1
00:00:06,869 --> 00:00:05,190
good evening thank you for joining us

2
00:00:10,390 --> 00:00:06,879
here at nasa's kennedy space center in

3
00:00:12,709 --> 00:00:10,400
florida for this sts-133 status briefing

4
00:00:16,470 --> 00:00:12,719
joining me is mike moses chair of the

5
00:00:18,150 --> 00:00:16,480
pre-launch mission management team

6
00:00:20,550 --> 00:00:18,160
and mike leinbach shuttle launch

7
00:00:22,230 --> 00:00:20,560
director

8
00:00:25,269 --> 00:00:22,240
we'll hear from them and then take

9
00:00:26,790 --> 00:00:25,279
questions mr moses thanks kendra

10
00:00:28,950 --> 00:00:26,800
let's see we finished up

11
00:00:30,950 --> 00:00:28,960
a mission management team meeting it was

12
00:00:32,229 --> 00:00:30,960
actually a a pretty quick meeting in

13
00:00:33,910 --> 00:00:32,239

that we didn't try to get into all the

14
00:00:35,270 --> 00:00:33,920
technical details the teams have been

15
00:00:38,229 --> 00:00:35,280
working all day long

16
00:00:40,709 --> 00:00:38,239
um the problem we've had is uh

17
00:00:42,069 --> 00:00:40,719
a main engine controller uh

18
00:00:43,270 --> 00:00:42,079
showed us a funny signature this morning

19
00:00:44,389 --> 00:00:43,280
when we powered up and we're doing a

20
00:00:45,830 --> 00:00:44,399
standard check

21
00:00:47,990 --> 00:00:45,840
the main engine controllers are

22
00:00:49,670 --> 00:00:48,000
basically dedicated computers that sit

23
00:00:51,670 --> 00:00:49,680
on the main engine themselves and

24
00:00:53,029 --> 00:00:51,680
control the the main engine so the the

25
00:00:54,310 --> 00:00:53,039
shuttle main computers tell the main

26
00:00:56,150 --> 00:00:54,320
engine controller what it needs to do

27
00:00:57,510 --> 00:00:56,160
and then the main engine controller

28
00:00:58,470 --> 00:00:57,520
runs all the pieces and parts on the

29
00:01:02,869 --> 00:00:58,480
engine

30
00:01:05,109 --> 00:01:02,879
a backup controller um obviously we like

31
00:01:06,630 --> 00:01:05,119
to have both of them running uh from a

32
00:01:08,070 --> 00:01:06,640
redundancy standpoint

33
00:01:09,590 --> 00:01:08,080
and and what happened is today they were

34
00:01:11,270 --> 00:01:09,600
doing some power checks on the redundant

35
00:01:13,670 --> 00:01:11,280
system and when they when they threw the

36
00:01:16,630 --> 00:01:13,680
switch to turn it on it's powered by uh

37
00:01:17,510 --> 00:01:16,640
uh three phases of ac so an a b and a c

38
00:01:19,350 --> 00:01:17,520

phase

39
00:01:20,630 --> 00:01:19,360
um and that uh

40
00:01:22,710 --> 00:01:20,640
one of the three phases didn't

41
00:01:24,789 --> 00:01:22,720
immediately come on and the controller

42
00:01:27,030 --> 00:01:24,799
will not work on two phases so it did

43
00:01:28,789 --> 00:01:27,040
not come on so when they were pulling

44
00:01:30,230 --> 00:01:28,799
the data to look at that and try to

45
00:01:32,069 --> 00:01:30,240
understand what happened maybe it was a

46
00:01:33,350 --> 00:01:32,079
switch or a circuit problem

47
00:01:35,350 --> 00:01:33,360
about an hour and a half later while

48
00:01:36,870 --> 00:01:35,360
they were talking and troubleshooting

49
00:01:38,630 --> 00:01:36,880
they looked and noticed that the the

50
00:01:41,670 --> 00:01:38,640
controller had suddenly come on and that

51
00:01:43,670 --> 00:01:41,680
phase b engaged itself and started

52
00:01:46,149 --> 00:01:43,680
