310 --> 00:21:54,400
send it up there you can put biological

626
00:21:58,390 --> 00:21:56,320
samples into it keep them at the right

627
00:22:01,510 --> 00:21:58,400
temperature the right gas

628
00:22:03,430 --> 00:22:01,520
combinations and you can also

629
00:22:06,310 --> 00:22:03,440
get video back and telemetry back from

630
00:22:08,710 --> 00:22:06,320
your experiment so the sable is going up

631
00:22:11,270 --> 00:22:08,720
on station to replace some of our older

632
00:22:13,510 --> 00:22:11,280
incubators and also to re-establish that

633
00:22:17,270 --> 00:22:13,520
capability to run multiple

634
00:22:19,590 --> 00:22:17,280
cell line samples tissue samples

635
00:22:21,909 --> 00:22:19,600
even small plant life and animal life

636
00:22:24,470 --> 00:22:21,919
within the confines of that device so it

637
00:22:27,510 --> 00:22:24,480
is a facility and it's there to support

638
00:22:29,830 --> 00:22:27,520

our life science research

639
00:22:31,750 --> 00:22:29,840
next questions on the other side

640
00:22:33,990 --> 00:22:31,760
hi yes with the decommissioned date of

641
00:22:36,549 --> 00:22:34,000
the iss set to be around 2020 and then

642
00:22:38,390 --> 00:22:36,559
the end of live systems for the eclss

643
00:22:40,470 --> 00:22:38,400
and those kind of getting towards that

644
00:22:42,630 --> 00:22:40,480
time how how do you plan on moving

645
00:22:44,470 --> 00:22:42,640
forward you're talking a lot about these

646
00:22:45,669 --> 00:22:44,480
uh projects as you want to plan ahead

647
00:22:47,430 --> 00:22:45,679
and i know bigelow's wanting to launch

648
00:22:49,029 --> 00:22:47,440
their commercial space station uh by the

649
00:22:50,149 --> 00:22:49,039
time of decommissioned to the iss would

650
00:22:51,750 --> 00:22:50,159
nasa and

651
00:22:53,029 --> 00:22:51,760
have contracted partnership with bigelow

652
00:22:55,669 --> 00:22:53,039
and use their commercial space station

653
00:22:57,350 --> 00:22:55,679
for continuing research

654
00:22:59,750 --> 00:22:57,360
okay so

655
00:23:01,750 --> 00:22:59,760
a lot of questions there the

656
00:23:04,630 --> 00:23:01,760
space station's been extended through

657
00:23:07,350 --> 00:23:04,640
2024 the president has come out with

658
00:23:09,270 --> 00:23:07,360
with that decree and we have our

659
00:23:11,510 --> 00:23:09,280
partners coming on board russia's on

660
00:23:13,029 --> 00:23:11,520
board canada is on board through 2024

661
00:23:14,950 --> 00:23:13,039
already we're working with the other

662
00:23:16,789 --> 00:23:14,960
partners to extend their programs out to

663
00:23:19,029 --> 00:23:16,799

2024 as well

664
00:23:22,950 --> 00:23:19,039
so uh hopefully the horizon is a little

665
00:23:25,350 --> 00:23:22,960
bit further out there than 2020 and

666
00:23:27,270 --> 00:23:25,360
when it comes to the follow-on that that

667
00:23:30,070 --> 00:23:27,280
really is one of the goals we're trying

668
00:23:31,750 --> 00:23:30,080
to understand how to commercialize that

669
00:23:34,470 --> 00:23:31,760
low-earth orbit market make it

670
00:23:37,430 --> 00:23:34,480
commercially viable help people in the

671
00:23:39,669 --> 00:23:37,440
startup regimes start to understand it

672
00:23:41,909 --> 00:23:39,679
and have a commercial entity willing to

673
00:23:44,310 --> 00:23:41,919
come online whenever station does go

674
00:23:46,470 --> 00:23:44,320
away so it's it's hard to say when that

675
00:23:49,190 --> 00:23:46,480
will actually happen the structural

676
00:23:50,630 --> 00:23:49,200
lifetime looks to be about 2028

677
00:23:52,710 --> 00:23:50,640
most of the items have been cleared

678
00:23:54,470 --> 00:23:52,720
through there but we'll see what follows

679
00:23:55,750 --> 00:23:54,480
on but hopefully it'll be a commercial

680
00:23:57,029 --> 00:23:55,760
space station

681
00:24:02,230 --> 00:23:57,039
we have time for just a couple more

682
00:24:04,950 --> 00:24:03,990
hi thank you you mentioned uh many of

683
00:24:06,870 --> 00:24:04,960
the tests are performed on the

684
00:24:08,549 --> 00:24:06,880
astronauts themselves uh nutrition is

685
00:24:10,549 --> 00:24:08,559
probably is of course a very important

686
00:24:12,710 --> 00:24:10,559
focus long term and with commander kelly

687
00:24:15,269 --> 00:24:12,720
and his twin brother at home um

688
00:24:16,710 --> 00:24:15,279

receiving a lot of simultaneous tests um

689
00:24:18,149 --> 00:24:16,720
uh

690
00:24:20,710 --> 00:24:18,159
you know a lot of the the food that's

691
00:24:22,070 --> 00:24:20,720
sent up uh to the space station is of

692
00:24:23,909 --> 00:24:22,080
course so we see a lot of what they had

693
00:24:25,990 --> 00:24:23,919
for thanksgiving dinner uh online the

694
00:24:28,230 --> 00:24:26,000
other uh uh last week but i think i saw

695
00:24:29,830 --> 00:24:28,240
their stuffing recipe yeah exactly so

696
00:24:31,190 --> 00:24:29,840
what is the most anticipated my daughter

697
00:24:32,789 --> 00:24:31,200
hannah in eighth grade wants to know

698
00:24:34,149 --> 00:24:32,799
what's the most anticipated food that's

699
00:24:35,510 --> 00:24:34,159
on its way to the space station that

700
00:24:37,110 --> 00:24:35,520
might be different from the normal

701
00:24:39,350 --> 00:24:37,120
routine

702
00:24:41,669 --> 00:24:39,360
um typically

703
00:24:44,149 --> 00:24:41,679
well typically what works best on these

704
00:24:46,470 --> 00:24:44,159
launches is they get they get their

705
00:24:48,470 --> 00:24:46,480
fruit basket essentially

706
00:24:51,110 --> 00:24:48,480
fresh fruits

707
00:24:53,190 --> 00:24:51,120
a few fresh veggies are something that's

708
00:24:54,870 --> 00:24:53,200
always really exciting to have now of

709
00:24:56,470 --> 00:24:54,880
course we're working to try and help

710
00:24:58,390 --> 00:24:56,480
them be able to grow some of their own

711
00:25:00,310 --> 00:24:58,400
vegetables on board you might have seen

712
00:25:01,990 --> 00:25:00,320
with the veggie experiment we did some

713
00:25:04,149 --> 00:25:02,000

red romaine lettuce

714
00:25:05,750 --> 00:25:04,159
that they were finally able to to clear

715
00:25:07,430 --> 00:25:05,760
and eat them themselves right now

716
00:25:08,710 --> 00:25:07,440
they're growing zinnias

717
00:25:10,870 --> 00:25:08,720
in the veggie

718
00:25:12,870 --> 00:25:10,880
box so they're hoping to add a little

719
00:25:15,190 --> 00:25:12,880
floral arrangement i think

720
00:25:16,630 --> 00:25:15,200
but but certainly they're probably

721
00:25:18,549 --> 00:25:16,640
looking forward to the fresh fruit they

722
00:25:22,549 --> 00:25:18,559
always say when they open up the the

723
00:25:29,669 --> 00:25:25,190
okay a few last questions

724
00:25:33,990 --> 00:25:32,149
um as you mentioned it was uh the iss is

725
00:25:35,510 --> 00:25:34,000
a fully functional science laboratory i

726
00:25:37,750 --> 00:25:35,520
was wondering how many science

727
00:25:39,590 --> 00:25:37,760
experiments are currently happening on

728
00:25:41,350 --> 00:25:39,600
board and which one has surfaced to be

729
00:25:46,149 --> 00:25:41,360
one of the more

730
00:25:51,110 --> 00:25:48,390
for any given increment and an increment

731
00:25:53,430 --> 00:25:51,120
is a six-month crew period we plan

732
00:25:56,149 --> 00:25:53,440
between 200 and 300 investigations

733
00:25:58,950 --> 00:25:56,159
across the entire partnership

734
00:26:01,190 --> 00:25:58,960
typically we have around 250ish going on

735
00:26:03,190 --> 00:26:01,200
at any single time and that's our

736
00:26:05,590 --> 00:26:03,200
automated investigations all the human

737
00:26:08,710 --> 00:26:05,600
research going on the various

738
00:26:11,590 --> 00:26:08,720

payloads in the racks themselves

739
00:26:13,750 --> 00:26:11,600
one of the the new and upcoming areas is

740
00:26:15,029 --> 00:26:13,760
is certainly protein crystal growth

741
00:26:17,029 --> 00:26:15,039
there's been a lot of commercial

742
00:26:19,269 --> 00:26:17,039
interest in looking at

743
00:26:21,430 --> 00:26:19,279
growing protein crystals in space to

744
00:26:23,590 --> 00:26:21,440
diffract here on earth either in x-ray

745
00:26:25,590 --> 00:26:23,600
or neutron diffraction and those are

746
00:26:27,669 --> 00:26:25,600
targeted at early stage

747
00:26:31,510 --> 00:26:27,679
drug development and trying to narrow

748
00:26:31,520 --> 00:26:36,070
all right one last question here

749
00:26:42,230 --> 00:26:37,190
thank you

750
00:26:43,909 --> 00:26:42,240
all the scientific experience

751
00:26:45,750 --> 00:26:43,919
experiments and knowing that

752
00:26:47,590 --> 00:26:45,760
obsolescence is something that happens

753
00:26:50,310 --> 00:26:47,600
over time

754
00:26:52,470 --> 00:26:50,320
is there an advanced team at nasa or

755
00:26:55,430 --> 00:26:52,480
elsewhere that's looking into

756
00:26:57,909 --> 00:26:55,440
a replacement for iss in the future

757
00:26:59,909 --> 00:26:57,919
when with new technological advances as

758
00:27:02,950 --> 00:26:59,919
such that could be incorporated into a

759
00:27:05,990 --> 00:27:02,960
new host so to speak

760
00:27:08,950 --> 00:27:06,000
i guess the best way to answer that is

761
00:27:11,510 --> 00:27:08,960
nasa's stated goal is to go out and

762
00:27:14,070 --> 00:27:11,520
continue our exploration further out

763
00:27:16,070 --> 00:27:14,080

into the solar system so the the

764
00:27:18,830 --> 00:27:16,080
follow-on should it be

765
00:27:22,310 --> 00:27:18,840
some waypoint at

766
00:27:24,549 --> 00:27:22,320
uh lagrangian point near the moon or

767
00:27:27,190 --> 00:27:24,559
somewhere as a as a

768
00:27:29,510 --> 00:27:27,200
station keeping and testing site

769
00:27:30,870 --> 00:27:29,520
may be a follow-on laboratory and there

770
00:27:33,669 --> 00:27:30,880
are people who are looking at what

771
00:27:36,630 --> 00:27:33,679
capabilities that might have but as far

772
00:27:38,870 --> 00:27:36,640
as replacing a low earth orbit uh

773
00:27:41,190 --> 00:27:38,880
orbital platform we're really hoping

774
00:27:43,110 --> 00:27:41,200
that the commercial industry can step up

775
00:27:45,830 --> 00:27:43,120
to take on that challenge

776
00:27:48,710 --> 00:27:47,269
thanks all right wonderful that's all

777
00:27:52,470 --> 00:27:48,720
the time we have with kurt today thank

778
00:27:55,909 --> 00:27:54,070
if you want to keep following along with

779
00:27:57,110 --> 00:27:55,919
what's going on on social media with the

780
00:27:59,350 --> 00:27:57,120
international space station you can

781
00:28:01,830 --> 00:27:59,360
follow them on social media either at

782
00:28:03,070 --> 00:28:01,840
iss on uh

783
00:28:06,310 --> 00:28:03,080
or you can follow them at

784
00:28:07,190 --> 00:28:06,320
spaceunderscorestation on twitter um if

785
00:28:08,389 --> 00:28:07,200
you want to follow along with what's

786
00:28:09,669 --> 00:28:08,399
going on with the research program

787
00:28:12,470 --> 00:28:09,679
specifically you can follow them on

788
00:28:14,389 --> 00:28:12,480

twitter at iss underscore research

789
00:28:15,510 --> 00:28:14,399
next up we've got a special treat we're

790
00:28:16,470 --> 00:28:15,520
going to hear a little about the rocket

791
00:28:18,710 --> 00:28:16,480
and the spacecraft that's gonna be

792
00:28:20,149 --> 00:28:18,720
launching tomorrow so joining us from

793
00:28:22,549 --> 00:28:20,159
the united launch alliance to talk about

794
00:28:26,310 --> 00:28:22,559
the rocket is matt donovan and then

795
00:28:28,710 --> 00:28:26,320
joining us from orbital atk is andrew

796
00:28:29,750 --> 00:28:28,720
z zerenschneck so

797
00:28:30,789 --> 00:28:29,760
take it away we're going to hear a

798
00:28:34,149 --> 00:28:30,799
little about the hardware that's going

799
00:28:39,430 --> 00:28:36,870
everybody i'm andrew and i'm matt

800
00:28:41,110 --> 00:28:39,440
how's it going good morning

801
00:28:42,630 --> 00:28:41,120
uh so i guess i'll just talk to you a

802
00:28:44,549 --> 00:28:42,640
little bit about spacecraft and matt

803
00:28:45,430 --> 00:28:44,559
i'll talk to you about the rocket so

804
00:28:46,789 --> 00:28:45,440
um

805
00:28:49,190 --> 00:28:46,799
my name is andrew and i work work for

806
00:28:51,750 --> 00:28:49,200
orbital atk and i'm on the fortunate

807
00:28:54,230 --> 00:28:51,760
enough to be on the on the team to

808
00:28:56,470 --> 00:28:54,240
prepare design deliver uh the cygnus

809
00:28:58,789 --> 00:28:56,480
spacecraft uh to the international space

810
00:29:01,669 --> 00:28:58,799
station aboard the ula atlas v launch

811
00:29:03,190 --> 00:29:01,679
vehicle so my role is is the uh i'm a

812
00:29:04,549 --> 00:29:03,200
launch vehicle interface manager and

813
00:29:05,750 --> 00:29:04,559

launch site interface manager and so

814
00:29:08,310 --> 00:29:05,760
what that means is

815
00:29:10,070 --> 00:29:08,320
um we go to the to the rocket and say

816
00:29:11,990 --> 00:29:10,080
here's here's what we need to do to fly

817
00:29:13,190 --> 00:29:12,000
to orbit here's the mass and here's the

818
00:29:14,470 --> 00:29:13,200
dimensions

819
00:29:16,549 --> 00:29:14,480
here's the parameters we got to make

820
00:29:18,630 --> 00:29:16,559
sure that we're compatible initially on

821
00:29:20,470 --> 00:29:18,640
fl on on flying on getting delivered to

822
00:29:22,549 --> 00:29:20,480
the space station and so we go through

823
00:29:24,470 --> 00:29:22,559
that process of compatibility and in

824
00:29:26,149 --> 00:29:24,480
this case we had a pretty short time

825
00:29:27,909 --> 00:29:26,159
frame and typically you have about two

826
00:29:29,350 --> 00:29:27,919
years to prepare for flight with a

827
00:29:30,789 --> 00:29:29,360
launch vehicle and with the spacecraft

828
00:29:33,269 --> 00:29:30,799
that's about how much time it takes to

829
00:29:35,830 --> 00:29:33,279
build from scratch design and build the

830
00:29:37,430 --> 00:29:35,840
spacecraft from from concept to

831
00:29:38,950 --> 00:29:37,440
to space is about two years is about as

832
00:29:40,310 --> 00:29:38,960
good as you can do

833
00:29:41,190 --> 00:29:40,320
fortunately we had the spacecraft ready

834
00:29:42,710 --> 00:29:41,200
to go

835
00:29:43,909 --> 00:29:42,720
we had a little pause with our rocket

836
00:29:46,149 --> 00:29:43,919
and so we needed to find a new one

837
00:29:48,310 --> 00:29:46,159
temporarily if we went to ula and within

838
00:29:51,350 --> 00:29:48,320

a year from kickoff to launch we kicked

839
00:29:54,230 --> 00:29:53,110
i think it was 20th so

840
00:29:57,029 --> 00:29:54,240
in less than a year we're going to be

841
00:29:59,750 --> 00:29:57,039
able to launch december 3rd thursday

842
00:30:01,909 --> 00:29:59,760
into flight and so it's been a long kind

843
00:30:04,710 --> 00:30:01,919
of intense

844
00:30:06,389 --> 00:30:04,720
preparation path over the last year to

845
00:30:07,750 --> 00:30:06,399
to prove that compatibility to do all

846
00:30:09,990 --> 00:30:07,760
the analysis do all the testing the

847
00:30:12,470 --> 00:30:10,000
interface testing to get us to where

848
00:30:14,470 --> 00:30:12,480
uh to where we can we can uh we can now

849
00:30:16,389 --> 00:30:14,480
ready to launch through the last

850
00:30:18,230 --> 00:30:16,399
readiness reviews we've proved that

851
00:30:19,590 --> 00:30:18,240
all of the eyes are dotted t's are

852
00:30:22,389 --> 00:30:19,600
crossed and we're ready to go launch on

853
00:30:24,230 --> 00:30:22,399
this thursday um

854
00:30:26,470 --> 00:30:24,240
so i think i'll go ahead and show you a

855
00:30:28,470 --> 00:30:26,480
little video of what we've done here in

856
00:30:31,029 --> 00:30:28,480
the last two months last two months has

857
00:30:32,950 --> 00:30:31,039
been is what happens is we we bring our

858
00:30:34,710 --> 00:30:32,960
spacecraft to the launch site

859
00:30:36,549 --> 00:30:34,720
or we have a pressurized cargo module

860
00:30:38,470 --> 00:30:36,559
that is built by the talicillini in

861
00:30:40,310 --> 00:30:38,480
italy and then the service module that

862
00:30:41,510 --> 00:30:40,320
we build at orbital dulles dulles

863
00:30:43,269 --> 00:30:41,520

virginia

864
00:30:45,190 --> 00:30:43,279
and those are the two has the spacecraft

865
00:30:46,789 --> 00:30:45,200
and so the the service module is the the

866
00:30:49,029 --> 00:30:46,799
brains of the spacecraft it has all the

867
00:30:51,350 --> 00:30:49,039
propulsion it has the computer systems

868
00:30:52,789 --> 00:30:51,360
the the com the thermal all the systems

869
00:30:54,549 --> 00:30:52,799
that basically drive the spacecraft and

870
00:30:56,789 --> 00:30:54,559
so we build that and tell us ship it

871
00:30:58,789 --> 00:30:56,799
here to here to uh the kennedy space

872
00:31:00,470 --> 00:30:58,799
center and process it at the facilities

873
00:31:01,750 --> 00:31:00,480
here and then italians they build a

874
00:31:03,350 --> 00:31:01,760
pressurized cargo module that's what

875
00:31:04,789 --> 00:31:03,360
holds the cargo

876
00:31:07,029 --> 00:31:04,799
the precious cargo that the the

877
00:31:08,389 --> 00:31:07,039
astronauts used to

878
00:31:10,710 --> 00:31:08,399
to do the science that he was talking

879
00:31:12,149 --> 00:31:10,720
about to eat to fix the systems on the

880
00:31:14,070 --> 00:31:12,159
station and so

881
00:31:16,549 --> 00:31:14,080
the pcm pressurized cargo module gets

882
00:31:18,070 --> 00:31:16,559
delivered to

883
00:31:20,070 --> 00:31:18,080
kennedy space center and the service

884
00:31:21,590 --> 00:31:20,080
monitor gets delivered nasa delivers the

885
00:31:23,750 --> 00:31:21,600
cargo we load the cargo into the

886
00:31:25,190 --> 00:31:23,760
pressurized cargo module and we make the

887
00:31:27,110 --> 00:31:25,200
two halves

888
00:31:29,590 --> 00:31:27,120

we test the whole system out

889
00:31:31,830 --> 00:31:29,600
fuel it up bring it to the rocket and

890
00:31:33,830 --> 00:31:31,840
then he takes it and delivers us to

891
00:31:35,190 --> 00:31:33,840
orbit so i've got let me go ahead and uh

892
00:31:36,789 --> 00:31:35,200
so i guess it's playing here this is a

893
00:31:39,110 --> 00:31:36,799
service module and this is testing at

894
00:31:40,630 --> 00:31:39,120
our facility we have new solar rays on

895
00:31:41,830 --> 00:31:40,640
this mission that we haven't ever flown

896
00:31:43,509 --> 00:31:41,840
before

897
00:31:44,710 --> 00:31:43,519
and you can see how they unfurl and they

898
00:31:47,110 --> 00:31:44,720
rotate

899
00:31:48,789 --> 00:31:47,120
so that's the new technology that we uh

900
00:31:49,830 --> 00:31:48,799
are bringing on to the spacecraft for

901
00:31:51,909 --> 00:31:49,840
for this mission that we hadn't

902
00:31:54,070 --> 00:31:51,919
previously flown and here's a service

903
00:31:55,990 --> 00:31:54,080
model that's essentially complete and

904
00:31:57,669 --> 00:31:56,000
ready to ship this now is the

905
00:32:00,310 --> 00:31:57,679
pressurized cargo module pcm that we

906
00:32:02,310 --> 00:32:00,320
talked about just being delivered to the

907
00:32:03,430 --> 00:32:02,320
sspf the facility at the kennedy space

908
00:32:04,710 --> 00:32:03,440
center

909
00:32:06,630 --> 00:32:04,720
and you can see the service module

910
00:32:07,990 --> 00:32:06,640
arriving and it gets placed

911
00:32:09,750 --> 00:32:08,000
and here's loading of the cargo one

912
00:32:11,430 --> 00:32:09,760
thing that's nice about our pcm is it's

913
00:32:13,190 --> 00:32:11,440

got a lot of volume

914
00:32:15,430 --> 00:32:13,200
so you can fit a lot of big bags nasa

915
00:32:18,310 --> 00:32:15,440
likes to have the flexibility of flying

916
00:32:20,549 --> 00:32:18,320
a lot of uh big things and here's

917
00:32:23,269 --> 00:32:20,559
so we can those mo3 bags are different

918
00:32:25,990 --> 00:32:23,279
size mo3 i'm a two mo one and so the big

919
00:32:27,669 --> 00:32:26,000
bags fit well into our our vehicle so we

920
00:32:30,549 --> 00:32:27,679
load it all up initial cargo load is

921
00:32:32,789 --> 00:32:30,559
done we rotate that pcm vertical we go

922
00:32:34,710 --> 00:32:32,799
made it to the service module here

923
00:32:37,509 --> 00:32:34,720
put the two halves together

924
00:32:39,590 --> 00:32:37,519
and then we transport over to

925
00:32:41,110 --> 00:32:39,600
the fueling facility

926
00:32:43,350 --> 00:32:41,120
and the fueling soda is just a mile down

927
00:32:46,870 --> 00:32:43,360
the road over at kennedy space center

928
00:32:49,430 --> 00:32:46,880
and at the phsf after fueling we have

929
00:32:51,350 --> 00:32:49,440
also a late cargo load nasa likes the

930
00:32:52,470 --> 00:32:51,360
ability to very late in the flow be able

931
00:32:56,870 --> 00:32:52,480
to

932
00:32:58,630 --> 00:32:56,880
for example if there's something that

933
00:32:59,669 --> 00:32:58,640
broke on station and they need to fix

934
00:33:01,190 --> 00:32:59,679
that

935
00:33:03,509 --> 00:33:01,200
later in the flow we can add add

936
00:33:05,029 --> 00:33:03,519
something to the vehicle

937
00:33:07,350 --> 00:33:05,039
you know the fresh food also comes in

938
00:33:08,870 --> 00:33:07,360

late then we encapsulate that's the ula

939
00:33:11,029 --> 00:33:08,880
fairing that encapsulates the cygnus

940
00:33:13,509 --> 00:33:11,039
spacecraft it just happened just a

941
00:33:14,950 --> 00:33:13,519
couple weeks ago that's our logo

942
00:33:17,269 --> 00:33:14,960
on the fairing

943
00:33:18,710 --> 00:33:17,279
and then from there it uh it gets

944
00:33:21,190 --> 00:33:18,720
shipped over to

945
00:33:22,549 --> 00:33:21,200
uh to the rocket at the vif and that's

946
00:33:24,789 --> 00:33:22,559
just about a week ago we made it that

947
00:33:28,149 --> 00:33:24,799
was an exciting day seeing the the

948
00:33:29,750 --> 00:33:28,159
cygnus lifted up onto the rocket

949
00:33:31,509 --> 00:33:29,760
i took a nice photo of myself i said we

950
00:33:33,029 --> 00:33:31,519
made a rocket today so

951
00:33:34,710 --> 00:33:33,039
that was that was that was a good that

952
00:33:37,190 --> 00:33:34,720
was a good day uh

953
00:33:39,509 --> 00:33:37,200
got a lot of likes on that one so anyway

954
00:33:41,430 --> 00:33:39,519
and you can take over and say uh what

955
00:33:43,590 --> 00:33:41,440
happened what happens next great thanks

956
00:33:45,350 --> 00:33:43,600
a lot andrew my name is matt donovan i'm

957
00:33:47,909 --> 00:33:45,360
the leader of our human launch services

958
00:33:49,909 --> 00:33:47,919
propulsion team so we do uh propulsion

959
00:33:52,070 --> 00:33:49,919
design propulsion analysis work on the

960
00:33:54,310 --> 00:33:52,080
mechanical ground support equipment

961
00:33:56,389 --> 00:33:54,320
ordnance systems and other aspects as

962
00:33:59,350 --> 00:33:56,399
ula transitions into this human launch

963
00:34:01,269 --> 00:33:59,360

services business so very excited from a

964
00:34:02,389 --> 00:34:01,279
united launch alliance perspective to be

965
00:34:04,230 --> 00:34:02,399
able to work with our partners at

966
00:34:05,590 --> 00:34:04,240
orbital atk and be able to take cargo to

967
00:34:07,830 --> 00:34:05,600
the international space station very

968
00:34:09,430 --> 00:34:07,840
exciting for us so you talked a little

969
00:34:11,510 --> 00:34:09,440
bit about the rocket the rock we're

970
00:34:13,909 --> 00:34:11,520
going to be flying for this mission is

971
00:34:15,829 --> 00:34:13,919
in what we call the 401 configuration

972
00:34:18,149 --> 00:34:15,839
that means a four meter diameter payload

973
00:34:19,990 --> 00:34:18,159
fairing we have zero srbs required and

974
00:34:22,470 --> 00:34:20,000
we're going to have one engine on the

975
00:34:24,069 --> 00:34:22,480
second stage to be able to power us uh

976
00:34:25,430 --> 00:34:24,079
up and get them on their way to station

977
00:34:26,869 --> 00:34:25,440
so that's a little bit of that from a

978
00:34:28,629 --> 00:34:26,879
united launch alliance perspective we're

979
00:34:30,950 --> 00:34:28,639
going to be using the atlas 5. we also

980
00:34:33,430 --> 00:34:30,960
have a delta iv and delta ii launch

981
00:34:35,349 --> 00:34:33,440
vehicles that we use for other launches

982
00:34:37,270 --> 00:34:35,359
this is going to be our 12th launch this

983
00:34:39,030 --> 00:34:37,280
year somebody was asking earlier from

984
00:34:40,629 --> 00:34:39,040
our perspective this is our 10th launch

985
00:34:42,149 --> 00:34:40,639
out of the cape across all of our

986
00:34:43,909 --> 00:34:42,159
different vehicle families so very

987
00:34:46,550 --> 00:34:43,919
excited very busy year for us and it's a

988
00:34:49,030 --> 00:34:46,560

fantastic way for us to cap off the year

989
00:34:50,389 --> 00:34:49,040
with this oa4 launch so i actually have

990
00:34:52,310 --> 00:34:50,399
a video for you as well just giving you

991
00:34:53,510 --> 00:34:52,320
a quick overview of what the mission is

992
00:34:58,630 --> 00:34:53,520
going to look like that you're going to

993
00:35:02,710 --> 00:35:00,550
the following profile details the

994
00:35:04,790 --> 00:35:02,720
important events of this mission using

995
00:35:05,829 --> 00:35:04,800
approximate times

996
00:35:06,790 --> 00:35:05,839
five

997
00:35:09,750 --> 00:35:06,800
four

998
00:35:12,870 --> 00:35:09,760
three we have atlas ignition two one

999
00:35:15,030 --> 00:35:12,880
zero and liftoff we have liftoff of the

1000
00:35:17,990 --> 00:35:15,040
atlas v rocket

1001
00:35:20,630 --> 00:35:18,000
the atlas rd-180 main engine ignites to

1002
00:35:22,870 --> 00:35:20,640
lift the vehicle away from the pad

1003
00:35:25,430 --> 00:35:22,880
shortly after liftoff atlas begins its

1004
00:35:27,829 --> 00:35:25,440
initial pitch yaw and roll maneuvers to

1005
00:35:32,069 --> 00:35:27,839
attain the proper ascent profile and

1006
00:35:38,790 --> 00:35:34,630
the atlas v reaches mach 1 the speed of

1007
00:35:45,910 --> 00:35:41,270
at 94 seconds the vehicle experiences

1008
00:35:49,589 --> 00:35:47,829
approaching booster engine cut off the

1009
00:35:50,910 --> 00:35:49,599
atlas 5 is burning propellant at the

1010
00:35:53,670 --> 00:35:50,920
rate of 1

1011
00:35:56,710 --> 00:35:53,680
350 pounds per second traveling at

1012
00:36:00,870 --> 00:35:56,720
approximately 10 000 miles per hour and

1013
00:36:03,910 --> 00:36:00,880

located 79 miles in altitude and 172

1014
00:36:06,069 --> 00:36:03,920
miles downrange

1015
00:36:10,150 --> 00:36:06,079
booster engine cutoff occurs 4 minutes

1016
00:36:12,310 --> 00:36:10,160
and 15 seconds after liftoff

1017
00:36:16,470 --> 00:36:12,320
six seconds after booster engine cut off

1018
00:36:20,550 --> 00:36:18,310
the first centaur main engine start

1019
00:36:23,270 --> 00:36:20,560
takes place 10 seconds after booster

1020
00:36:27,349 --> 00:36:24,950
the payload fairing is jettisoned

1021
00:36:30,390 --> 00:36:27,359
approximately 4 minutes and 40 seconds

1022
00:36:34,950 --> 00:36:32,150
cutoff of the centaur main engine

1023
00:36:36,870 --> 00:36:34,960
follows a nearly 14-minute burn the

1024
00:36:41,270 --> 00:36:36,880
mission now enters a short coast in

1025
00:36:44,310 --> 00:36:41,280
preparation for spacecraft separation

1026
00:36:47,510 --> 00:36:44,320
at just over 21 minutes centaur releases

1027
00:36:52,230 --> 00:36:47,520
the cygnus spacecraft for orbital atk

1028
00:36:56,230 --> 00:36:53,990
so that's just a brief preview of the

1029
00:36:58,150 --> 00:36:56,240
mission that we've got coming up um

1030
00:36:59,670 --> 00:36:58,160
heard earlier the 21 minutes that you

1031
00:37:01,349 --> 00:36:59,680
heard the spacecraft separation is

1032
00:37:02,470 --> 00:37:01,359
faster than you can get a pizza most

1033
00:37:04,150 --> 00:37:02,480
places and we'll be getting them on

1034
00:37:05,990 --> 00:37:04,160
their way to station so

1035
00:37:09,109 --> 00:37:06,000
nice short mission uh we'll be

1036
00:37:10,550 --> 00:37:09,119
deorbiting centaur with a second burn uh

1037
00:37:11,990 --> 00:37:10,560
following that

1038
00:37:14,150 --> 00:37:12,000

putting that down in the ocean but yeah

1039
00:37:15,750 --> 00:37:14,160
very excited to be able to participate

1040
00:37:20,790 --> 00:37:15,760
in this mission with orbital atk and

1041
00:37:24,230 --> 00:37:22,470
all right with that we've got time for

1042
00:37:25,670 --> 00:37:24,240
some questions here so we'll go first

1043
00:37:26,870 --> 00:37:25,680
question over here

1044
00:37:28,790 --> 00:37:26,880
i was just curious what is the

1045
00:37:30,790 --> 00:37:28,800
anticipated uh arrival date for the

1046
00:37:33,270 --> 00:37:30,800
payload

1047
00:37:35,430 --> 00:37:33,280
so uh assuming we get off this thursday

1048
00:37:37,750 --> 00:37:35,440
the third we should be birthing on the

1049
00:37:41,430 --> 00:37:37,760
sixth so it's about two and a half three

1050
00:37:44,630 --> 00:37:43,109
yeah i'm curious if there was any

1051
00:37:46,470 --> 00:37:44,640
changes that were required to be made to

1052
00:37:48,470 --> 00:37:46,480
cygnus or atlas to support this it was

1053
00:37:50,710 --> 00:37:48,480
entirely a certification process to get

1054
00:37:52,310 --> 00:37:50,720
working together that's a good question

1055
00:37:54,069 --> 00:37:52,320
um

1056
00:37:55,349 --> 00:37:54,079
we we really didn't have to make any

1057
00:37:58,230 --> 00:37:55,359
fundamental changes to either the

1058
00:37:59,589 --> 00:37:58,240
spacecraft or the or the launch vehicle

1059
00:38:01,750 --> 00:37:59,599
there were some very minor things the

1060
00:38:03,750 --> 00:38:01,760
one area that required

1061
00:38:06,310 --> 00:38:03,760
minor changes was our blankets so the

1062
00:38:07,670 --> 00:38:06,320
venting analysis took took some time to

1063
00:38:09,990 --> 00:38:07,680

get to the point to where we were

1064
00:38:11,349 --> 00:38:10,000
compatible so we had to adjust our holes

1065
00:38:13,270 --> 00:38:11,359
but it was very minor adjustments to the

1066
00:38:14,870 --> 00:38:13,280
blankets an inexpensive change so

1067
00:38:16,790 --> 00:38:14,880
essentially we were compatible we were

1068
00:38:18,390 --> 00:38:16,800
designed from the start

1069
00:38:20,790 --> 00:38:18,400
cygnus to be compatible with multiple

1070
00:38:21,750 --> 00:38:20,800
launch vehicles at least at a high level

1071
00:38:23,270 --> 00:38:21,760
and then you've got to get into the

1072
00:38:24,630 --> 00:38:23,280
details to confirm that and so we found

1073
00:38:27,589 --> 00:38:24,640
some minor things that we had to adjust

1074
00:38:29,270 --> 00:38:27,599
but no no significant

1075
00:38:30,630 --> 00:38:29,280
detail changes on the cygnus side on the

1076
00:38:34,470 --> 00:38:30,640
on the launch vehicle side they did have

1077
00:38:36,550 --> 00:38:34,480
to build a unique payload adapter for us

1078
00:38:38,069 --> 00:38:36,560
so that pilot adapter was had to be

1079
00:38:41,270 --> 00:38:38,079
designed very quickly and they did a

1080
00:38:42,550 --> 00:38:41,280
fantastic job of putting that together

1081
00:38:44,069 --> 00:38:42,560
and then on the umbilical side there

1082
00:38:45,829 --> 00:38:44,079
were some some changes that they had to

1083
00:38:48,310 --> 00:38:45,839
do there's some unique umbilicals on

1084
00:38:50,630 --> 00:38:48,320
their side that they had to

1085
00:38:51,589 --> 00:38:50,640
prepare for us and test out so those are

1086
00:38:52,710 --> 00:38:51,599
the two

1087
00:38:54,470 --> 00:38:52,720
probably most significant things the

1088
00:38:57,510 --> 00:38:54,480

payload adapter and the umbilicals that

1089
00:38:58,950 --> 00:38:57,520
were mission unique to our to our flight

1090
00:39:01,030 --> 00:38:58,960
and i'll add to that from a hardware

1091
00:39:02,069 --> 00:39:01,040
perspective i think andrew captured it

1092
00:39:03,910 --> 00:39:02,079
the other unique thing is what we're

1093
00:39:05,829 --> 00:39:03,920
able to do as far as launch windows with

1094
00:39:07,910 --> 00:39:05,839
the capability that we have on atlas 5

1095
00:39:09,670 --> 00:39:07,920
and the performance we were able to give

1096
00:39:11,589 --> 00:39:09,680
them a longer launch window most of

1097
00:39:13,829 --> 00:39:11,599
these missions to station have an

1098
00:39:15,589 --> 00:39:13,839
instantaneous launch window so you have

1099
00:39:17,190 --> 00:39:15,599