working and that's actually not all that

53
00:01:48,710 --> 00:01:46,159
uncommon these circuit breakers

54
00:01:49,990 --> 00:01:48,720
are basically single pole push switches

55
00:01:50,950 --> 00:01:50,000
and they build up a little bit of

56
00:01:52,310 --> 00:01:50,960
contamination a little bit of

57
00:01:54,069 --> 00:01:52,320
carbonization

58
00:01:55,590 --> 00:01:54,079
and sometimes you have to scrub them by

59
00:01:57,429 --> 00:01:55,600
cycling them back and forth mechanically

60
00:01:59,590 --> 00:01:57,439
moving them around to to knock some of

61
00:02:01,830 --> 00:01:59,600
that loose historically we've seen that

62
00:02:03,910 --> 00:02:01,840
uh in circuit breakers before so that

63
00:02:05,270 --> 00:02:03,920

alone didn't really cause a whole lot of

64
00:02:07,030 --> 00:02:05,280
concern but we did want to talk about

65
00:02:09,350 --> 00:02:07,040
the fact that that it kind of healed

66
00:02:11,430 --> 00:02:09,360
itself after time but again

67
00:02:12,229 --> 00:02:11,440
that by itself is not all that big of a

68
00:02:13,750 --> 00:02:12,239
deal

69
00:02:15,030 --> 00:02:13,760
um so they talked a little bit and the

70
00:02:16,390 --> 00:02:15,040
troubleshooting plan they came up with

71
00:02:17,589 --> 00:02:16,400
was to cycle that breaker a little bit

72
00:02:19,190 --> 00:02:17,599
to try to make sure we've shaken

73
00:02:20,949 --> 00:02:19,200
everything off of it do some actual

74
00:02:22,790 --> 00:02:20,959
power up sequences of that main engine

75
00:02:24,869 --> 00:02:22,800
controller make sure it was healthy and

76
00:02:26,949 --> 00:02:24,879
let it run its own self-checks to show

77
00:02:29,510 --> 00:02:26,959
that it was okay um while they were

78
00:02:31,750 --> 00:02:29,520
doing that they noticed uh a little blip

79
00:02:33,350 --> 00:02:31,760
in all three phases about a

80
00:02:36,150 --> 00:02:33,360
it's it's hard to it's hard to nail it

81
00:02:38,070 --> 00:02:36,160
down because there's a

82
00:02:39,910 --> 00:02:38,080
the circuit that feeds off the voltage

83
00:02:41,990 --> 00:02:39,920
is really feeding us a summation of all

84
00:02:43,589 --> 00:02:42,000
three phases so to call it a five volt

85
00:02:45,589 --> 00:02:43,599
change in the circuit's actually not not

86
00:02:47,110 --> 00:02:45,599
true but needless to say let's let's

87
00:02:48,630 --> 00:02:47,120
keep it in layman's terms the the

88
00:02:50,790 --> 00:02:48,640

signature coming out of that that

89
00:02:52,390 --> 00:02:50,800
circuit showed another little glitch

90
00:02:54,309 --> 00:02:52,400
that was was a little bit unexpected and

91
00:02:55,830 --> 00:02:54,319
we hadn't seen before

92
00:02:57,190 --> 00:02:55,840
the teams

93
00:02:58,470 --> 00:02:57,200
struggled with that all day struggle's

94
00:03:00,550 --> 00:02:58,480
not the right word they grappled with it

95
00:03:02,550 --> 00:03:00,560
all day to try to come up with is there

96
00:03:04,470 --> 00:03:02,560
one cause here is there two problems is

97
00:03:06,070 --> 00:03:04,480
it is it something we understand is it

98
00:03:08,149 --> 00:03:06,080
in the controller is it in the power

99
00:03:10,710 --> 00:03:08,159
feed system is it the circuit breaker is

100
00:03:12,790 --> 00:03:10,720
it the switch uh is it the ac system on

101
00:03:13,990 --> 00:03:12,800
the on the vehicle and in in running

102
00:03:15,589 --> 00:03:14,000
through all that they got to a really