one second to launch and if it's bad

1100
00:39:18,470 --> 00:39:17,200
weather you have something that comes up

1101
00:39:19,510 --> 00:39:18,480
you're scrubbing to the next day with

1102
00:39:21,910 --> 00:39:19,520
the performance that we're able to

1103
00:39:23,670 --> 00:39:21,920
provide with an atlas 5 and our our

1104
00:39:25,670 --> 00:39:23,680
fantastic trajectory and performance

1105
00:39:27,589 --> 00:39:25,680
team they were able to design multiple

1106
00:39:28,630 --> 00:39:27,599
mission profiles to be able to give us

1107
00:39:30,310 --> 00:39:28,640
five

1108
00:39:32,069 --> 00:39:30,320
launch periods that we're going to have

1109
00:39:33,270 --> 00:39:32,079
tomorrow which gives us an extended

1110
00:39:34,630 --> 00:39:33,280
launch window so when you talk about

1111
00:39:35,829 --> 00:39:34,640
things like weather when you have things

1112
00:39:37,829 --> 00:39:35,839
that come up during the countdown gives

1113
00:39:39,510 --> 00:39:37,839

us a lot more flexibility to be able to

1114
00:39:41,349 --> 00:39:39,520
support hopefully launching them

1115
00:39:42,870 --> 00:39:41,359
tomorrow so that was a really exciting

1116
00:39:44,630 --> 00:39:42,880
thing from rn that we're able to do for

1117
00:39:46,150 --> 00:39:44,640
this mission

1118
00:39:48,310 --> 00:39:46,160
that's a real good point a 30 minute

1119
00:39:49,990 --> 00:39:48,320
window is the uh the longest window that

1120
00:39:52,310 --> 00:39:50,000
any any vehicle flying a station has

1121
00:39:53,750 --> 00:39:52,320
been able to do so that's that's a

1122
00:39:56,390 --> 00:39:53,760
great thing for the atlas v to be able

1123
00:39:57,910 --> 00:39:56,400
to do for us

1124
00:39:59,270 --> 00:39:57,920
wonderful just a reminder for those who

1125
00:40:01,270 --> 00:39:59,280
are watching online we're taking

1126
00:40:03,190 --> 00:40:01,280
questions using the hashtag asknasa for

1127
00:40:05,430 --> 00:40:03,200
members of our panel up here

1128
00:40:07,030 --> 00:40:05,440
next question

1129
00:40:08,870 --> 00:40:07,040
hello i just wanted to know the

1130
00:40:12,710 --> 00:40:08,880
specifics of the experiments that are

1131
00:40:15,349 --> 00:40:12,720
being delivering to the ess iss

1132
00:40:16,870 --> 00:40:15,359
um so i might defer that to the to the

1133
00:40:18,150 --> 00:40:16,880
nasa folks but i

1134
00:40:20,390 --> 00:40:18,160
i don't have a lot of details i know

1135
00:40:23,109 --> 00:40:20,400
that there are food

1136
00:40:24,390 --> 00:40:23,119
there's science experiments there's uh

1137
00:40:25,990 --> 00:40:24,400
crew hardware there's there's some

1138
00:40:26,950 --> 00:40:26,000

laptops there's some eva equipment

1139
00:40:28,870 --> 00:40:26,960
there's some

1140
00:40:30,309 --> 00:40:28,880
eva suits for spacewalks that the

1141
00:40:31,750 --> 00:40:30,319
astronauts need to fly in so there are

1142
00:40:33,589 --> 00:40:31,760
some replacement parts and new parts

1143
00:40:34,950 --> 00:40:33,599
that they're going to fly in our vehicle

1144
00:40:36,230 --> 00:40:34,960
those are the details i'm aware of i

1145
00:40:38,309 --> 00:40:36,240
don't know if you know any other

1146
00:40:39,910 --> 00:40:38,319
specifics about our mission those are

1147
00:40:40,870 --> 00:40:39,920
the ones i'm aware of

1148
00:40:42,309 --> 00:40:40,880
yeah i'll add to that one of the ones

1149
00:40:43,829 --> 00:40:42,319
we're really excited about is there's

1150
00:40:45,430 --> 00:40:43,839
some fire extinguishers that were

1151
00:40:47,109 --> 00:40:45,440
developed by colorado school of mines

1152
00:40:48,550 --> 00:40:47,119
just up the road from us and our

1153
00:40:49,829 --> 00:40:48,560
engineering headquarters in denver one

1154
00:40:51,829 --> 00:40:49,839
of the guys on my team actually as part

1155
00:40:53,109 --> 00:40:51,839
of his graduate studies worked on the

1156
00:40:54,390 --> 00:40:53,119
development of these unique fire

1157
00:40:56,390 --> 00:40:54,400
extinguishers that were delivering the

1158
00:40:57,829 --> 00:40:56,400
international space station so it's

1159
00:40:59,270 --> 00:40:57,839
great to be able to see the partnerships

1160
00:41:01,589 --> 00:40:59,280
that we've made with local universities

1161
00:41:02,950 --> 00:41:01,599
and schools coming to fruition now with

1162
00:41:04,790 --> 00:41:02,960
something like that that we're able to

1163
00:41:06,630 --> 00:41:04,800

fly on cygnus to the international space

1164
00:41:10,790 --> 00:41:06,640
station

1165
00:41:12,230 --> 00:41:10,800
i i i did also remember that there is uh

1166
00:41:13,510 --> 00:41:12,240
with every mission there's some family

1167
00:41:16,230 --> 00:41:13,520
packs and so

1168
00:41:17,750 --> 00:41:16,240
we're also sort of uh i heard frank

1169
00:41:19,349 --> 00:41:17,760
frank culbertson say we're sort of a

1170
00:41:21,190 --> 00:41:19,359
santa claus we're going to learn some

1171
00:41:23,030 --> 00:41:21,200
some christmas presents to the crew so

1172
00:41:24,470 --> 00:41:23,040
the family members do get a small

1173
00:41:25,990 --> 00:41:24,480
percentage of the cargo and so we'll be

1174
00:41:28,710 --> 00:41:26,000
delivering christmas presents to the to

1175
00:41:30,870 --> 00:41:28,720
those our primary uh customers our

1176
00:41:32,069 --> 00:41:30,880
astronauts on board so they do get a

1177
00:41:33,510 --> 00:41:32,079
little bit of christmas presents on the

1178
00:41:40,710 --> 00:41:33,520
way

1179
00:41:45,030 --> 00:41:43,109
hi what was the motivation for changing

1180
00:41:48,309 --> 00:41:45,040
the solar arrays what are the benefits

1181
00:41:49,829 --> 00:41:48,319
lighter weight increased output uh

1182
00:41:51,670 --> 00:41:49,839
primarily it was lighter weight there's

1183
00:41:54,069 --> 00:41:51,680
a couple things it's lighter weight

1184
00:41:55,750 --> 00:41:54,079
uh the cost was also a potent

1185
00:41:58,069 --> 00:41:55,760
consideration and the third

1186
00:41:59,750 --> 00:41:58,079
consideration is it's it's atk

1187
00:42:01,510 --> 00:41:59,760
at the time it was a separate company

1188
00:42:03,910 --> 00:42:01,520

orbital and atk merged about a year ago

1189
00:42:06,069 --> 00:42:03,920
but prior to that we made so so now it's

1190
00:42:07,430 --> 00:42:06,079
an in-house solar array

1191
00:42:09,190 --> 00:42:07,440
which is overlaid to get so those are

1192
00:42:11,349 --> 00:42:09,200
the three primary reasons that we made

1193
00:42:14,870 --> 00:42:11,359
the change

1194
00:42:18,309 --> 00:42:16,069
i wonder if you could talk a little bit

1195
00:42:19,750 --> 00:42:18,319
about the loading process for cargo it's

1196
00:42:21,670 --> 00:42:19,760
obviously not like throwing a bunch of

1197
00:42:23,670 --> 00:42:21,680
suitcases in your station wagon you know

1198
00:42:26,069 --> 00:42:23,680
how do you work that out especially with

1199
00:42:28,230 --> 00:42:26,079
the late stage requirements nasa has for

1200
00:42:31,829 --> 00:42:28,240
fresh fruit and that sort of thing

1201
00:42:33,589 --> 00:42:31,839
so yeah that's a good question so it uh

1202
00:42:35,750 --> 00:42:33,599
it's uh

1203
00:42:37,910 --> 00:42:35,760
it's it's not like loading an airplane

1204
00:42:39,430 --> 00:42:37,920
so we have uh

1205
00:42:41,349 --> 00:42:39,440
specific requirements for the mass we

1206
00:42:43,349 --> 00:42:41,359
have to keep the thing very light and so

1207
00:42:45,190 --> 00:42:43,359
to do that we've had to do make

1208
00:42:47,349 --> 00:42:45,200
modifications actually to our spacecraft

1209
00:42:49,109 --> 00:42:47,359
to reduce the internal secondary

1210
00:42:50,950 --> 00:42:49,119
structures inside the vehicle so we now

1211
00:42:53,030 --> 00:42:50,960
have cargo nets inside

1212
00:42:54,790 --> 00:42:53,040
uh the vehicle and so

1213
00:42:56,150 --> 00:42:54,800

we have a crane you might have seen the

1214
00:42:57,510 --> 00:42:56,160
video there's a crane that picks up the

1215
00:42:59,030 --> 00:42:57,520
big bags and puts them in the smaller

1216
00:43:00,550 --> 00:42:59,040
bags you can take by hand and put them

1217
00:43:01,910 --> 00:43:00,560
in and the bigger ones there's a small

1218
00:43:02,550 --> 00:43:01,920
crane that picks them up and puts them

1219
00:43:04,150 --> 00:43:02,560
in

1220
00:43:05,030 --> 00:43:04,160
uh we call it the armpit that's its

1221
00:43:06,630 --> 00:43:05,040
nickname

1222
00:43:08,710 --> 00:43:06,640
so you have a

1223
00:43:09,910 --> 00:43:08,720
guy inside that receives that bag puts

1224
00:43:10,870 --> 00:43:09,920
it in the right spot and then has to

1225
00:43:12,950 --> 00:43:10,880
strap

1226
00:43:14,470 --> 00:43:12,960
in that bag and so it's a long process

1227
00:43:16,550 --> 00:43:14,480
it takes about five days just for the

1228
00:43:18,790 --> 00:43:16,560
initial load that's the non-time

1229
00:43:20,069 --> 00:43:18,800
sensitive cargo to load all that and get

1230
00:43:21,430 --> 00:43:20,079
it strapped in perfectly everything's

1231
00:43:22,390 --> 00:43:21,440
got to be just right you're going to get

1232
00:43:23,990 --> 00:43:22,400
a pretty

1233
00:43:25,270 --> 00:43:24,000
you know a ride on the rocket that

1234
00:43:27,270 --> 00:43:25,280
vibrates you pretty good so you got to

1235
00:43:28,790 --> 00:43:27,280
make sure you're very secure

1236
00:43:29,829 --> 00:43:28,800
and so that takes time so there's a

1237
00:43:31,510 --> 00:43:29,839
crane there's people in there and they

1238
00:43:33,349 --> 00:43:31,520

strap it in and there's a net that goes

1239
00:43:35,990 --> 00:43:33,359
on top and then the late cargo you

1240
00:43:37,510 --> 00:43:36,000
talked about being able to do

1241
00:43:39,270 --> 00:43:37,520
so we do it at the very last minute just

1242
00:43:41,349 --> 00:43:39,280
before encapsulation

1243
00:43:43,030 --> 00:43:41,359
so we have after fueling the very last

1244
00:43:44,790 --> 00:43:43,040
thing we do is open up that hatch again

1245
00:43:46,870 --> 00:43:44,800
and do the same process with the same

1246
00:43:48,150 --> 00:43:46,880
nets and load them in until just prior

1247
00:43:51,510 --> 00:43:48,160
to capsulation so that's that's the

1248
00:43:59,430 --> 00:43:51,520
process we use to load the cargo

1249
00:44:03,270 --> 00:44:01,349
how durable are the new solar panels and

1250
00:44:05,349 --> 00:44:03,280
are they going to be reusable

1251
00:44:07,030 --> 00:44:05,359
uh they're not everything on the vehicle

1252
00:44:08,710 --> 00:44:07,040
is one time and one of the benefits that

1253
00:44:09,510 --> 00:44:08,720
we provide actually with this spacecraft

1254
00:44:11,030 --> 00:44:09,520
is

1255
00:44:12,710 --> 00:44:11,040
uh it may not be glamorous but there's a

1256
00:44:15,510 --> 00:44:12,720
lot of trash that needs to come off the

1257
00:44:17,589 --> 00:44:15,520
the station and so we we take a good

1258
00:44:19,430 --> 00:44:17,599
significant amount of trash from the iss

1259
00:44:21,270 --> 00:44:19,440
and we we burn it up uh through a

1260
00:44:23,109 --> 00:44:21,280
destructive controlled reentry into the

1261
00:44:28,470 --> 00:44:23,119
station so there's nothing reusable it's

1262
00:44:31,829 --> 00:44:29,990
so i had a question where uh somebody

1263
00:44:35,670 --> 00:44:31,839

want to know how many earth rotations it

1264
00:44:37,109 --> 00:44:35,680
takes for uh to arrive to the iss okay

1265
00:44:37,990 --> 00:44:37,119
you're gonna make me do math in public

1266
00:44:39,430 --> 00:44:38,000
here

1267
00:44:44,069 --> 00:44:39,440
so

1268
00:44:46,230 --> 00:44:44,079
multiply three in a

1269
00:44:48,230 --> 00:44:46,240
uh how many orbits are in it's 16 orbits

1270
00:44:50,790 --> 00:44:48,240
i believe it is per day so three times

1271
00:44:53,030 --> 00:44:50,800
16 what is that about 40 a little more

1272
00:44:55,829 --> 00:44:53,040
than 45. so about that many orbits to

1273
00:44:59,589 --> 00:44:57,270
wonderful we got time for one last

1274
00:45:03,990 --> 00:44:59,599
question

1275
00:45:05,030 --> 00:45:04,000
going once

1276
00:45:06,790 --> 00:45:05,040
going twice

1277
00:45:07,910 --> 00:45:06,800
all right thank you both for uh coming

1278
00:45:09,030 --> 00:45:07,920
and talking about the rocket in the

1279
00:45:16,550 --> 00:45:09,040
spacecraft good luck with launch

1280
00:45:20,550 --> 00:45:18,309
all right next up we're going to hear a

1281
00:45:21,829 --> 00:45:20,560
quick little video here from one of our

1282
00:45:23,990 --> 00:45:21,839
partners on the international space

1283
00:45:25,829 --> 00:45:24,000
station here uh cases which is running

1284
00:45:27,510 --> 00:45:25,839
the national laboratory on board has

1285
00:45:29,430 --> 00:45:27,520
some uh some science experiments that

1286
00:45:30,230 --> 00:45:29,440
they're going to be flying in cygnus and

1287
00:45:31,670 --> 00:45:30,240
so

1288
00:45:37,190 --> 00:45:31,680

we've got a little video talking about

1289
00:45:41,109 --> 00:45:39,430
we go around uh many industries all over

1290
00:45:43,829 --> 00:45:41,119
the country we're in in front of some of

1291
00:45:45,589 --> 00:45:43,839
the top r d people the biggest companies

1292
00:45:46,630 --> 00:45:45,599
in the world and these folks once they

1293
00:45:48,390 --> 00:45:46,640
see about what they can do in

1294
00:45:50,230 --> 00:45:48,400
microgravity they get a ton of project

1295
00:45:52,150 --> 00:45:50,240
ideas like the folks here at millikin

1296
00:45:53,910 --> 00:45:52,160
they're developing a flame retardant

1297
00:45:55,510 --> 00:45:53,920
textile for clothing that a lot of

1298
00:45:58,790 --> 00:45:55,520
people will wear

1299
00:46:00,790 --> 00:45:58,800
we're trying to design and engineer

1300
00:46:04,390 --> 00:46:00,800
put on the right chemicals such that the

1301
00:46:06,950 --> 00:46:04,400
textiles don't burn so this is think of

1302
00:46:09,030 --> 00:46:06,960
for the military and ied think of a

1303
00:46:10,950 --> 00:46:09,040
firefighter when they're going into a

1304
00:46:13,109 --> 00:46:10,960
burning building and it's really again

1305
00:46:14,950 --> 00:46:13,119
trying to protect the person so they

1306
00:46:16,870 --> 00:46:14,960
don't get second and third degree burns

1307
00:46:19,109 --> 00:46:16,880
we try to use unique insights and

1308
00:46:21,829 --> 00:46:19,119
meaningful design and deep science to

1309
00:46:23,910 --> 00:46:21,839
deliver a good to the world and to our

1310
00:46:26,470 --> 00:46:23,920
customer so they're flame retardant

1311
00:46:28,470 --> 00:46:26,480
textiles that they're trying to develop

1312
00:46:30,630 --> 00:46:28,480
seeing what happens when they burn

1313
00:46:32,630 --> 00:46:30,640

without gravity is very important

1314
00:46:34,710 --> 00:46:32,640
because gravity gets in the way of a lot

1315
00:46:36,150 --> 00:46:34,720
of other phenomena so when they see that

1316
00:46:37,910 --> 00:46:36,160
they can really understand what's going

1317
00:46:40,630 --> 00:46:37,920
on and apply that

1318
00:46:41,829 --> 00:46:40,640
back down to their processing on earth

1319
00:46:43,910 --> 00:46:41,839
it's really nice they have a lot of

1320
00:46:46,069 --> 00:46:43,920
camera and digital work up there so we

1321
00:46:48,069 --> 00:46:46,079
can look how it burns and then we're

1322
00:46:49,589 --> 00:46:48,079
going to get the samples back bring them

1323
00:46:52,230 --> 00:46:49,599
here and then take them through a litany

1324
00:46:53,510 --> 00:46:52,240
of analysis methods so we can find out

1325
00:46:55,750 --> 00:46:53,520
how hot

1326
00:46:57,349 --> 00:46:55,760
the flame was all kinds of good nerdy

1327
00:46:59,190 --> 00:46:57,359
stuff

1328
00:47:01,510 --> 00:46:59,200
i mean ultimately we want to deliver

1329
00:47:03,750 --> 00:47:01,520
innovative solution to the market

1330
00:47:05,190 --> 00:47:03,760
we want to protect people and we want to

1331
00:47:07,750 --> 00:47:05,200
have the best product out there that

1332
00:47:10,790 --> 00:47:07,760
last the longest

1333
00:47:13,109 --> 00:47:10,800
so this can really save lives and that

1334
00:47:14,710 --> 00:47:13,119
touches home to everyone so that's why

1335
00:47:17,109 --> 00:47:14,720
it's a great partnership to work with

1336
00:47:19,030 --> 00:47:17,119
milliken because the goals of their

1337
00:47:29,190 --> 00:47:19,040
project and the goals of our mission

1338
00:47:32,150 --> 00:47:30,950

so also flying on board are a lot of

1339
00:47:33,030 --> 00:47:32,160
other science experiments and today

1340
00:47:35,270 --> 00:47:33,040
we're going to hear from one of the

1341
00:47:37,510 --> 00:47:35,280
principal investigators of the pbre

1342
00:47:39,510 --> 00:47:37,520
experiment who joins us he's from nasa's

1343
00:47:40,710 --> 00:47:39,520
glen research center and this is brian

1344
00:47:46,950 --> 00:47:40,720
model and he's the principal

1345
00:47:50,710 --> 00:47:49,270
thank you and uh good morning

1346
00:47:52,549 --> 00:47:50,720
so i understand

1347
00:47:54,390 --> 00:47:52,559
most folks here got invited

1348
00:47:56,309 --> 00:47:54,400
and uh you're probably pretty excited to

1349
00:47:58,309 --> 00:47:56,319
be here but i want to say

1350
00:47:59,589 --> 00:47:58,319
that

1351
00:48:01,990 --> 00:47:59,599
i've been working on this experiment i

1352
00:48:04,549 --> 00:48:02,000
conceived this experiment about 16 17

1353
00:48:06,470 --> 00:48:04,559
years ago so i'm really excited to be

1354
00:48:09,109 --> 00:48:06,480
here guys i'm finally getting this thing

1355
00:48:11,589 --> 00:48:10,470
so i'm

1356
00:48:21,750 --> 00:48:11,599
i

1357
00:48:23,750 --> 00:48:21,760
thermal control

1358
00:48:25,270 --> 00:48:23,760
system for the space station

1359
00:48:26,069 --> 00:48:25,280
and what i find kind of interesting is

1360
00:48:27,750 --> 00:48:26,079
uh

1361
00:48:29,349 --> 00:48:27,760
after that i worked there for about four

1362
00:48:32,150 --> 00:48:29,359
or five years and then i moved over at

1363
00:48:33,750 --> 00:48:32,160

the time glenn research center had

1364
00:48:37,030 --> 00:48:33,760
responsibility for all the intermediate

1365
00:48:39,990 --> 00:48:37,040
and large unmanned launch vehicles

1366
00:48:42,470 --> 00:48:40,000
and i got assigned to a designing a new

1367
00:48:44,630 --> 00:48:42,480
pressurization system for the atlas v

1368
00:48:45,829 --> 00:48:44,640
and actually got to work on that and i

1369
00:48:48,630 --> 00:48:45,839
think it's kind of cool that that's

1370
00:48:50,790 --> 00:48:48,640
going to be taking my experiment up

1371
00:48:52,390 --> 00:48:50,800
one of the highlights of my career was

1372
00:48:54,390 --> 00:48:52,400
crawling around in the business end of

1373
00:48:55,510 --> 00:48:54,400
an atlas five years ago this was

1374
00:48:57,670 --> 00:48:55,520
actually we were working with general

1375
00:48:59,030 --> 00:48:57,680
dynamics at the time

1376
00:49:00,390 --> 00:48:59,040
crawling around in the business end of

1377
00:49:02,390 --> 00:49:00,400
the atlas 5

1378
00:49:04,549 --> 00:49:02,400
doing our final inspection and then

1379
00:49:05,750 --> 00:49:04,559
seeing that take off it was a goes

1380
00:49:07,109 --> 00:49:05,760
satellite that we were launching it's a

1381
00:49:08,230 --> 00:49:07,119
lot of fun

1382
00:49:10,150 --> 00:49:08,240
but

1383
00:49:11,430 --> 00:49:10,160
if i could i have a few uh picture

1384
00:49:12,950 --> 00:49:11,440
slides i want to show you so you can

1385
00:49:15,270 --> 00:49:12,960
bring the first one up

1386
00:49:18,230 --> 00:49:15,280
this is our patch

1387
00:49:20,630 --> 00:49:18,240
and we have a number of partners the the

1388
00:49:23,589 --> 00:49:20,640

experiment is is led by glenn but we

1389
00:49:25,430 --> 00:49:23,599
also have a co-i uh professor balakitaya

1390
00:49:27,270 --> 00:49:25,440
from university of houston

1391
00:49:30,390 --> 00:49:27,280
and we're working with

1392
00:49:32,309 --> 00:49:30,400
nasa johnson space flight center and

1393
00:49:34,950 --> 00:49:32,319
marshall space flight center

1394
00:49:36,470 --> 00:49:34,960
zen technologies um

1395
00:49:38,790 --> 00:49:36,480
is

1396
00:49:40,549 --> 00:49:38,800
our a local contractor who built the

1397
00:49:42,150 --> 00:49:40,559
flight hardware so i want to recognize

1398
00:49:45,030 --> 00:49:42,160
them

1399
00:49:47,829 --> 00:49:45,040
so the next slide um so a little

1400
00:49:49,589 --> 00:49:47,839
background on what what a packed bed

1401
00:49:52,549 --> 00:49:49,599
reactor is okay

1402
00:49:55,750 --> 00:49:52,559
it's uh actually one of the most common

1403
00:49:57,349 --> 00:49:55,760
reactors uh class of reactors in

1404
00:49:58,870 --> 00:49:57,359
industry today in fact about 80 percent

1405
00:50:00,950 --> 00:49:58,880
of all reactors

1406
00:50:02,710 --> 00:50:00,960
fall under this classification as you

1407
00:50:04,549 --> 00:50:02,720
see in this picture there's a number of

1408
00:50:06,230 --> 00:50:04,559
different types of packing

1409
00:50:09,430 --> 00:50:06,240
shapes sizes

1410
00:50:11,750 --> 00:50:09,440
uh and and purposes

1411
00:50:13,750 --> 00:50:11,760
and this is just a few of them

1412
00:50:15,430 --> 00:50:13,760
the the packing the solid packing being

1413
00:50:18,630 --> 00:50:15,440

used for

1414
00:50:20,309 --> 00:50:18,640
as a typically is used as a catalyst for

1415
00:50:22,710 --> 00:50:20,319
a reaction it could be a host for

1416
00:50:25,349 --> 00:50:22,720
biological media or it could simply be

1417
00:50:26,950 --> 00:50:25,359
there just to mix up the gas and liquid

1418
00:50:29,349 --> 00:50:26,960
to enhance the reaction as it flows

1419
00:50:31,670 --> 00:50:29,359
through the column

1420
00:50:32,630 --> 00:50:31,680
next chart please

1421
00:50:34,710 --> 00:50:32,640
so

1422
00:50:36,630 --> 00:50:34,720
the types of reactors

1423
00:50:38,630 --> 00:50:36,640
can be broken down into into these

1424
00:50:40,710 --> 00:50:38,640
classifications there's a whole

1425
00:50:43,349 --> 00:50:40,720
class of suspended

1426
00:50:45,670 --> 00:50:43,359
fluidized type beds which require

1427
00:50:47,270 --> 00:50:45,680
gravity really to function so we're not

1428
00:50:49,670 --> 00:50:47,280
even looking at those

1429
00:50:51,750 --> 00:50:49,680
on the fixed bed side which is where the

1430
00:50:54,870 --> 00:50:51,760
packing the solid packing is held solid

1431
00:50:56,309 --> 00:50:54,880
it's not allowed to move around in bed

1432
00:50:58,309 --> 00:50:56,319
there are also a number of

1433
00:50:59,910 --> 00:50:58,319
classifications you can see there and i

1434
00:51:01,510 --> 00:50:59,920
want to get down to the bottom the

1435
00:51:03,349 --> 00:51:01,520
bubble and pulse flow that are

1436
00:51:05,589 --> 00:51:03,359
highlighted in red there are really the

1437
00:51:07,190 --> 00:51:05,599
two types of flow regimes that that

1438
00:51:10,309 --> 00:51:07,200

behave very differently when you go to

1439
00:51:12,470 --> 00:51:10,319
0g to space than they do on earth and

1440
00:51:14,150 --> 00:51:12,480
i'll show you a video at the end of what

1441
00:51:16,390 --> 00:51:14,160
that looks like on one of our early

1442
00:51:18,470 --> 00:51:16,400
experiments on the um

1443
00:51:19,829 --> 00:51:18,480
that we did on the aircraft

1444
00:51:23,510 --> 00:51:19,839
some of the other

1445
00:51:24,870 --> 00:51:23,520
types of flows that you get are either

1446
00:51:26,069 --> 00:51:24,880
there's very little difference when you

1447
00:51:28,549 --> 00:51:26,079
go to

1448
00:51:30,309 --> 00:51:28,559
space or they can't exist at all like

1449
00:51:32,710 --> 00:51:30,319
trickle flow

1450
00:51:35,750 --> 00:51:32,720
okay next chart please

1451
00:51:36,710 --> 00:51:35,760
um so why are we doing this uh

1452
00:51:38,790 --> 00:51:36,720
they're

1453
00:51:40,309 --> 00:51:38,800
one of the keys i think most of you know

1454
00:51:42,549 --> 00:51:40,319
this

1455
00:51:45,030 --> 00:51:42,559
mass savings is really critical to

1456
00:51:47,270 --> 00:51:45,040
long-duration space flight so we have

1457
00:51:50,470 --> 00:51:47,280
got to recycle pretty much everything we

1458
00:51:51,670 --> 00:51:50,480
take water air and even

1459
00:51:53,270 --> 00:51:51,680
trash

1460
00:51:55,670 --> 00:51:53,280
and

1461
00:51:57,349 --> 00:51:55,680
today i think we have about

1462
00:51:59,510 --> 00:51:57,359
we recycle something on the order of

1463
00:52:00,790 --> 00:51:59,520

about 93 percent of our water on space

1464
00:52:02,829 --> 00:52:00,800
station

1465
00:52:06,069 --> 00:52:02,839
and i think it's about 50 percent of our

1466
00:52:07,589 --> 00:52:06,079
air we'd like to in fact as you can see

1467
00:52:09,750 --> 00:52:07,599
what this chart is trying to show is

1468
00:52:13,349 --> 00:52:09,760
that the longer you go

1469
00:52:15,990 --> 00:52:13,359
uh the more cost effective it is uh

1470
00:52:17,349 --> 00:52:16,000
to invest in re in equipment to do the

1471
00:52:20,470 --> 00:52:17,359
recycling rather than taking the

1472
00:52:24,230 --> 00:52:23,030
and the water is

1473
00:52:35,270 --> 00:52:24,240
i

1474
00:52:36,309 --> 00:52:35,280
or or any other consumables

1475
00:52:38,069 --> 00:52:36,319
so

1476
00:52:40,630 --> 00:52:38,079
this particular technology is really

1477
00:52:42,309 --> 00:52:40,640
focusing on getting that that

1478
00:52:46,390 --> 00:52:42,319
water

1479
00:52:48,150 --> 00:52:46,400
recycle to almost to a complete 100

1480
00:52:50,710 --> 00:52:48,160
uh next chart

1481
00:52:52,390 --> 00:52:50,720
so this shows that kind of that that the

1482
00:52:54,230 --> 00:52:52,400
cycle and all the different processes

1483
00:52:57,829 --> 00:52:54,240
that you have to go through to fully

1484
00:52:59,270 --> 00:52:57,839
reclaim uh water in space and the reason

1485
00:53:00,710 --> 00:52:59,280
i want to show this is every one of

1486
00:53:03,349 --> 00:53:00,720
those boxes

1487
00:53:05,510 --> 00:53:03,359
there's a packed bed reactor or some

1488
00:53:07,030 --> 00:53:05,520

sort of reactor bed in there

1489
00:53:09,270 --> 00:53:07,040
on the early

1490
00:53:11,430 --> 00:53:09,280
wastewater treatment primary processor

1491
00:53:13,270 --> 00:53:11,440
there there's two phase there's there

1492
00:53:14,549 --> 00:53:13,280
could be a biological reactor there's a

1493
00:53:16,470 --> 00:53:14,559
number of other

1494
00:53:18,710 --> 00:53:16,480
types of systems we use and when you get

1495
00:53:21,109 --> 00:53:18,720
over to the post-processing and even the

1496
00:53:22,230 --> 00:53:21,119
disinfection

1497
00:53:26,390 --> 00:53:22,240
phase

1498
00:53:30,549 --> 00:53:26,400
reactors

1499
00:53:32,630 --> 00:53:30,559
which are not a single phase reactor um

1500
00:53:34,150 --> 00:53:32,640
isn't influenced as much by gravity but

1501
00:53:37,270 --> 00:53:34,160
what we found

1502
00:53:38,630 --> 00:53:37,280
is that we over time bubbles accumulate

1503
00:53:40,710 --> 00:53:38,640
in these systems

1504
00:53:44,069 --> 00:53:40,720
and they get trapped in these in these

1505
00:53:48,470 --> 00:53:46,390
take up volume and the reactor bed loses

1506
00:53:50,470 --> 00:53:48,480
its efficiency so one so we're actually

1507
00:53:52,069 --> 00:53:50,480
going to be looking at how do we remove

1508
00:53:53,750 --> 00:53:52,079
those bubbles that'll be another aspect

1509
00:53:54,829 --> 00:53:53,760
of this experiment

1510
00:53:58,230 --> 00:53:54,839
okay next

1511
00:54:00,950 --> 00:53:58,240
chart so this is sort of the history up

1512
00:54:03,190 --> 00:54:00,960
on your uh your upper left was the very

1513
00:54:05,510 --> 00:54:03,200

first experiment that uh where i wanted

1514
00:54:08,230 --> 00:54:05,520
to just see what would happen uh nobody

1515
00:54:10,390 --> 00:54:08,240
had looked at this before so i i we

1516
00:54:11,190 --> 00:54:10,400
built a drop tower experiment

1517
00:54:13,430 --> 00:54:11,200
um

1518
00:54:14,950 --> 00:54:13,440
we saw that there was an effect going to

1519
00:54:16,950 --> 00:54:14,960
microgravity but we only have two

1520
00:54:19,670 --> 00:54:16,960
seconds to see that so it didn't really

1521
00:54:22,069 --> 00:54:19,680
develop too much and then as you go uh

1522
00:54:25,750 --> 00:54:22,079
down and and up to your right those were

1523
00:54:28,150 --> 00:54:25,760
a series of zero-g aircraft experiments

1524
00:54:29,670 --> 00:54:28,160
that we built and flew over the years

1525
00:54:34,230 --> 00:54:29,680
and we have

1526
00:54:39,430 --> 00:54:36,950
next okay this is our flight experiment

1527
00:54:40,870 --> 00:54:39,440
this is what we're launching

1528
00:54:42,630 --> 00:54:40,880
tomorrow

1529
00:54:44,069 --> 00:54:42,640
it'll be in the microgravity science

1530
00:54:45,190 --> 00:54:44,079
glove box

1531
00:54:46,950 --> 00:54:45,200
it's actually going to be launched in

1532
00:54:50,150 --> 00:54:46,960
pieces like that and right in front is

1533
00:54:51,910 --> 00:54:50,160
the reactor bed that entire

1534
00:54:55,030 --> 00:54:51,920
bed is heavily instrumented we're

1535
00:54:58,390 --> 00:54:55,040
looking at all aspects of of

1536
00:55:00,789 --> 00:54:58,400
of the flow dynamics in this bed

1537
00:55:02,470 --> 00:55:00,799
is removable so we have two different

1538
00:55:04,829 --> 00:55:02,480

systems where we're looking at two

1539
00:55:07,430 --> 00:55:04,839
different types of packing

1540
00:55:09,109 --> 00:55:07,440
um and uh

1541
00:55:10,390 --> 00:55:09,119
what's really cool about this experiment

1542
00:55:13,510 --> 00:55:10,400
too is that

1543
00:55:15,030 --> 00:55:13,520
uh all that that section with all the

1544
00:55:17,190 --> 00:55:15,040
instrumentation

1545
00:55:18,870 --> 00:55:17,200
uh can be removed and the rest of the

1546
00:55:21,349 --> 00:55:18,880
system can provide

1547
00:55:23,109 --> 00:55:21,359
a gas liquid flow

1548
00:55:24,470 --> 00:55:23,119
facility for any other types of

1549
00:55:26,069 --> 00:55:24,480
experiments so if somebody wants to look

1550
00:55:28,390 --> 00:55:26,079
at a different type of bed or even a

1551
00:55:30,069 --> 00:55:28,400
fitting or other component

1552
00:55:31,990 --> 00:55:30,079
they'll be able to come up later and use

1553
00:55:33,750 --> 00:55:32,000
this system

1554
00:55:35,109 --> 00:55:33,760
so the last thing i want to show you is

1555
00:55:36,230 --> 00:55:35,119
a quick

1556
00:55:38,630 --> 00:55:36,240
video

1557
00:55:41,670 --> 00:55:38,640
of what it looks like

1558
00:55:43,430 --> 00:55:41,680
uh in space okay so this is this is off

1559
00:55:45,589 --> 00:55:43,440
of our aircraft and this is the bubble

1560
00:55:47,750 --> 00:55:45,599
flow regime and you can see

1561
00:55:49,589 --> 00:55:47,760
uh this is slowed down as it's taken at

1562
00:55:51,510 --> 00:55:49,599
high speed and it's being played back at

1563
00:55:53,910 --> 00:55:51,520

a normal speed but you see

1564
00:55:56,150 --> 00:55:53,920
how well distributed the bubbles are

1565
00:55:58,390 --> 00:55:56,160
they tend to get trapped

1566
00:56:00,309 --> 00:55:58,400
in gravity they would want to

1567
00:56:01,349 --> 00:56:00,319
rise up depending on the orientation of

1568
00:56:04,069 --> 00:56:01,359
the bed

1569
00:56:06,710 --> 00:56:04,079
and here is this is really interesting

1570
00:56:08,630 --> 00:56:06,720
this is what we call a pulse flow regime

1571
00:56:09,670 --> 00:56:08,640
this is actually a natural condition in

1572
00:56:12,710 --> 00:56:09,680
a bed

1573
00:56:14,390 --> 00:56:12,720
you can get this type of flow in one g

1574
00:56:17,190 --> 00:56:14,400
but you have to go at very high flow

1575
00:56:18,710 --> 00:56:17,200
rates and it's difficult

1576
00:56:20,150 --> 00:56:18,720
it's such a high flow rate that it's

1577
00:56:21,349 --> 00:56:20,160
difficult really to get much of a

1578
00:56:23,190 --> 00:56:21,359
reaction

1579
00:56:25,109 --> 00:56:23,200
one of the interesting things we found

1580
00:56:27,829 --> 00:56:25,119
on our aircraft tests is that we can get

1581
00:56:30,150 --> 00:56:27,839
pulse flow at a much lower flow rate

1582
00:56:31,589 --> 00:56:30,160
so what we're pushing is that you know

1583
00:56:34,390 --> 00:56:31,599
this is a

1584
00:56:36,950 --> 00:56:34,400
a type of way we could operate a bed

1585
00:56:39,030 --> 00:56:36,960
in space that you can't unearth and

1586