103
00:03:17,910 --> 00:03:15,599
good story and i think if we would have

104
00:03:19,830 --> 00:03:17,920
had about a nine hour mmt we could have

105
00:03:21,270 --> 00:03:19,840
heard all that data judged it all and

106
00:03:22,550 --> 00:03:21,280
been good to fly

107
00:03:23,830 --> 00:03:22,560
but that's not the right thing to do for

108
00:03:25,830 --> 00:03:23,840
this team to try to then come in in the

109
00:03:27,509 --> 00:03:25,840
morning and tank and launch so so it was

110
00:03:28,949 --> 00:03:27,519
a pretty easy decision to say that we're

111
00:03:30,630 --> 00:03:28,959
getting really close to having really

112
00:03:32,309 --> 00:03:30,640
good understanding of the problem but we

113
00:03:34,390 --> 00:03:32,319

need to polish it we need to organize it

114
00:03:36,550 --> 00:03:34,400
we need to make sure uh that we're not

115
00:03:38,309 --> 00:03:36,560
wrong about it and in that we do two big

116
00:03:39,830 --> 00:03:38,319
things one is we wanna even though we

117
00:03:41,750 --> 00:03:39,840
think we understand the problem spend a

118
00:03:43,270 --> 00:03:41,760
whole lot of time talking about what if

119
00:03:45,830 --> 00:03:43,280
we're wrong so what's gonna happen if

120
00:03:48,710 --> 00:03:45,840
this controller does flake out

121
00:03:50,789 --> 00:03:48,720
either in the count tomorrow or thursday

122
00:03:52,869 --> 00:03:50,799
now or once we start going uphill after

123
00:03:54,710 --> 00:03:52,879
launch uh so what are the consequences

124
00:03:56,630 --> 00:03:54,720
what's our tolerance what margins do

125
00:03:58,390 --> 00:03:56,640
this does the system have if there's a

126
00:04:00,710 --> 00:03:58,400
problem the other big piece of that is

127
00:04:02,789 --> 00:04:00,720
to make sure we're not uh

128
00:04:04,630 --> 00:04:02,799
to put it bluntly crafting a solution

129
00:04:06,869 --> 00:04:04,640
that matches what we think the problem

130
00:04:08,470 --> 00:04:06,879
is and that we're actually having a good

131
00:04:10,949 --> 00:04:08,480
physics based understanding of the

132
00:04:12,869 --> 00:04:10,959
phenomenon does it make sense that

133
00:04:14,949 --> 00:04:12,879
a circuit breaker with a little bit of

134
00:04:17,030 --> 00:04:14,959
of bad contact could explain both of

135
00:04:18,390 --> 00:04:17,040
these signatures we saw

136
00:04:20,310 --> 00:04:18,400
the community feels pretty confident

137
00:04:22,469 --> 00:04:20,320
that that is the case but they do need

138
00:04:24,629 --> 00:04:22,479

time to polish that story bring some

139
00:04:26,310 --> 00:04:24,639
historical data to show

140
00:04:28,310 --> 00:04:26,320
whether we've had instances like this in

141
00:04:29,510 --> 00:04:28,320
the past what was similar to this

142
00:04:31,830 --> 00:04:29,520
scenario what was different from this

143
00:04:34,230 --> 00:04:31,840
scenario what extrapolations we can make

144
00:04:35,670 --> 00:04:34,240
and really spend the time to to draw all

145
00:04:38,150 --> 00:04:35,680
the dots on the piece of paper and draw

146
00:04:39,909 --> 00:04:38,160
the line that takes us from

147
00:04:41,590 --> 00:04:39,919
what we like to say we don't fly with

148
00:04:43,350 --> 00:04:41,600
unknown risk and right now this risk is

149
00:04:44,710 --> 00:04:43,360
a little bit still unknown to us we're

150
00:04:46,950 --> 00:04:44,720
going to take another day to get to know