00:56:41,270 --> 00:56:39,040
actually get a more efficient bed when

1587
00:56:43,030 --> 00:56:41,280
you go to space

1588
00:56:45,349 --> 00:56:43,040

so

1589
00:56:46,630 --> 00:56:45,359
uh

1590
00:56:48,069 --> 00:56:46,640
that's all i have and i guess i'll take

1591
00:56:49,910 --> 00:56:48,079
some questions

1592
00:56:51,349 --> 00:56:49,920
indeed if you have a question remember

1593
00:56:53,510 --> 00:56:51,359
if you're following along online you can

1594
00:56:54,789 --> 00:56:53,520
ask it using the hashtag ask nasa

1595
00:56:56,710 --> 00:56:54,799
otherwise here in the room just wait for

1596
00:57:01,190 --> 00:56:56,720
a microphone do we have any questions

1597
00:57:05,109 --> 00:57:02,789
hi yes i have a question from a fellow

1598
00:57:06,390 --> 00:57:05,119
engineer named nick mizmanski and he

1599
00:57:09,990 --> 00:57:06,400
would like to know

1600
00:57:12,150 --> 00:57:10,000
because you guys are focused on

1601
00:57:15,270 --> 00:57:12,160
the astronauts having uh reusable

1602
00:57:17,349 --> 00:57:15,280
resources that are um obviously easy to

1603
00:57:19,990 --> 00:57:17,359
access has it been a consideration for

1604
00:57:21,589 --> 00:57:20,000
you to view the moon base as a necessary

1605
00:57:23,349 --> 00:57:21,599
stop as the

1606
00:57:25,349 --> 00:57:23,359
first stop in introducing

1607
00:57:26,710 --> 00:57:25,359
sorry interplanetary canalization

1608
00:57:29,270 --> 00:57:26,720
colonization i can talk today i

1609
00:57:31,910 --> 00:57:29,280
apologize okay um

1610
00:57:34,069 --> 00:57:31,920
so that's way above my pay grade um but

1611
00:57:35,510 --> 00:57:34,079
i will say that uh you know we are

1612
00:57:36,390 --> 00:57:35,520
certainly

1613
00:57:38,390 --> 00:57:36,400

uh

1614
00:57:39,270 --> 00:57:38,400
this type of a bed

1615
00:57:41,430 --> 00:57:39,280
is

1616
00:57:43,430 --> 00:57:41,440
you know can be used in space it can be

1617
00:57:44,470 --> 00:57:43,440
used on a lunar outpost it can be used

1618
00:57:46,950 --> 00:57:44,480
um

1619
00:57:49,750 --> 00:57:46,960
in mars and a mars mission

1620
00:57:51,829 --> 00:57:49,760
um we're very interested in

1621
00:57:53,589 --> 00:57:51,839
you know if taking a bed that's

1622
00:57:55,349 --> 00:57:53,599
operating in zero g and then putting

1623
00:57:57,829 --> 00:57:55,359
into a partial g environment like on the

1624
00:57:59,510 --> 00:57:57,839
moon or mars and how will that behave

1625
00:58:01,109 --> 00:57:59,520
we can't you know we won't be able to

1626
00:58:03,670 --> 00:58:01,119
test that on

1627
00:58:05,829 --> 00:58:03,680
on the space station but we can do some

1628
00:58:10,230 --> 00:58:05,839
preliminary testing with the aircraft

1629
00:58:14,069 --> 00:58:12,230
just a clarification is are there a

1630
00:58:15,349 --> 00:58:14,079
particular reaction or set of reactions

1631
00:58:17,270 --> 00:58:15,359
you're going for or is it more just

1632
00:58:18,630 --> 00:58:17,280
studying like how the system works good

1633
00:58:20,470 --> 00:58:18,640
sorry yeah sorry i should have explained

1634
00:58:22,150 --> 00:58:20,480
a little better the there's actually no

1635
00:58:23,829 --> 00:58:22,160
reaction going on in this bed what we're

1636
00:58:27,430 --> 00:58:23,839
looking at is the hydrodynamics how the

1637
00:58:33,430 --> 00:58:30,630
if we give the if we give the

1638
00:58:36,390 --> 00:58:33,440

pressure drop and how the phases are are

1639
00:58:37,510 --> 00:58:36,400
mixing and based on an input on a flow

1640
00:58:40,069 --> 00:58:37,520
rate

1641
00:58:42,390 --> 00:58:40,079
we give all that to a chemical engineer

1642
00:58:44,630 --> 00:58:42,400
that's really the key of what they need

1643
00:58:46,549 --> 00:58:44,640
to know okay they can the the mass

1644
00:58:48,309 --> 00:58:46,559
transfer the actual reaction they can

1645
00:58:50,710 --> 00:58:48,319
calculate fairly easy and there's really

1646
00:58:52,309 --> 00:58:50,720
no difference in zero g versus 1g so the

1647
00:58:56,789 --> 00:58:52,319
real key is the hydrodynamics and that's

1648
00:58:56,799 --> 00:59:01,990
next question

1649
00:59:05,190 --> 00:59:03,670
all right i've got one uh for you all

1650
00:59:06,710 --> 00:59:05,200
taking moderator privilege here you've

1651
00:59:09,030 --> 00:59:06,720
been working on this for 16 years and so

1652
00:59:10,390 --> 00:59:09,040
on so what are you most excited about

1653
00:59:12,230 --> 00:59:10,400
what's what what's going to go through

1654
00:59:14,309 --> 00:59:12,240
your mind on launch day here

1655
00:59:16,549 --> 00:59:14,319
wow well first of all it gets up there

1656
00:59:19,270 --> 00:59:16,559
safely

1657
00:59:21,750 --> 00:59:19,280
uh no i'm it's it's just so cool i don't

1658
00:59:22,549 --> 00:59:21,760
know i've uh

1659
00:59:24,309 --> 00:59:22,559
uh

1660
00:59:26,150 --> 00:59:24,319
the

1661
00:59:28,470 --> 00:59:26,160
you know i'm kind of i'm really excited

1662
00:59:30,230 --> 00:59:28,480
to come down here uh one of the things

1663
00:59:32,630 --> 00:59:30,240

is you know we've got a test matrix as

1664
00:59:33,990 --> 00:59:32,640
we constantly keep tweaking so i'm glad

1665
00:59:37,750 --> 00:59:34,000
to get away from that and stop thinking

1666
00:59:38,630 --> 00:59:37,760
about that uh and uh you know i'm i'm

1667
00:59:40,710 --> 00:59:38,640
just

1668
00:59:42,309 --> 00:59:40,720
hoping it gets up there and and i can't

1669
00:59:44,630 --> 00:59:42,319
wait till they turn the switch on we're

1670
00:59:47,430 --> 00:59:44,640
gonna be operating it for about

1671
00:59:49,430 --> 00:59:47,440
10 weeks so we'll be uh that'll be an

1672
00:59:50,710 --> 00:59:49,440
exciting uh

1673
00:59:53,190 --> 00:59:50,720
you know eight to ten weeks that we

1674
00:59:53,200 --> 00:59:57,430
great any last questions

1675
01:00:01,349 --> 00:59:58,789
all right then thank you very much for

1676
01:00:02,470 --> 01:00:01,359
joining us okay thank you

1677
01:00:04,309 --> 01:00:02,480
thank you

1678
01:00:06,630 --> 01:00:04,319
and good luck with your experiment and

1679
01:00:08,470 --> 01:00:06,640
the launch tomorrow

1680
01:00:10,950 --> 01:00:08,480
all right next up we have

1681
01:00:12,870 --> 01:00:10,960
andy petro from nasa's small satellites

1682
01:00:14,150 --> 01:00:12,880
technologies program here and he's going

1683
01:00:15,670 --> 01:00:14,160
to talk about some of the little

1684
01:00:20,150 --> 01:00:15,680
satellites that are going to be riding

1685
01:00:24,710 --> 01:00:22,789
all right thank you um

1686
01:00:26,630 --> 01:00:24,720
yeah so i'm the uh

1687
01:00:28,549 --> 01:00:26,640
from uh the space technology

1688
01:00:29,510 --> 01:00:28,559

organization at nasa headquarters and i

1689
01:00:31,510 --> 01:00:29,520
oversee

1690
01:00:33,670 --> 01:00:31,520
both our small spacecraft technology

1691
01:00:34,710 --> 01:00:33,680
program and also our solar electric

1692
01:00:36,870 --> 01:00:34,720
propulsion

1693
01:00:38,630 --> 01:00:36,880
program so i deal with some of the

1694
01:00:40,470 --> 01:00:38,640
biggest stuff we're thinking of putting

1695
01:00:42,470 --> 01:00:40,480
into space as well as

1696
01:00:43,510 --> 01:00:42,480
some of the smallest uh the great thing

1697
01:00:45,030 --> 01:00:43,520
about

1698
01:00:47,190 --> 01:00:45,040
cubesats is i

1699
01:00:49,190 --> 01:00:47,200
don't have a scale model here i have the

1700
01:00:52,630 --> 01:00:49,200
actual spacecraft this is an engineering

1701
01:00:54,710 --> 01:00:52,640
unit of uh one of the two

1702
01:00:56,549 --> 01:00:54,720
nodes cubesats that we're going to be

1703
01:00:58,950 --> 01:00:56,559
launching

1704
01:01:00,950 --> 01:00:58,960
as cargo tomorrow up to the space

1705
01:01:03,430 --> 01:01:00,960
station these will go up with a bunch of

1706
01:01:05,510 --> 01:01:03,440
other small spacecraft

1707
01:01:06,470 --> 01:01:05,520
in the nanoracks dispenser

1708
01:01:08,789 --> 01:01:06,480
and then

1709
01:01:10,789 --> 01:01:08,799
once they arrive to station

1710
01:01:12,309 --> 01:01:10,799
they will later be put

1711
01:01:15,990 --> 01:01:12,319
out through the airlock

1712
01:01:18,470 --> 01:01:16,000
and uh deployed into orbit so

1713
01:01:19,670 --> 01:01:18,480

we're really excited about that

1714
01:01:22,309 --> 01:01:19,680
i'll come back to this in a moment i

1715
01:01:25,270 --> 01:01:22,319
just wanted to

1716
01:01:26,789 --> 01:01:25,280
provide a little bit of context

1717
01:01:27,990 --> 01:01:26,799
and i think if you look at all of the

1718
01:01:30,630 --> 01:01:28,000
different satellites that are going to

1719
01:01:32,390 --> 01:01:30,640
be going up as part of this package

1720
01:01:33,910 --> 01:01:32,400
on this launch

1721
01:01:35,670 --> 01:01:33,920
you see the the

1722
01:01:36,630 --> 01:01:35,680
the full spectrum of things that you can

1723
01:01:38,549 --> 01:01:36,640
do with

1724
01:01:40,470 --> 01:01:38,559
with these small satellites especially

1725
01:01:42,309 --> 01:01:40,480
the cubesats

1726
01:01:44,150 --> 01:01:42,319
they're obviously valuable as an

1727
01:01:45,430 --> 01:01:44,160
educational tool you'll see there are

1728
01:01:46,789 --> 01:01:45,440
university

1729
01:01:48,870 --> 01:01:46,799
projects

1730
01:01:51,270 --> 01:01:48,880
built around using the spacecraft

1731
01:01:54,870 --> 01:01:51,280
there's even

1732
01:01:56,230 --> 01:01:54,880
school children have built a cubesat but

1733
01:01:57,829 --> 01:01:56,240
from our perspective we want to

1734
01:02:01,029 --> 01:01:57,839
emphasize the fact that these are real

1735
01:02:02,789 --> 01:02:01,039
tools for engineering and science

1736
01:02:05,829 --> 01:02:02,799
this particular one was built by

1737
01:02:08,390 --> 01:02:05,839
engineers at the ames research center

1738
01:02:10,630 --> 01:02:08,400

and we have projects um

1739
01:02:12,950 --> 01:02:10,640
in the next few months

1740
01:02:15,990 --> 01:02:12,960
in which we will demonstrate laser

1741
01:02:17,349 --> 01:02:16,000
communication with a cubesat of the same

1742
01:02:18,549 --> 01:02:17,359
size

1743
01:02:20,390 --> 01:02:18,559
that's the project being done by the

1744
01:02:22,309 --> 01:02:20,400
aerospace corporation they'll actually

1745
01:02:24,470 --> 01:02:22,319
be two of those they will demonstrate

1746
01:02:26,630 --> 01:02:24,480
laser communication from orbit back to

1747
01:02:29,109 --> 01:02:26,640
the ground they will also be tracking

1748
01:02:30,870 --> 01:02:29,119
each other and will be doing formation

1749
01:02:31,990 --> 01:02:30,880
flight they will have a propulsion

1750
01:02:34,309 --> 01:02:32,000
system and they were going to try to

1751
01:02:35,430 --> 01:02:34,319
maneuver within 200 meters of each other

1752
01:02:37,670 --> 01:02:35,440
in orbit

1753
01:02:38,630 --> 01:02:37,680
again with a cubesat of that scale

1754
01:02:40,870 --> 01:02:38,640
i think

1755
01:02:43,910 --> 01:02:40,880
nothing like that has been done on that

1756
01:02:45,349 --> 01:02:43,920
scale before we'll also be

1757
01:02:48,789 --> 01:02:45,359
having a

1758
01:02:51,270 --> 01:02:48,799
a set of 3u cubesats this is a project

1759
01:02:52,470 --> 01:02:51,280
being done by tyvac under contract to

1760
01:02:54,789 --> 01:02:52,480
our program

1761
01:02:57,029 --> 01:02:54,799
they will demonstrate autonomous

1762
01:02:58,710 --> 01:02:57,039
rendezvous and docking of two cubesats

1763
01:03:00,870 --> 01:02:58,720

in orbit

1764
01:03:04,150 --> 01:03:00,880
both those missions are coming

1765
01:03:05,430 --> 01:03:04,160
early in 2016. another one being done by

1766
01:03:07,109 --> 01:03:05,440
jpl

1767
01:03:10,069 --> 01:03:07,119
is going to demonstrate a high gain

1768
01:03:11,829 --> 01:03:10,079
antenna on a cubesat using a deployable

1769
01:03:13,589 --> 01:03:11,839
solar array

1770
01:03:15,990 --> 01:03:13,599
and the back of the array is then used

1771
01:03:18,870 --> 01:03:16,000
as the hygiene antenna to demonstrate

1772
01:03:20,230 --> 01:03:18,880
getting very high data rates from a

1773
01:03:22,390 --> 01:03:20,240
cubesat

1774
01:03:24,309 --> 01:03:22,400
scale vehicle back to earth

1775
01:03:26,150 --> 01:03:24,319
what's exciting about that is

1776
01:03:28,390 --> 01:03:26,160
as we are just getting prepared to

1777
01:03:31,510 --> 01:03:28,400
launch that that technology has already

1778
01:03:33,029 --> 01:03:31,520
been infused into a nasa mission

1779
01:03:35,349 --> 01:03:33,039
coming

1780
01:03:36,390 --> 01:03:35,359
very close behind it which is the

1781
01:03:38,309 --> 01:03:36,400
insight

1782
01:03:40,069 --> 01:03:38,319
mission to mars that's going to carry

1783
01:03:41,510 --> 01:03:40,079
two cubesats

1784
01:03:44,309 --> 01:03:41,520
that have been developed by the jet

1785
01:03:46,630 --> 01:03:44,319
propulsion lab that will use this

1786
01:03:48,309 --> 01:03:46,640
particular type of reflect array which

1787
01:03:50,950 --> 01:03:48,319
is the high gain antenna that we are

1788
01:03:53,270 --> 01:03:50,960

demonstrating with our cubesat project

1789
01:03:55,190 --> 01:03:53,280
will be on a mission to mars

1790
01:03:57,109 --> 01:03:55,200
in the coming year as well so that's the

1791
01:03:59,109 --> 01:03:57,119
kind of thing we want to see happen with

1792
01:03:59,990 --> 01:03:59,119
this technology development work that we

1793
01:04:03,190 --> 01:04:00,000
do

1794
01:04:05,510 --> 01:04:03,200
now getting back to to nodes

1795
01:04:08,870 --> 01:04:05,520
again this is a one and a half u cubesat

1796
01:04:11,109 --> 01:04:08,880
built by the ames research center

1797
01:04:13,190 --> 01:04:11,119
the instrument inside

1798
01:04:14,549 --> 01:04:13,200
which measures high energy particles in

1799
01:04:16,789 --> 01:04:14,559
space was

1800
01:04:19,029 --> 01:04:16,799
designed and built by the

1801
01:04:20,549 --> 01:04:19,039
montana state university

1802
01:04:22,069 --> 01:04:20,559
and

1803
01:04:23,990 --> 01:04:22,079
the whole mission

1804
01:04:26,470 --> 01:04:24,000
will be controlled on the ground by

1805
01:04:27,910 --> 01:04:26,480
students at santa clara university

1806
01:04:31,029 --> 01:04:27,920
so we have a good

1807
01:04:33,190 --> 01:04:31,039
collaboration between nasa engineers and

1808
01:04:35,270 --> 01:04:33,200
the academic community on on this

1809
01:04:37,589 --> 01:04:35,280
particular mission

1810
01:04:39,510 --> 01:04:37,599
what's sort of interesting about this

1811
01:04:42,390 --> 01:04:39,520
just to explain what it's going to do as

1812
01:04:43,190 --> 01:04:42,400
i said it will be measuring

1813
01:04:46,470 --> 01:04:43,200

the

1814
01:04:48,230 --> 01:04:46,480
environment

1815
01:04:49,670 --> 01:04:48,240
the two of them of course will be taking

1816
01:04:52,069 --> 01:04:49,680
those measurements at two different

1817
01:04:54,150 --> 01:04:52,079
places in space they will share that

1818
01:04:56,549 --> 01:04:54,160
information back and forth between them

1819
01:04:59,430 --> 01:04:56,559
using the uhf radio these are the

1820
01:05:02,230 --> 01:04:59,440
antennas for that radio so they talk to

1821
01:05:03,990 --> 01:05:02,240
each other on a regular basis and then

1822
01:05:06,390 --> 01:05:04,000
one of them and it can be either one

1823
01:05:08,069 --> 01:05:06,400
will relay it to the ground and they

1824
01:05:10,390 --> 01:05:08,079
will determine between themselves which

1825
01:05:13,349 --> 01:05:10,400
one will have the best communications

1826
01:05:15,270 --> 01:05:13,359
pass on a you know day by day basis and

1827
01:05:16,789 --> 01:05:15,280
will make that decision and and

1828
01:05:18,710 --> 01:05:16,799
automatically

1829
01:05:19,670 --> 01:05:18,720
relay that to the ground

1830
01:05:21,750 --> 01:05:19,680
and

1831
01:05:23,589 --> 01:05:21,760
they also have two-way communication so

1832
01:05:25,670 --> 01:05:23,599
we can send commands to either one of

1833
01:05:27,829 --> 01:05:25,680
them and relay those

1834
01:05:30,230 --> 01:05:27,839
to each other

1835
01:05:32,230 --> 01:05:30,240
this is actually a companion mission

1836
01:05:34,549 --> 01:05:32,240
that we came up with

1837
01:05:37,270 --> 01:05:34,559
somewhat after the fact to the edison

1838
01:05:39,109 --> 01:05:37,280

mission which was the same spacecraft

1839
01:05:41,670 --> 01:05:39,119
but with eight of these

1840
01:05:43,270 --> 01:05:41,680
launched as a as a group doing what i

1841
01:05:45,349 --> 01:05:43,280
was just saying each of them taking

1842
01:05:46,390 --> 01:05:45,359
these measurements sharing them among

1843
01:05:48,630 --> 01:05:46,400
each other

1844
01:05:50,470 --> 01:05:48,640
and then one of them any one of them can

1845
01:05:53,430 --> 01:05:50,480
relay it to the ground

1846
01:05:55,829 --> 01:05:53,440
the value of that is you can now operate

1847
01:05:58,069 --> 01:05:55,839
a fairly large

1848
01:05:59,670 --> 01:05:58,079
constellation of satellites

1849
01:06:01,270 --> 01:05:59,680
in space and only have to talk to one of

1850
01:06:03,430 --> 01:06:01,280
them in order to get the data from all

1851
01:06:04,789 --> 01:06:03,440
of them and that would enable a lot of

1852
01:06:06,950 --> 01:06:04,799
different kinds of science missions that

1853
01:06:08,069 --> 01:06:06,960
we might like to do in the future and of

1854
01:06:09,910 --> 01:06:08,079
course

1855
01:06:12,390 --> 01:06:09,920
what also makes that possible is that

1856
01:06:14,150 --> 01:06:12,400
each of these is a very low cost

1857
01:06:17,589 --> 01:06:14,160
satellite

1858
01:06:20,549 --> 01:06:17,599
a unique feature of this is it's using a

1859
01:06:22,069 --> 01:06:20,559
off-the-shelf commercial smartphone as

1860
01:06:23,990 --> 01:06:22,079
the computer that's the brain of the

1861
01:06:26,630 --> 01:06:24,000
satellite so

1862
01:06:28,630 --> 01:06:26,640
keeps the cost very low allows us to

1863
01:06:30,309 --> 01:06:28,640

take advantage of

1864
01:06:32,470 --> 01:06:30,319
all that past research that the

1865
01:06:34,470 --> 01:06:32,480
government invested in that created

1866
01:06:36,789 --> 01:06:34,480
these electronic devices that we all use

1867
01:06:38,950 --> 01:06:36,799
every day we take that spin-off

1868
01:06:41,430 --> 01:06:38,960
technology turn it back around and use

1869
01:06:44,069 --> 01:06:41,440
it in our own spacecraft to make them a

1870
01:06:46,390 --> 01:06:44,079
low-cost alternative way of doing

1871
01:06:49,109 --> 01:06:46,400
science and engineering and space

1872
01:06:51,029 --> 01:06:49,119
so i think i'll take questions if you

1873
01:06:56,069 --> 01:06:51,039
have any

1874
01:06:59,750 --> 01:06:58,069
i was interested in how they're powered

1875
01:07:01,990 --> 01:06:59,760
or those

1876
01:07:03,750 --> 01:07:02,000
solar arrays are they battery powered

1877
01:07:05,349 --> 01:07:03,760
internally yeah it has rechargeable

1878
01:07:07,910 --> 01:07:05,359
batteries and these are solar panels on

1879
01:07:09,990 --> 01:07:07,920
the outside interesting thing about this

1880
01:07:11,750 --> 01:07:10,000
uh another one of these great cubesat

1881
01:07:15,270 --> 01:07:11,760
things is that there's a company in

1882
01:07:18,069 --> 01:07:15,280
california that buys scraps of solar

1883
01:07:20,470 --> 01:07:18,079
panels from the big ones that are made

1884
01:07:23,029 --> 01:07:20,480
so these are very high high efficiency

1885
01:07:24,789 --> 01:07:23,039
very high value solar cell

1886
01:07:26,390 --> 01:07:24,799
panels but they're just the scraps that

1887
01:07:28,390 --> 01:07:26,400
would normally be thrown away this

1888
01:07:31,750 --> 01:07:28,400

company buys them up puts them on boards

1889
01:07:32,710 --> 01:07:31,760
and sells them um one panel is about 150

1890
01:07:34,710 --> 01:07:32,720
i believe

1891
01:07:35,750 --> 01:07:34,720
and that's a you know 28 efficiency

1892
01:07:38,309 --> 01:07:35,760
solar

1893
01:07:40,390 --> 01:07:38,319
cell so it's it's good stuff at a very

1894
01:07:43,510 --> 01:07:40,400
low price and that's the kind of thing

1895
01:07:46,230 --> 01:07:43,520
and you can see the antenna as well

1896
01:07:48,230 --> 01:07:46,240
so it's a it's a

1897
01:07:50,309 --> 01:07:48,240
deployable

1898
01:07:52,870 --> 01:07:50,319
antenna

1899
01:07:54,950 --> 01:07:52,880
but you can buy it in a hardware store

1900
01:07:57,510 --> 01:07:54,960
and and that's you know no reason to

1901
01:07:59,589 --> 01:07:57,520
spend more than we need to

1902
01:08:01,990 --> 01:07:59,599
all right next questions down front here

1903
01:08:04,870 --> 01:08:02,000
at what data rate is a signal going down

1904
01:08:07,589 --> 01:08:04,880
to earth uh with the s this has an

1905
01:08:08,950 --> 01:08:07,599
s-band antenna

1906
01:08:14,069 --> 01:08:08,960
and that's

1907
01:08:17,030 --> 01:08:14,870
so

1908
01:08:19,030 --> 01:08:17,040
fairly low for this that's why we're

1909
01:08:21,430 --> 01:08:19,040
interested in the laser com that could

1910
01:08:22,390 --> 01:08:21,440
get up to hundreds of megabits per

1911
01:08:24,789 --> 01:08:22,400
second

1912
01:08:26,550 --> 01:08:24,799
and and even the uh the high gain

1913
01:08:28,470 --> 01:08:26,560

antenna that we'll be testing would

1914
01:08:29,590 --> 01:08:28,480
would be in the hundreds of megabits per

1915
01:08:31,510 --> 01:08:29,600
second so

1916
01:08:33,349 --> 01:08:31,520
um

1917
01:08:34,630 --> 01:08:33,359
right now there's a limitation on

1918
01:08:37,189 --> 01:08:34,640
communication with these small

1919
01:08:39,269 --> 01:08:37,199
satellites i think we will rapidly see

1920
01:08:42,149 --> 01:08:39,279
that change and that will no longer

1921
01:08:43,349 --> 01:08:42,159
really be a limitation

1922
01:08:45,030 --> 01:08:43,359
all right just a reminder for our

1923
01:08:46,470 --> 01:08:45,040
followers online who are watching we're

1924
01:08:47,990 --> 01:08:46,480
taking questions using the hashtag

1925
01:08:50,950 --> 01:08:48,000
asknasa and we're going to go to one of

1926
01:08:54,309 --> 01:08:52,390
a question is how can high school

1927
01:08:56,229 --> 01:08:54,319
students get involved in cubescat

1928
01:08:58,309 --> 01:08:56,239
creation

1929
01:09:00,229 --> 01:08:58,319
um

1930
01:09:02,309 --> 01:09:00,239
i think we'll have there's probably some

1931
01:09:05,590 --> 01:09:02,319
other guests here this this week that

1932
01:09:08,390 --> 01:09:05,600
could better answer that um but i there

1933
01:09:10,950 --> 01:09:08,400
are programs across the country one

1934
01:09:13,669 --> 01:09:10,960
i mentioned two things one is that nasa

1935
01:09:16,149 --> 01:09:13,679
provides launch opportunities for those

1936
01:09:17,510 --> 01:09:16,159
types of projects and we'll be doing

1937
01:09:20,630 --> 01:09:17,520
that that's how some of these are being

1938
01:09:22,950 --> 01:09:20,640

flown even even this week

1939
01:09:24,550 --> 01:09:22,960
our focus of course is on engineering

1940
01:09:27,030 --> 01:09:24,560
and science developing these

1941
01:09:28,789 --> 01:09:27,040
capabilities for our our science

1942
01:09:30,550 --> 01:09:28,799
exploration and space operations

1943
01:09:32,870 --> 01:09:30,560
missions but

1944
01:09:35,829 --> 01:09:32,880
we obviously recognize the tremendous

1945
01:09:38,630 --> 01:09:35,839
value of this as an educational tool

1946
01:09:40,309 --> 01:09:38,640
we also have our our program does have a

1947
01:09:41,590 --> 01:09:40,319
collaboration program with universities

1948
01:09:43,510 --> 01:09:41,600
where we take proposals from

1949
01:09:46,229 --> 01:09:43,520
universities

1950
01:09:47,590 --> 01:09:46,239
and then match them with a nasa

1951
01:09:49,990 --> 01:09:47,600
collaborator

1952
01:09:51,510 --> 01:09:50,000
to do projects and we've had

1953
01:09:53,269 --> 01:09:51,520
a number of those going on over the past

1954
01:09:55,990 --> 01:09:53,279
few years and we intend to do that

1955
01:09:58,070 --> 01:09:56,000
opportunity every year

1956
01:10:00,630 --> 01:09:58,080
next question is over here in the back

1957
01:10:02,550 --> 01:10:00,640
yes hello eric brown with cosmic cafe

1958
01:10:04,709 --> 01:10:02,560
show my question is since you mentioned

1959
01:10:05,910 --> 01:10:04,719
that the brain of it is cell phone

1960
01:10:08,470 --> 01:10:05,920
technology

1961
01:10:11,990 --> 01:10:08,480
and not to maybe perpetuate the rivalry

1962
01:10:13,910 --> 01:10:12,000
between os and android which uh cell

1963
01:10:15,189 --> 01:10:13,920

phone brain technology is being used if

1964
01:10:16,550 --> 01:10:15,199
you don't mind answering yeah they're

1965
01:10:18,550 --> 01:10:16,560
using android

1966
01:10:21,189 --> 01:10:18,560
um

1967
01:10:24,310 --> 01:10:21,199
and and yeah and i i believe

1968
01:10:27,030 --> 01:10:24,320
the the reason is just the accessibility

1969
01:10:28,870 --> 01:10:27,040
for doing programming with it um you

1970
01:10:30,390 --> 01:10:28,880
know i'm not a software expert but

1971
01:10:33,590 --> 01:10:30,400
that's what the

1972
01:10:35,590 --> 01:10:33,600
the team members chose to do but the

1973
01:10:37,110 --> 01:10:35,600
what's inside is just the board taken

1974
01:10:39,030 --> 01:10:37,120
out of a phone that's bought off the

1975
01:10:41,189 --> 01:10:39,040
shelf so they go out and buy them and

1976
01:10:43,270 --> 01:10:41,199
take them out of the box and then

1977
01:10:45,270 --> 01:10:43,280
the original phone sats that tested this

1978
01:10:47,510 --> 01:10:45,280
technology a couple years ago and on a

1979
01:10:50,470 --> 01:10:47,520
couple of missions that we we sponsored

1980
01:10:52,709 --> 01:10:50,480
um had literally the phone inside the

1981
01:10:54,149 --> 01:10:52,719
the cube but then they've kind of

1982
01:10:55,910 --> 01:10:54,159
progressed to taking that out but they

1983
01:10:58,310 --> 01:10:55,920
use a lot of the components on those

1984
01:10:59,430 --> 01:10:58,320
phone stats they even used the camera

1985
01:11:01,030 --> 01:10:59,440
from the phone

1986
01:11:03,350 --> 01:11:01,040
to take pictures of the earth and send

1987
01:11:05,430 --> 01:11:03,360
those back

1988
01:11:07,350 --> 01:11:05,440

next questions

1989
01:11:09,590 --> 01:11:07,360
i was curious since yesterday we've

1990
01:11:10,950 --> 01:11:09,600
heard several times the term off the

1991
01:11:12,470 --> 01:11:10,960
shelf and i was always under the

1992
01:11:14,229 --> 01:11:12,480
impression that most of

1993
01:11:15,750 --> 01:11:14,239
the things that we used here for

1994
01:11:18,310 --> 01:11:15,760
missions were custom built for the

1995
01:11:20,390 --> 01:11:18,320
missions so my question would be um what

1996
01:11:22,550 --> 01:11:20,400
percentage are we looking now for the

1997
01:11:25,189 --> 01:11:22,560
projects that we have that are now going

1998
01:11:27,750 --> 01:11:25,199
to be off the shelf so to speak

1999
01:11:30,070 --> 01:11:27,760
i think we'll always see a mix um and to

2000
01:11:31,350 --> 01:11:30,080
me the ideal thing is is you have a

2001
01:11:33,590 --> 01:11:31,360
satellite bus

2002
01:11:35,510 --> 01:11:33,600
you know that is using mainly

2003
01:11:37,750 --> 01:11:35,520
off-the-shelf types of things as much as

2004
01:11:39,750 --> 01:11:37,760
possible and then you're introducing to

2005
01:11:41,669 --> 01:11:39,760
that the unique things that you want to

2006
01:11:43,910 --> 01:11:41,679
be using either as instruments for your

2007
01:11:45,110 --> 01:11:43,920
mission or new technology that you're

2008
01:11:47,030 --> 01:11:45,120
testing

2009
01:11:49,110 --> 01:11:47,040
so i i see it they'll always be i think

2010
01:11:51,510 --> 01:11:49,120
a little bit of a mix there but we can

2011
01:11:56,390 --> 01:11:51,520
make i think a satellite bus for you

2012
01:12:00,149 --> 01:11:57,750
all right next questions down here in

2013
01:12:03,270 --> 01:12:01,270

thank you

2014
01:12:06,310 --> 01:12:03,280
i see a huge potential related to

2015
01:12:07,750 --> 01:12:06,320
communication to this technology

2016
01:12:11,270 --> 01:12:07,760
is this uh

2017
01:12:12,470 --> 01:12:11,280
is you know the starting phase of uh

2018
01:12:14,390 --> 01:12:12,480
out uh

2019
01:12:16,790 --> 01:12:14,400
you know lower orbit internet so to

2020
01:12:18,470 --> 01:12:16,800
speak i see also some spacecrafts that

2021
01:12:20,630 --> 01:12:18,480
are deep space

2022
01:12:23,030 --> 01:12:20,640
dropping these boxes along the way so

2023
01:12:25,590 --> 01:12:23,040
that it relays communication back so are

2024
01:12:27,110 --> 01:12:25,600
there plans on on expanding to this type

2025
01:12:30,070 --> 01:12:27,120
of level

2026
01:12:32,310 --> 01:12:30,080
yeah well the the uh the marco

2027
01:12:34,070 --> 01:12:32,320
mission as part of insight is an example

2028
01:12:36,470 --> 01:12:34,080
of dropping them and use them as a

2029
01:12:38,229 --> 01:12:36,480
communications relay

2030
01:12:40,149 --> 01:12:38,239
there's you know i've been talking about

2031
01:12:41,510 --> 01:12:40,159
our nasa research but there's a huge

2032
01:12:43,270 --> 01:12:41,520
commercial

2033
01:12:44,630 --> 01:12:43,280
activity out there

2034
01:12:45,669 --> 01:12:44,640
you have companies

2035
01:12:47,910 --> 01:12:45,679
building

2036
01:12:49,030 --> 01:12:47,920
these by the dozen

2037
01:12:51,110 --> 01:12:49,040
and with

2038
01:12:53,350 --> 01:12:51,120

all kinds of ideas of how they might

2039
01:12:54,550 --> 01:12:53,360
might build networks around the earth

2040
01:12:58,149 --> 01:12:54,560
for

2041
01:12:59,510 --> 01:12:58,159
that all kinds of communications

2042
01:13:06,310 --> 01:12:59,520
all right we've got time for one more

2043
01:13:10,310 --> 01:13:07,990
i was just curious what do you do about

2044
01:13:11,669 --> 01:13:10,320
thermal protection for the phone inside

2045
01:13:13,990 --> 01:13:11,679
the cubesat

2046
01:13:16,070 --> 01:13:14,000
yeah thermal management yeah what we

2047
01:13:17,830 --> 01:13:16,080
found with the original phonesat

2048
01:13:19,669 --> 01:13:17,840
missions that we're looking at that

2049
01:13:21,990 --> 01:13:19,679
particular problem they didn't really

2050
01:13:24,790 --> 01:13:22,000
need to do very much um

2051
01:13:26,950 --> 01:13:24,800
you know these these satellites um

2052
01:13:29,590 --> 01:13:26,960
you know as aluminum frame the heat kind

2053
01:13:31,189 --> 01:13:29,600
of dissipates into into the structure

2054
01:13:33,430 --> 01:13:31,199
and it wasn't really a problem as we get

2055
01:13:35,030 --> 01:13:33,440
the higher and higher power systems

2056
01:13:37,270 --> 01:13:35,040
which is you know what we want to do we

2057
01:13:39,590 --> 01:13:37,280
have to begin to be concerned

2058
01:13:41,510 --> 01:13:39,600
about thermal control so we that's an

2059
01:13:43,189 --> 01:13:41,520
area of technology we're beginning to

2060
01:13:45,830 --> 01:13:43,199
put a little more attention we've been

2061
01:13:47,189 --> 01:13:45,840
focused on communications propulsion

2062
01:13:49,350 --> 01:13:47,199
we're going to be start trying to look

2063
01:13:50,709 --> 01:13:49,360

at more power and

2064
01:13:52,550 --> 01:13:50,719
and then once you have more power how

2065
01:13:53,990 --> 01:13:52,560
you deal with with heat rejection that

2066
01:13:55,590 --> 01:13:54,000
goes with that

2067
01:13:57,110 --> 01:13:55,600
i will be around after the program's

2068
01:13:58,149 --> 01:13:57,120
over if people want to look at this up

2069
01:14:00,390 --> 01:13:58,159
close or

2070
01:14:01,590 --> 01:14:00,400
talk some more as well

2071
01:14:02,790 --> 01:14:01,600
wonderful thank you very much for

2072
01:14:04,149 --> 01:14:02,800
joining us today and telling us about it

2073
01:14:09,830 --> 01:14:04,159
and good luck with launch tomorrow thank

2074
01:14:12,950 --> 01:14:11,189
all right so we're here at the kennedy

2075
01:14:14,470 --> 01:14:12,960
space center in order to see this launch

2076
01:14:15,750 --> 01:14:14,480
that's happening tomorrow here and so

2077
01:14:17,430 --> 01:14:15,760
who better to tell us a little bit about

2078
01:14:18,950 --> 01:14:17,440
what's going on right now to

2079
01:14:20,870 --> 01:14:18,960
prepare for the future here at america's

2080
01:14:23,350 --> 01:14:20,880
spaceport than the director of kennedy

2081
01:14:27,270 --> 01:14:23,360