151
00:04:48,390 --> 00:04:46,960
it better for lack of a better word and

152
00:04:50,310 --> 00:04:48,400
make this a known risk that we do

153
00:04:51,830 --> 00:04:50,320
understand and we quantified

154
00:04:53,430 --> 00:04:51,840
you've seen us do that time and time

155
00:04:55,909 --> 00:04:53,440
again it's one of the fundamental tenets

156
00:04:57,749 --> 00:04:55,919
of of nasa and the space shuttle program

157
00:04:59,510 --> 00:04:57,759
that we make sure we truly understand

158
00:05:01,749 --> 00:04:59,520
the the the risk we do fly with you

159
00:05:03,029 --> 00:05:01,759
don't want to ever go with unknown risk

160
00:05:04,070 --> 00:05:03,039
and so we're going to take an extra day

161
00:05:05,510 --> 00:05:04,080
to do that

162
00:05:07,270 --> 00:05:05,520
like i said i think we could have gotten

163
00:05:10,070 --> 00:05:07,280

there i think the data is there in the

164
00:05:11,510 --> 00:05:10,080
team um but it's really the the better

165
00:05:13,430 --> 00:05:11,520
part of valor to let them have the time

166
00:05:14,790 --> 00:05:13,440
to go put that story together in a nice

167
00:05:17,189 --> 00:05:14,800
crisp package that we can all walk

168
00:05:18,710 --> 00:05:17,199
through tomorrow so our plan is to let

169
00:05:19,990 --> 00:05:18,720
the teams do that um they're gonna be

170
00:05:21,350 --> 00:05:20,000
working pretty hard overnight and in the

171
00:05:23,189 --> 00:05:21,360
morning and we're gonna reconvene

172
00:05:24,629 --> 00:05:23,199
tomorrow at 2 p.m eastern time for

173
00:05:27,430 --> 00:05:24,639
another mmt

174
00:05:29,189 --> 00:05:27,440
um typically when we have mmts we like

175
00:05:31,029 --> 00:05:29,199
to let the teams go off get their

176
00:05:32,390 --> 00:05:31,039
answers vet that through all the sub

177
00:05:34,310 --> 00:05:32,400
elements the safety reviews the

178
00:05:36,550 --> 00:05:34,320
independent reviews the ground ops team

179
00:05:38,550 --> 00:05:36,560
the orbiter teams the jsc teams the ksc

180
00:05:39,749 --> 00:05:38,560
teams and come to the mmt with a nice

181
00:05:41,350 --> 00:05:39,759
here's the answer this is what you

182
00:05:42,550 --> 00:05:41,360
should vote on it makes my job really

183
00:05:43,749 --> 00:05:42,560
easy

184
00:05:44,710 --> 00:05:43,759
tomorrow we'll do it a little different

185
00:05:45,909 --> 00:05:44,720
because we're not going to have that

186
00:05:47,189 --> 00:05:45,919
chance we're going to let the teams come

187
00:05:48,950 --> 00:05:47,199
in present all that data we're going to

188
00:05:50,550 --> 00:05:48,960

sit and talk about it and then we'll

189
00:05:52,150 --> 00:05:50,560
kind of take a break and let those

190
00:05:53,830 --> 00:05:52,160
little sub teams go off and have their

191
00:05:55,350 --> 00:05:53,840
meetings and talk uh and then we'll come

192
00:05:56,950 --> 00:05:55,360
back you know i don't know how long of a

193
00:05:58,710 --> 00:05:56,960
break i'll take a half an hour an hour

194
00:06:00,870 --> 00:05:58,720
we've done this before when we when we

195
00:06:02,230 --> 00:06:00,880
face a time critical problem uh it's

196
00:06:03,990 --> 00:06:02,240
easier to let the teams all hear the

197
00:06:05,749 --> 00:06:04,000
data together and make a decision

198
00:06:06,390 --> 00:06:05,759
together rather than trying to to kind

199
00:06:09,830 --> 00:06:06,400
of

200
00:06:10,870 --> 00:06:09,840