space center bob cabana

2082
01:14:31,350 --> 01:14:29,270
hope you're all having a good day so far

2083
01:14:33,669 --> 01:14:31,360
so i was just out at the beach house uh

2084
01:14:35,830 --> 01:14:33,679
talking to our legislative affairs folks

2085
01:14:38,709 --> 01:14:35,840
and and i was driving back you know i

2086
01:14:41,110 --> 01:14:38,719
drive past all the launch pads and i was

2087
01:14:43,910 --> 01:14:41,120
contemplating the tremendous positive

2088
01:14:46,229 --> 01:14:43,920

change that has gone on here at ksc in

2089
01:14:48,950 --> 01:14:46,239
the last four years and it starts right

2090
01:14:50,229 --> 01:14:48,960
there at pad 41 right out by the beach

2091
01:14:51,990 --> 01:14:50,239
house and i'm looking at the pad and

2092
01:14:54,070 --> 01:14:52,000
tomorrow we'll see an atlas 5 on it with

2093
01:14:55,910 --> 01:14:54,080
the cygnus vehicle which was processed

2094
01:14:57,910 --> 01:14:55,920
and fueled right here at the the kennedy

2095
01:14:59,669 --> 01:14:57,920
space center before it was put on top of

2096
01:15:01,590 --> 01:14:59,679
that atlas v

2097
01:15:03,830 --> 01:15:01,600
but out there on that pad you see this

2098
01:15:06,310 --> 01:15:03,840
huge vertical structure on the pad that

2099
01:15:08,950 --> 01:15:06,320
wasn't there just a few months ago and

2100
01:15:11,910 --> 01:15:08,960
that is the access for the crew to the

2101
01:15:13,590 --> 01:15:11,920
atlas 5 for the cst-100 starliner

2102
01:15:15,189 --> 01:15:13,600
spacecraft that boeing

2103
01:15:17,030 --> 01:15:15,199
is going to take crews to the

2104
01:15:18,709 --> 01:15:17,040
international space station on hopefully

2105
01:15:21,270 --> 01:15:18,719
we'll have a test flight in 2017 with

2106
01:15:24,070 --> 01:15:21,280
crews flying it in 2018. and you know

2107
01:15:26,149 --> 01:15:24,080
just back behind us here in opf bay 3

2108
01:15:28,790 --> 01:15:26,159
you see that huge boeing logo on the

2109
01:15:30,709 --> 01:15:28,800
front of it and what was an orbiter

2110
01:15:33,350 --> 01:15:30,719
processing facility an engine shop for

2111
01:15:36,550 --> 01:15:33,360
the shuttle is now the processing

2112
01:15:38,950 --> 01:15:36,560
facility for boeing's crew module

2113
01:15:40,390 --> 01:15:38,960

command module and service module what

2114
01:15:43,350 --> 01:15:40,400
what a great

2115
01:15:45,590 --> 01:15:43,360
way to utilize excess facilities to

2116
01:15:48,390 --> 01:15:45,600
enable commercial space operations so

2117
01:15:51,510 --> 01:15:48,400
then i pass pad 41 and the next pad i

2118
01:15:53,910 --> 01:15:51,520
come to is pad 39a which could have been

2119
01:15:56,229 --> 01:15:53,920
just rusting away out there in the salt

2120
01:15:59,030 --> 01:15:56,239
air but instead what do you see you see

2121
01:16:00,950 --> 01:15:59,040
this huge horizontal uh processing

2122
01:16:03,910 --> 01:16:00,960
facility that spacex has built for the

2123
01:16:06,470 --> 01:16:03,920
falcon 9 and falcon 9 heavy the pad

2124
01:16:09,350 --> 01:16:06,480
totally redone it's got the transporter

2125
01:16:12,229 --> 01:16:09,360
erector out on it uh you know totally

2126
01:16:14,470 --> 01:16:12,239
refurbished to accommodate the falcon 9

2127
01:16:16,709 --> 01:16:14,480
heavy and their commercial crew entrant

2128
01:16:18,470 --> 01:16:16,719
the falcon 9 with the crew dragon on it

2129
01:16:20,790 --> 01:16:18,480
you know hopefully flying a test flight

2130
01:16:23,590 --> 01:16:20,800
in 2017 with crews to the space station

2131
01:16:26,390 --> 01:16:23,600
in 2018 that's pad a and you go a little

2132
01:16:28,950 --> 01:16:26,400
further and i took a spin around pad b

2133
01:16:31,030 --> 01:16:28,960
and you know we're going to mars from

2134
01:16:33,270 --> 01:16:31,040
pad b you know they're working on the

2135
01:16:35,189 --> 01:16:33,280
flame trench right now new flame trench

2136
01:16:38,550 --> 01:16:35,199
new flame deflector but most of the

2137
01:16:40,870 --> 01:16:38,560
refurbishment is complete on that pad

2138
01:16:43,750 --> 01:16:40,880

we just need a rocket and i i just can't

2139
01:16:45,510 --> 01:16:43,760
wait until we get a sls out on pad b

2140
01:16:47,750 --> 01:16:45,520
even even for the initial integration

2141
01:16:50,070 --> 01:16:47,760
and testing it's going to be awesome so

2142
01:16:52,229 --> 01:16:50,080
then i went back up the crawler way road

2143
01:16:53,990 --> 01:16:52,239
and i see the doors open on high bay

2144
01:16:56,709 --> 01:16:54,000
three and a vab because what's going on

2145
01:16:57,910 --> 01:16:56,719
in there you know it's totally gutted uh

2146
01:17:00,550 --> 01:16:57,920
they're getting ready to install the

2147
01:17:02,630 --> 01:17:00,560
platforms for sls in there and the

2148
01:17:04,790 --> 01:17:02,640
platforms are arriving uh you can see

2149
01:17:06,470 --> 01:17:04,800
them out in the park site outside the

2150
01:17:07,510 --> 01:17:06,480
vab and maybe i'll get a christmas

2151
01:17:10,310 --> 01:17:07,520
present and the first one will be

2152
01:17:12,470 --> 01:17:10,320
installed by christmas but what a what a

2153
01:17:14,470 --> 01:17:12,480
great design you know this rocket is

2154
01:17:16,149 --> 01:17:14,480
going to evolve you know the sls starts

2155
01:17:18,790 --> 01:17:16,159
out on em1

2156
01:17:20,709 --> 01:17:18,800
but it's gonna evolve to a bigger rocket

2157
01:17:22,630 --> 01:17:20,719
and these platforms they move eight to

2158
01:17:23,990 --> 01:17:22,640
ten feet up and down they have inserts

2159
01:17:25,270 --> 01:17:24,000
in them so that as the outer mold line

2160
01:17:26,310 --> 01:17:25,280
of the rocket changes you don't have to

2161
01:17:27,990 --> 01:17:26,320
change the whole platform you just

2162
01:17:31,510 --> 01:17:28,000
remove the insert put a different insert

2163
01:17:33,430 --> 01:17:31,520

in to accommodate sls as it evolves

2164
01:17:35,110 --> 01:17:33,440
that's going on right now and then i

2165
01:17:36,709 --> 01:17:35,120
took a picture of the mobile launcher

2166
01:17:37,990 --> 01:17:36,719
right outside there's a crane by it and

2167
01:17:39,590 --> 01:17:38,000
the reason that crane is there is

2168
01:17:41,830 --> 01:17:39,600
because we've completed all the

2169
01:17:44,070 --> 01:17:41,840
structural mods to that launcher we're

2170
01:17:45,510 --> 01:17:44,080
now installing the swing arms and the

2171
01:17:47,030 --> 01:17:45,520
umbilicals and the systems that are

2172
01:17:49,030 --> 01:17:47,040
needed to support

2173
01:17:50,950 --> 01:17:49,040
the space launch system

2174
01:17:52,790 --> 01:17:50,960
and that is happening right now over in

2175
01:17:55,510 --> 01:17:52,800
the launch environment test facility

2176
01:17:57,030 --> 01:17:55,520
back behind the onc building is you know

2177
01:17:58,470 --> 01:17:57,040
the swing arms and umbilicals have

2178
01:18:00,470 --> 01:17:58,480
started to arrive they were built by a

2179
01:18:03,189 --> 01:18:00,480
small company right here in cocoa

2180
01:18:05,669 --> 01:18:03,199
florida coastal steel and they've got

2181
01:18:07,990 --> 01:18:05,679
the the big one for the interim cryo

2182
01:18:09,750 --> 01:18:08,000
upper stage installed they've tested the

2183
01:18:10,830 --> 01:18:09,760
one for the

2184
01:18:17,110 --> 01:18:10,840
uh

2185
01:18:18,790 --> 01:18:17,120
is real testing real work that's going

2186
01:18:21,750 --> 01:18:18,800
on right now

2187
01:18:23,189 --> 01:18:21,760
and change is happening and it's a very

2188
01:18:24,870 --> 01:18:23,199

positive change we're enabling

2189
01:18:27,030 --> 01:18:24,880
commercial operations

2190
01:18:28,709 --> 01:18:27,040
and we're also enabling uh the united

2191
01:18:29,990 --> 01:18:28,719
states to explore beyond planet earth

2192
01:18:32,229 --> 01:18:30,000
again our

2193
01:18:33,910 --> 01:18:32,239
you know i get really excited i look at

2194
01:18:35,270 --> 01:18:33,920
you know nasa we've been number one in

2195
01:18:36,470 --> 01:18:35,280
the federal government three years in a

2196
01:18:38,630 --> 01:18:36,480
row and hopefully this will be the

2197
01:18:40,550 --> 01:18:38,640
fourth year and i i asked why is that

2198
01:18:42,550 --> 01:18:40,560
why is nasa number one and i think

2199
01:18:45,830 --> 01:18:42,560
there's a couple of reasons first off we

2200
01:18:47,669 --> 01:18:45,840
have an amazing team you know people we

2201
01:18:49,030 --> 01:18:47,679
really do believe in the nasa family and

2202
01:18:51,510 --> 01:18:49,040
we look out for one another and we

2203
01:18:54,149 --> 01:18:51,520
create an environment where nasa is a

2204
01:18:55,510 --> 01:18:54,159
great place to work but i think the one

2205
01:18:57,270 --> 01:18:55,520
of the main reasons we're always number

2206
01:18:59,350 --> 01:18:57,280
one is we have a meaningful mission i

2207
01:19:00,790 --> 01:18:59,360
mean we come to work every day and we're

2208
01:19:02,390 --> 01:19:00,800
not just making a difference for the

2209
01:19:04,229 --> 01:19:02,400
united states we're making a difference

2210
01:19:05,910 --> 01:19:04,239
for the world for humanity you know to

2211
01:19:08,550 --> 01:19:05,920
be able to survive to explore to go

2212
01:19:10,550 --> 01:19:08,560
beyond and to be part of that every day

2213
01:19:13,270 --> 01:19:10,560

i don't care what your job is and i hope

2214
01:19:14,550 --> 01:19:13,280
you can walk up to anybody at ksc and

2215
01:19:16,870 --> 01:19:14,560
ask them what they do and they'll tell

2216
01:19:18,870 --> 01:19:16,880
you i launch rockets you know because

2217
01:19:20,790 --> 01:19:18,880
everybody has a role to play for us to

2218
01:19:22,070 --> 01:19:20,800
be successful on this team and i just

2219
01:19:24,149 --> 01:19:22,080
think it's an awesome team and a great

2220
01:19:25,590 --> 01:19:24,159
place to work so

2221
01:19:27,270 --> 01:19:25,600
the change that's happened here you know

2222
01:19:28,709 --> 01:19:27,280
this the shuttle landing facility we

2223
01:19:30,709 --> 01:19:28,719
turn that over to the state of florida

2224
01:19:32,950 --> 01:19:30,719
to maintain and operate doesn't cost us

2225
01:19:34,950 --> 01:19:32,960
a penny anymore and they're going to be

2226
01:19:36,470 --> 01:19:34,960
able to commercialize it for horizontal

2227
01:19:38,470 --> 01:19:36,480
launch capability and suborbital

2228
01:19:40,790 --> 01:19:38,480
missions

2229
01:19:43,110 --> 01:19:40,800
blue origin i'm sure you all saw where

2230
01:19:45,510 --> 01:19:43,120
they had their successful landing here a

2231
01:19:47,270 --> 01:19:45,520
few days ago on their launch vehicle

2232
01:19:49,750 --> 01:19:47,280
they're coming to the cape they're going

2233
01:19:50,790 --> 01:19:49,760
to be launching down on pad 46 cape side

2234
01:19:53,189 --> 01:19:50,800
but they're going to have a huge

2235
01:19:54,870 --> 01:19:53,199
manufacturing facility on ksc property

2236
01:19:56,550 --> 01:19:54,880
at exploration park

2237
01:19:59,590 --> 01:19:56,560
again another partnership with the state

2238
01:20:02,310 --> 01:19:59,600

of florida through space florida so

2239
01:20:04,070 --> 01:20:02,320
i'm excited about the future here at ksc

2240
01:20:06,310 --> 01:20:04,080
it's been a time of tremendous change

2241
01:20:08,709 --> 01:20:06,320
very positive change and i feel that we

2242
01:20:11,750 --> 01:20:08,719
have an absolutely awesome plan moving

2243
01:20:13,270 --> 01:20:11,760
forward as we support sls and orion put

2244
01:20:14,950 --> 01:20:13,280
the ground infrastructure in place to

2245
01:20:17,189 --> 01:20:14,960
take us to mars one day that's gonna

2246
01:20:19,590 --> 01:20:17,199
happen it's real it's not just

2247
01:20:21,590 --> 01:20:19,600
powerpoint slides it's real that we

2248
01:20:23,030 --> 01:20:21,600
support commercial crew have a

2249
01:20:24,709 --> 01:20:23,040
capability to fly crews to the

2250
01:20:26,470 --> 01:20:24,719
international space station on a us

2251
01:20:30,070 --> 01:20:26,480
rocket from here at the cape that we

2252
01:20:33,350 --> 01:20:31,510
you know that our launch services

2253
01:20:35,910 --> 01:20:33,360
program continues to provide the

2254
01:20:38,310 --> 01:20:35,920
expandable vehicles we got uh jason 3

2255
01:20:40,790 --> 01:20:38,320
coming up launch on a falcon 9 out on

2256
01:20:43,990 --> 01:20:40,800
the west coast at vandenberg hopefully

2257
01:20:46,149 --> 01:20:44,000
in january you know this is an awesome

2258
01:20:49,030 --> 01:20:46,159
place we are doing amazing things every

2259
01:20:50,950 --> 01:20:49,040
day and it's real it's not paper it's

2260
01:20:52,870 --> 01:20:50,960
not powerpoint slides it's real and you

2261
01:20:55,189 --> 01:20:52,880
can go out and see the hardware and that

2262
01:20:56,070 --> 01:20:55,199
to me is pretty darn exciting so with

2263
01:20:57,590 --> 01:20:56,080

that

2264
01:21:00,070 --> 01:20:57,600
i'm going to take any questions you got

2265
01:21:02,790 --> 01:21:00,080
about what's going on at nasa ksc and uh

2266
01:21:06,070 --> 01:21:03,990
i was curious we actually had the

2267
01:21:08,070 --> 01:21:06,080
opportunity to tour the boeing facility

2268
01:21:09,669 --> 01:21:08,080
yesterday you know indeed yeah it was

2269
01:21:11,910 --> 01:21:09,679
super neat it was like the coolest thing

2270
01:21:13,430 --> 01:21:11,920
ever but um

2271
01:21:15,030 --> 01:21:13,440
my question was gonna be with these

2272
01:21:18,229 --> 01:21:15,040
commercial companies coming on the

2273
01:21:19,910 --> 01:21:18,239
facility how much of

2274
01:21:21,990 --> 01:21:19,920
nasa is like involved in what they're

2275
01:21:23,350 --> 01:21:22,000
doing are you seeing the aspects that

2276
01:21:24,950 --> 01:21:23,360
you know other people don't get to see

2277
01:21:26,870 --> 01:21:24,960
because we were told that not many

2278
01:21:28,629 --> 01:21:26,880
people get to see those facilities so i

2279
01:21:30,310 --> 01:21:28,639
was just curious how much involvement

2280
01:21:32,390 --> 01:21:30,320
you have in those the commercial crew

2281
01:21:34,709 --> 01:21:32,400
program is very involved in what

2282
01:21:37,590 --> 01:21:34,719
boeing's doing and what spacex is doing

2283
01:21:39,270 --> 01:21:37,600
you know uh we are active participants

2284
01:21:41,669 --> 01:21:39,280
in helping make that happen so we're

2285
01:21:44,390 --> 01:21:41,679
working with them but again you know

2286
01:21:46,390 --> 01:21:44,400
it's a commercial venture and we have

2287
01:21:49,110 --> 01:21:46,400
given them as much autonomy as we

2288
01:21:50,870 --> 01:21:49,120

possibly can to operate here at ksc but

2289
01:21:53,350 --> 01:21:50,880
absolutely we know what's going on in

2290
01:21:55,510 --> 01:21:53,360
fact this uh this afternoon uh the

2291
01:21:57,510 --> 01:21:55,520
deputy administrator david newman and i

2292
01:21:59,270 --> 01:21:57,520
are going to go out and tour a spacex's

2293
01:22:01,669 --> 01:21:59,280
pad and see all the latest upgrades out

2294
01:22:02,870 --> 01:22:01,679
there she hasn't seen it and

2295
01:22:04,070 --> 01:22:02,880
you know we want to show that off we

2296
01:22:05,510 --> 01:22:04,080
want to show the great progress that

2297
01:22:10,310 --> 01:22:05,520
commercial companies are making here at

2298
01:22:12,790 --> 01:22:11,990
hi thank you uh

2299
01:22:17,590 --> 01:22:12,800
uh

2300
01:22:19,830 --> 01:22:17,600
need to learn invent or conceive in

2301
01:22:22,310 --> 01:22:19,840
order to take the next big step beyond

2302
01:22:23,270 --> 01:22:22,320
what you're currently planning today

2303
01:22:25,430 --> 01:22:23,280
well

2304
01:22:28,310 --> 01:22:25,440
to me the next big step i mean our

2305
01:22:29,750 --> 01:22:28,320
ultimate goal is boots on mars and in

2306
01:22:31,350 --> 01:22:29,760
order to do that

2307
01:22:33,590 --> 01:22:31,360
i really believe that we have the right

2308
01:22:36,790 --> 01:22:33,600
architecture that we're putting in place

2309
01:22:38,790 --> 01:22:36,800
it's a capability with the space launch

2310
01:22:41,350 --> 01:22:38,800
system and the orion crew vehicle you

2311