one team's okay and recommends the next

201
00:06:13,670 --> 00:06:10,880
thing we all kind of need to hear the

202
00:06:15,270 --> 00:06:13,680
whole story together so tomorrow uh you

203
00:06:17,029 --> 00:06:15,280
guys might be looking for data coming

204
00:06:18,790 --> 00:06:17,039
out during the day but really it's gonna

205
00:06:20,790 --> 00:06:18,800
it's gonna head right into that mmt

206
00:06:22,790 --> 00:06:20,800
where we hear the story and then decide

207
00:06:23,990 --> 00:06:22,800
whether we're good to go

208
00:06:25,749 --> 00:06:24,000
mike can talk to you a little bit about

209
00:06:27,909 --> 00:06:25,759
what they're doing at the pad to set up

210
00:06:30,150 --> 00:06:27,919
for that the team's brought some some

211
00:06:31,830 --> 00:06:30,160
options forward to look at can we just r

212
00:06:34,710 --> 00:06:31,840
r that circuit breaker can we r r the

213
00:06:36,710 --> 00:06:34,720

engine controller and rnr i mean remove

214
00:06:38,710 --> 00:06:36,720
and replace the work to do that is

215
00:06:40,390 --> 00:06:38,720
pretty invasive uh both on the engine

216
00:06:41,670 --> 00:06:40,400
and on the controller and on the circuit

217
00:06:43,270 --> 00:06:41,680
breakers

218
00:06:44,629 --> 00:06:43,280
we probably could have taken that work

219
00:06:45,990 --> 00:06:44,639
but but by doing so we would have

220
00:06:48,390 --> 00:06:46,000
introduced a fair bit of risk into the

221
00:06:49,990 --> 00:06:48,400
system by making that change

222
00:06:51,350 --> 00:06:50,000
there's a anytime you break an

223
00:06:53,589 --> 00:06:51,360
electrical connection we like to do a

224
00:06:55,110 --> 00:06:53,599
complete re-test of that connector some

225
00:06:57,830 --> 00:06:55,120
of those circuits we can't re-test at

226
00:06:59,749 --> 00:06:57,840
the pad main landing gear

227
00:07:01,589 --> 00:06:59,759
proxop sensors you can't go test et

228
00:07:03,189 --> 00:07:01,599
doors we can't go test right now so

229
00:07:04,950 --> 00:07:03,199
there's some things we couldn't retest

230
00:07:06,469 --> 00:07:04,960
and so we'd have to buy some risk and

231
00:07:07,909 --> 00:07:06,479
really mike and i talked right up front

232
00:07:09,270 --> 00:07:07,919
and it was not worth even talking about

233
00:07:10,790 --> 00:07:09,280
that risk so we took that right off the

234
00:07:12,870 --> 00:07:10,800
plate and what we're going to do is

235
00:07:15,029 --> 00:07:12,880
focus on the rationale to fly in the

236
00:07:16,950 --> 00:07:15,039
condition we're in and if that rationale

237
00:07:18,870 --> 00:07:16,960
tomorrow doesn't sound good enough we'll

238
00:07:20,710 --> 00:07:18,880

see what more time we need to make it

239
00:07:22,309 --> 00:07:20,720
a story that we are comfortable with and

240
00:07:23,430 --> 00:07:22,319
ultimately if we find that we cannot get

241
00:07:25,510 --> 00:07:23,440
comfortable with the scenario we have

242
00:07:27,270 --> 00:07:25,520
then we'll go down the path of rnr

243
00:07:29,029 --> 00:07:27,280
because that is a little longer term

244
00:07:30,390 --> 00:07:29,039
investment in time and effort and then

245
00:07:31,110 --> 00:07:30,400
the retest that would be needed to do

246
00:07:35,670 --> 00:07:31,120
that

247
00:07:36,950 --> 00:07:35,680
the teams really focus on the problem at

248
00:07:38,790 --> 00:07:36,960
hand and not worrying about too many

249
00:07:40,469 --> 00:07:38,800
options at once which is another thing

250
00:07:42,790 --> 00:07:40,479
this team is really good at is building

251
00:07:44,390 --> 00:07:42,800
lots and lots of options

252
00:07:46,790 --> 00:07:44,400
but again the main theme today was was

253
00:07:48,070 --> 00:07:46,800
to focus and let them narrow down and

254
00:07:50,390 --> 00:07:48,080
and like i said i think they had the

255
00:07:51,990 --> 00:07:50,400
answer for me uh it's just a better part

256
00:07:53,110 --> 00:07:52,000
of value and and to be honest it lets me

257
00:07:54,790 --> 00:07:53,120
have some dinner then later tonight

258
00:07:56,390 --> 00:07:54,800
rather than meeting all night long and

259
00:07:58,150 --> 00:07:56,400
then having to come right back in at 5am

260
00:08:00,150 --> 00:07:58,160
to help mike and and let him know and

261
00:08:02,390 --> 00:08:00,160
get his team ready to tank the vehicle

262
00:08:03,670 --> 00:08:02,400
so this was a pretty easy decision on my

263
00:08:05,749 --> 00:08:03,680

my point um

264
00:08:07,990 --> 00:08:05,759
you know the problem is is pretty simple

265
00:08:09,270 --> 00:08:08,000
um it's it's got a few nuances that we

266
00:08:10,710 --> 00:08:09,280
haven't really seen before we're gonna

267
00:08:14,469 --> 00:08:10,720
let the team make sure that we're not

268
00:08:16,150 --> 00:08:14,479
doing something uh a little too

269
00:08:18,309 --> 00:08:16,160
like i said that we're not being too

270
00:08:19,990 --> 00:08:18,319
uh aggressive on our analysis of the

271
00:08:21,749 --> 00:08:20,000
problem and uh and i fully expect

272
00:08:23,270 --> 00:08:21,759
tomorrow we'll hear a decent story and

273
00:08:24,629 --> 00:08:23,280
be ready to press ahead with uh with the

274
00:08:25,830 --> 00:08:24,639
thursday launch

275
00:08:27,909 --> 00:08:25,840
so i think that's enough for now let

276
00:08:29,270 --> 00:08:27,919
mike give you his comments all right

277
00:08:31,510 --> 00:08:29,280
appreciate it uh we'll see from an

278
00:08:33,110 --> 00:08:31,520
execution perspective we're we are in

279
00:08:35,509 --> 00:08:33,120
the t minus 11 hour hold and we will

280
00:08:36,949 --> 00:08:35,519
remain there for an additional 24 hours

281
00:08:38,790 --> 00:08:36,959
we'll pick up the clock again tomorrow

282
00:08:40,230 --> 00:08:38,800
night at 18 30 assuming that we get to

283
00:08:42,230 --> 00:08:40,240
go from mike and the mission management

284
00:08:45,110 --> 00:08:42,240
team that we have a sufficient flight

285
00:08:46,790 --> 00:08:45,120
rash now based on the anomaly we've seen

286
00:08:48,790 --> 00:08:46,800
i'd like to emphasize one point that

287
00:08:51,110 --> 00:08:48,800
mike made a lot of the decision tonight

288
00:08:53,750 --> 00:08:51,120

in my mind was based on crew fatigue if

289
00:08:55,269 --> 00:08:53,760
we had pressed on and gotten through all

290
00:08:57,269 --> 00:08:55,279
the discussions necessary to get to

291
00:08:58,150 --> 00:08:57,279
flight rationale tonight probably could

292
00:09:00,550 --> 00:08:58,160
have gotten there but it would have

293
00:09:02,150 --> 00:09:00,560
taken several hours and a lot of the

294
00:09:03,590 --> 00:09:02,160
people supporting that flight rationale

295
00:09:05,670 --> 00:09:03,600
tonight would have also been required on

296
00:09:07,670 --> 00:09:05,680
console tomorrow morning for for e.t

297
00:09:09,990 --> 00:09:07,680