01:22:42,709 --> 01:22:41,360
know i think it's absolutely correct to

2312
01:22:44,470 --> 01:22:42,719
turn low earth

2313
01:22:45,910 --> 01:22:44,480

low earth orbit operations over to

2314
01:22:47,750 --> 01:22:45,920
commercial companies

2315
01:22:50,149 --> 01:22:47,760
they can do that and

2316
01:22:52,070 --> 01:22:50,159
utilize commercial space for or low

2317
01:22:54,149 --> 01:22:52,080
earth orbit for commercial space but

2318
01:22:56,950 --> 01:22:54,159
nasa really needs to be involved in in

2319
01:22:59,669 --> 01:22:56,960
the exploration beyond our home planet

2320
01:23:01,590 --> 01:22:59,679
and i i think the proving ground is that

2321
01:23:03,110 --> 01:23:01,600
area beyond earth but not quite to mars

2322
01:23:04,390 --> 01:23:03,120
yet we have to learn how to operate out

2323
01:23:06,709 --> 01:23:04,400
there and i think the international

2324
01:23:09,430 --> 01:23:06,719
space station is just a phenomenal

2325
01:23:11,910 --> 01:23:09,440
test bed and research facility to enable

2326
01:23:14,629 --> 01:23:11,920
that the systems that we have you know

2327
01:23:17,350 --> 01:23:14,639
how many you i better see all the hands

2328
01:23:18,550 --> 01:23:17,360
go up how many saw the martian

2329
01:23:20,070 --> 01:23:18,560
all right

2330
01:23:21,910 --> 01:23:20,080
how many read the book before they saw

2331
01:23:24,229 --> 01:23:21,920
the movie

2332
01:23:27,430 --> 01:23:24,239
how many read the book over a year ago

2333
01:23:29,430 --> 01:23:27,440
before it was really popular

2334
01:23:31,030 --> 01:23:29,440
all right what you know i walked out of

2335
01:23:32,709 --> 01:23:31,040
that movie and i said man this is so

2336
01:23:34,790 --> 01:23:32,719
cool i want to make that happen for real

2337
01:23:36,310 --> 01:23:34,800
i also i was watching it with uh our

2338
01:23:37,910 --> 01:23:36,320

associate administrator

2339
01:23:39,030 --> 01:23:37,920
calvin manning he was sitting next to me

2340
01:23:40,629 --> 01:23:39,040
and that one scene where they're coming

2341
01:23:41,830 --> 01:23:40,639
back from mars office and they zoom out

2342
01:23:43,189 --> 01:23:41,840
in space and they show this huge

2343
01:23:47,590 --> 01:23:43,199
spacecraft coming i leaned over to

2344
01:23:50,550 --> 01:23:49,030
i want that gym that they had did you

2345
01:23:53,030 --> 01:23:50,560
see that jim you know with all that

2346
01:23:55,110 --> 01:23:53,040
exercise equipment that's the spacecraft

2347
01:23:56,070 --> 01:23:55,120
i want now we're not going to have that

2348
01:23:57,430 --> 01:23:56,080
right away

2349
01:23:58,709 --> 01:23:57,440
all right

2350
01:24:00,709 --> 01:23:58,719
you know that's a lot of mass and that

2351
01:24:02,709 --> 01:24:00,719
costs a lot of money but

2352
01:24:04,229 --> 01:24:02,719
the truth is we have to be able to

2353
01:24:06,390 --> 01:24:04,239
operate out in that environment for an

2354
01:24:07,669 --> 01:24:06,400
extended period of time

2355
01:24:09,990 --> 01:24:07,679
right now with current propulsion

2356
01:24:11,350 --> 01:24:10,000
technology uh it's six to eight months

2357
01:24:12,870 --> 01:24:11,360
to get to mars another six to eight

2358
01:24:15,510 --> 01:24:12,880
months there's for another six to eight

2359
01:24:17,750 --> 01:24:15,520
month trip home and the systems on the

2360
01:24:19,669 --> 01:24:17,760
international space station uh i bet

2361
01:24:21,110 --> 01:24:19,679
there's not one environmental system i

2362
01:24:22,950 --> 01:24:21,120
know there's not that has worked

2363
01:24:26,310 --> 01:24:22,960

continuously without repair or

2364
01:24:28,070 --> 01:24:26,320
replacement for uh a year you know or

2365
01:24:29,510 --> 01:24:28,080
two all right and that's that's what

2366
01:24:31,510 --> 01:24:29,520
we're gonna need we're gonna need highly

2367
01:24:33,830 --> 01:24:31,520
reliable systems to take care of the

2368
01:24:35,110 --> 01:24:33,840
crew and as close you heard earlier you

2369
01:24:38,310 --> 01:24:35,120
know the importance of a closed-loop

2370
01:24:40,709 --> 01:24:38,320
environmental system in reclaiming water

2371
01:24:43,030 --> 01:24:40,719
and how important that is you know we

2372
01:24:44,229 --> 01:24:43,040
have to prove those systems and we also

2373
01:24:46,310 --> 01:24:44,239
have to be able to operate for an

2374
01:24:48,070 --> 01:24:46,320
extended period of time away from earth

2375
01:24:49,110 --> 01:24:48,080
you know when we went to the moon

2376
01:24:51,270 --> 01:24:49,120
uh

2377
01:24:52,229 --> 01:24:51,280
that was a two to three day camping trip

2378
01:24:53,750 --> 01:24:52,239
you know if things went bad you're

2379
01:24:55,030 --> 01:24:53,760
always home in two to three days all

2380
01:24:56,950 --> 01:24:55,040
right and

2381
01:24:59,110 --> 01:24:56,960
um you know

2382
01:25:00,790 --> 01:24:59,120
like this asteroid redirect mission

2383
01:25:02,470 --> 01:25:00,800
when we pull an asteroid back here and

2384
01:25:04,229 --> 01:25:02,480
put it in a lunar distant retrograde

2385
01:25:05,430 --> 01:25:04,239
orbit you're talking seven to nine days

2386
01:25:07,510 --> 01:25:05,440
to get there

2387
01:25:08,870 --> 01:25:07,520
in that orbit and another seven and nine

2388
01:25:10,709 --> 01:25:08,880

day trip home that's different than

2389
01:25:12,470 --> 01:25:10,719
we've operated in the past you know the

2390
01:25:14,390 --> 01:25:12,480
shuttle on space station

2391
01:25:16,870 --> 01:25:14,400
they have an emergency on space station

2392
01:25:19,590 --> 01:25:16,880
they just jump in their soyuz or soon to

2393
01:25:21,750 --> 01:25:19,600
be you know cst 100 or

2394
01:25:23,669 --> 01:25:21,760
crew dragon and they're home in a few

2395
01:25:25,830 --> 01:25:23,679
hours all right

2396
01:25:27,110 --> 01:25:25,840
we need to be able to operate in that

2397
01:25:28,390 --> 01:25:27,120
environment for an extended period of

2398
01:25:29,830 --> 01:25:28,400
time and i think it's developing the

2399
01:25:32,149 --> 01:25:29,840
environmental control systems the

2400
01:25:33,830 --> 01:25:32,159
procedures you know that's what we're

2401
01:25:35,830 --> 01:25:33,840
going to need to focus on and it's all

2402
01:25:38,709 --> 01:25:35,840
stuff that we can do we know how to do

2403
01:25:41,430 --> 01:25:38,719
this we just need to persevere and keep

2404
01:25:45,189 --> 01:25:41,440
developing it

2405
01:25:48,870 --> 01:25:47,270
mike there you go changing topics just a

2406
01:25:51,750 --> 01:25:48,880
little bit on you but uh speaking of

2407
01:25:53,590 --> 01:25:51,760
propulsion systems is is the

2408
01:25:56,390 --> 01:25:53,600
the most likely candidate for a real

2409
01:25:57,830 --> 01:25:56,400
change in propulsion not star trek but

2410
01:25:59,910 --> 01:25:57,840
for real

2411
01:26:01,189 --> 01:25:59,920
plasma rockets is that where we're

2412
01:26:03,510 --> 01:26:01,199
heading you know i mean we're looking at

2413
01:26:05,669 --> 01:26:03,520

solar electric propulsion for the

2414
01:26:07,430 --> 01:26:05,679
asteroid redirect mission

2415
01:26:09,750 --> 01:26:07,440
franklin chang diaz is working on his

2416
01:26:11,270 --> 01:26:09,760
vasmir his plasma rocket and and that

2417
01:26:13,750 --> 01:26:11,280
would be awesome you know you get to

2418
01:26:15,430 --> 01:26:13,760
mars in weeks instead of months i was

2419
01:26:17,110 --> 01:26:15,440
talking to franklin about it and i said

2420
01:26:18,470 --> 01:26:17,120
and and i understood this but i was just

2421
01:26:19,830 --> 01:26:18,480
talking to franklin i said so franklin

2422
01:26:23,270 --> 01:26:19,840
let me get this right now you got this

2423
01:26:25,669 --> 01:26:23,280
engine and uh you have a

2424
01:26:27,110 --> 01:26:25,679
low uh thrust but you continually

2425
01:26:28,550 --> 01:26:27,120
accelerate halfway to mars and then you

2426
01:26:30,709 --> 01:26:28,560
turn around and decelerate the rest of

2427
01:26:32,790 --> 01:26:30,719
the way there i said so if that thing

2428
01:26:33,990 --> 01:26:32,800
fails uh you're just gone you're not

2429
01:26:35,590 --> 01:26:34,000
coming back i said what kind of

2430
01:26:39,750 --> 01:26:35,600
redundancy do you have in franklin said

2431
01:26:43,590 --> 01:26:41,750
but you know i i think

2432
01:26:45,030 --> 01:26:43,600
there's a there's

2433
01:26:46,709 --> 01:26:45,040
the future is going to be propulsion

2434
01:26:48,390 --> 01:26:46,719
technology and what we develop and to be

2435
01:26:51,110 --> 01:26:48,400
able to travel these

2436
01:26:53,430 --> 01:26:51,120
long distances faster but our goal

2437
01:26:55,990 --> 01:26:53,440
you know it goes back to exploring and

2438
01:26:57,669 --> 01:26:56,000

pioneering and um

2439
01:26:58,870 --> 01:26:57,679
i've got some great slides that i use

2440
01:27:00,229 --> 01:26:58,880
when i give talks and one of my

2441
01:27:01,910 --> 01:27:00,239
favorites is i don't know how many of

2442
01:27:04,470 --> 01:27:01,920
you read captain woolsey's account of

2443
01:27:07,350 --> 01:27:04,480
shackleton's voyage to antarctica back

2444
01:27:09,590 --> 01:27:07,360
in 1914 1917

2445
01:27:10,629 --> 01:27:09,600
phenomenal this is what exploration is

2446
01:27:12,550 --> 01:27:10,639
all right

2447
01:27:13,910 --> 01:27:12,560
explorers leave a safe environment they

2448
01:27:16,070 --> 01:27:13,920
go off to an extreme environment they

2449
01:27:18,229 --> 01:27:16,080
learn in the

2450
01:27:19,750 --> 01:27:18,239
antarctica it got a ship locked in the

2451
01:27:21,750 --> 01:27:19,760
ice the endurance crushed from

2452
01:27:23,430 --> 01:27:21,760
underneath them got two small boats

2453
01:27:25,110 --> 01:27:23,440
after they're living off whatever food

2454
01:27:26,470 --> 01:27:25,120
they brought with them and whale

2455
01:27:28,149 --> 01:27:26,480
seals and whatever you know and then

2456
01:27:29,830 --> 01:27:28,159
they they take these two small boats to

2457
01:27:31,590 --> 01:27:29,840
an island he leaves most of the crew

2458
01:27:32,790 --> 01:27:31,600
there takes a 24-foot boat goes to

2459
01:27:34,790 --> 01:27:32,800
another island

2460
01:27:37,030 --> 01:27:34,800
climbs a mountain crosses a glacier goes

2461
01:27:39,110 --> 01:27:37,040
down to this norwegian whaling village

2462
01:27:40,470 --> 01:27:39,120
and gets transported back to argentina

2463
01:27:41,669 --> 01:27:40,480

where he gets a ship and goes back and

2464
01:27:43,910 --> 01:27:41,679
picks up the rest of the crew and he

2465
01:27:46,629 --> 01:27:43,920
didn't lose a person that that's

2466
01:27:48,310 --> 01:27:46,639
exploration that's leadership uh we need

2467
01:27:50,070 --> 01:27:48,320
to be able to operate in an environment

2468
01:27:51,510 --> 01:27:50,080
like that we need to you know the

2469
01:27:53,990 --> 01:27:51,520
martian what

2470
01:27:55,990 --> 01:27:54,000
that story it's a great story but that's

2471
01:27:59,189 --> 01:27:56,000
that's what we need to be able to uh to

2472
01:28:01,590 --> 01:27:59,199
do to adapt and to explore and our goal

2473
01:28:04,229 --> 01:28:01,600
is not to to just explore to leave that

2474
01:28:07,350 --> 01:28:04,239
safe environment learn and go home our

2475
01:28:09,510 --> 01:28:07,360
goal is to pioneer and to have to

2476
01:28:12,070 --> 01:28:09,520
actually establish a presence in the

2477
01:28:13,189 --> 01:28:12,080
solar system uh beyond planet earth and

2478
01:28:14,870 --> 01:28:13,199
that's where we're going and we're

2479
01:28:17,189 --> 01:28:14,880
making that happen today you know when

2480
01:28:19,430 --> 01:28:17,199
we go to mars that space launch system

2481
01:28:21,270 --> 01:28:19,440
with orion is going to roll out of high

2482
01:28:22,550 --> 01:28:21,280
bay 3 and the vab on that mobile

2483
01:28:24,550 --> 01:28:22,560
launcher that you see right now with

2484
01:28:25,990 --> 01:28:24,560
crawler transporter to out to pad b and

2485
01:28:27,669 --> 01:28:26,000
we're going to mars from that pad with

2486
01:28:29,669 --> 01:28:27,679
that equipment and that's pretty darn

2487
01:28:31,350 --> 01:28:29,679
neat

2488
01:28:33,030 --> 01:28:31,360

any others all right last question is

2489
01:28:35,270 --> 01:28:33,040
going to be here and then we'll have a

2490
01:28:37,669 --> 01:28:35,280
few more after the end of the broadcast

2491
01:28:39,110 --> 01:28:37,679
so uh question for you how important in

2492
01:28:41,510 --> 01:28:39,120
your opinion is international

2493
01:28:44,550 --> 01:28:41,520
cooperation versus for nasa focusing

2494
01:28:46,310 --> 01:28:44,560
more on american made yeah yeah i think

2495
01:28:48,229 --> 01:28:46,320
international cooperation is absolutely

2496
01:28:50,149 --> 01:28:48,239
important you know and the international

2497
01:28:51,430 --> 01:28:50,159
space station is a superb model for that

2498
01:28:53,270 --> 01:28:51,440
you know there's hardware built around

2499
01:28:55,270 --> 01:28:53,280
the world coming together for the first

2500
01:28:57,830 --> 01:28:55,280
time in space and it operates perfectly

2501
01:29:00,149 --> 01:28:57,840
you know we got japan canada the united

2502
01:29:02,470 --> 01:29:00,159
states russia the international space

2503
01:29:05,270 --> 01:29:02,480
the european space agency and all its

2504
01:29:07,669 --> 01:29:05,280
partners and we're working together as

2505
01:29:09,910 --> 01:29:07,679
one team and i think when we leave

2506
01:29:11,669 --> 01:29:09,920
planet earth we're going to do it as you

2507
01:29:14,149 --> 01:29:11,679
know people from planet earth not any

2508
01:29:15,990 --> 01:29:14,159
one nation and it's it's too expensive

2509
01:29:18,390 --> 01:29:16,000
for one thing uh we need a cooperative

2510
01:29:20,310 --> 01:29:18,400
effort in order to uh to actually pull

2511
01:29:22,149 --> 01:29:20,320
it all together and and make it happen

2512
01:29:24,629 --> 01:29:22,159
so i think international cooperation is

2513
01:29:26,070 --> 01:29:24,639

very important to our future

2514
01:29:28,070 --> 01:29:26,080
excellent so that marks the end of our

2515
01:29:29,270 --> 01:29:28,080
broadcast today here for those of you

2516
01:29:30,629 --> 01:29:29,280
who are going to be following online and

2517
01:29:32,310 --> 01:29:30,639
everything uh we're going to be doing

2518
01:29:34,709 --> 01:29:32,320
live coverage and picking up tomorrow at

2519
01:29:37,030 --> 01:29:34,719
4 30 p.m on nasa television you can

2520
01:29:38,870 --> 01:29:37,040
follow along using the hashtag cygnus

2521
01:29:41,189 --> 01:29:38,880
you can also follow along with orbital

2522
01:29:43,669 --> 01:29:41,199
atk on their social media accounts as

2523
01:29:46,229 --> 01:29:43,679
they go towards launch here and ula as

2524
01:29:47,669 --> 01:29:46,239
they go uh to launch the rocket tomorrow

2525
01:29:49,430 --> 01:29:47,679
we're going to be doing live coverage on

2526
01:29:50,950 --> 01:29:49,440
at nasa and so you're welcome to join us

2527
01:29:52,149 --> 01:29:50,960
there follow along and join the

2528
01:29:54,070 --> 01:29:52,159
conversation we'll have two more

2529
01:29:55,590 --> 01:29:54,080
televised briefings today where we'll be

2530
01:29:57,750 --> 01:29:55,600
taking your questions as well using the

2531
01:29:59,830 --> 01:29:57,760
hashtag asknasa if you want to get

2532
01:30:01,669 --> 01:29:59,840
involved in a future nasa social follow

2533
01:30:03,750 --> 01:30:01,679
along at nasa social and we'll be sure

2534
01:30:05,189 --> 01:30:03,760
to broadcast opportunities to come and

2535
01:30:07,030 --> 01:30:05,199
be a part of the audience for future

2536
01:30:08,790 --> 01:30:07,040
events just like these where you can go

2537
01:30:10,790 --> 01:30:08,800
behind the scenes at nasa and get that

2538
01:30:12,229 --> 01:30:10,800

in-person experience that shows off some

2539
01:30:13,669 --> 01:30:12,239
of the incredible and wonderful things

2540
01:30:15,110 --> 01:30:13,679
that we're doing here at nasa to prepare

2541
01:30:16,709 --> 01:30:15,120
for the future

2542
01:30:18,310 --> 01:30:16,719
without any further ado thank you very

2543
01:30:21,350 --> 01:30:18,320
much for joining us