load and of course for launch itself and

298
00:09:11,910 --> 00:09:10,000
so from a crew perspective it made sense

299
00:09:13,430 --> 00:09:11,920
to uh to take the additional 24 hours

300
00:09:14,949 --> 00:09:13,440
also

301
00:09:16,870 --> 00:09:14,959
let's see the rest of the countdown then

302
00:09:18,710 --> 00:09:16,880
for thursday um

303
00:09:21,269 --> 00:09:18,720
locks and lh2 loading begin a little

304
00:09:23,670 --> 00:09:21,279
after 6 a.m on thursday morning the crew

305
00:09:26,150 --> 00:09:23,680
will board just just afternoon time the

306
00:09:27,590 --> 00:09:26,160
window opens at 15 24 eastern and we

307
00:09:29,509 --> 00:09:27,600
would shoot for a preferred launch time

308
00:09:31,990 --> 00:09:29,519
of 15 29.

309
00:09:33,829 --> 00:09:32,000
the team has executed an extended hold

310
00:09:35,430 --> 00:09:33,839
of tmos 11 hours

311
00:09:37,430 --> 00:09:35,440
quite quite a few times in the past it's

312
00:09:39,110 --> 00:09:37,440
very easy thing for us to do

313
00:09:40,710 --> 00:09:39,120

the test directors and test conductors

314
00:09:43,269 --> 00:09:40,720
are in in the firing room right now

315
00:09:44,949 --> 00:09:43,279
executing this plan for us the rss will

316
00:09:47,350 --> 00:09:44,959
remain in place we won't retract tonight

317
00:09:50,150 --> 00:09:47,360
we'll do that tomorrow night

318
00:09:51,269 --> 00:09:50,160
on time and looking for a launch on

319
00:09:53,110 --> 00:09:51,279
thursday

320
00:09:55,030 --> 00:09:53,120
uh the weather we got a little bit of an

321
00:09:56,470 --> 00:09:55,040
update from from range weather the

322
00:09:58,870 --> 00:09:56,480
percentages haven't changed it's still

323
00:10:00,389 --> 00:09:58,880
70 percent no go for thursday

324
00:10:01,750 --> 00:10:00,399
tomorrow will be the transition day with

325
00:10:03,269 --> 00:10:01,760
the front coming through you see some of

326
00:10:05,910 --> 00:10:03,279
that some of the pre-front frontal

327
00:10:08,790 --> 00:10:05,920
cloudiness out there tonight

328
00:10:10,550 --> 00:10:08,800
and then the the major concern thursday

329
00:10:13,190 --> 00:10:10,560
is low cloud ceilings and the potential

330
00:10:14,069 --> 00:10:13,200
showers within 20 miles of the slf

331
00:10:15,350 --> 00:10:14,079
so

332
00:10:16,550 --> 00:10:15,360
you know we're

333
00:10:17,990 --> 00:10:16,560
we are where we are we're going to take

334
00:10:20,069 --> 00:10:18,000
time to understand this problem we will

335
00:10:22,069 --> 00:10:20,079
pick back up with the countdown tomorrow

336
00:10:25,190 --> 00:10:22,079
evening and hope for a good on time

337
00:10:26,949 --> 00:10:25,200
launch thursday morning now thanks

338
00:10:28,310 --> 00:10:26,959

thank you we'll now take questions when

339
00:10:30,389 --> 00:10:28,320
the microphone comes your way please

340
00:10:31,590 --> 00:10:30,399
state your name affiliation and to whom

341
00:10:34,310 --> 00:10:31,600
you're addressing your question we'll

342
00:10:36,870 --> 00:10:34,320
start over in the corner with mark

343
00:10:39,269 --> 00:10:36,880
hi mark kirkman interspace news for mike

344
00:10:40,550 --> 00:10:39,279
moses um i'm really surprised to hear

345
00:10:42,870 --> 00:10:40,560
you say that you're leading towards fly

346
00:10:44,829 --> 00:10:42,880
rationale uh given the sensitivity of

347
00:10:46,870 --> 00:10:44,839
those controllers to trans current

348
00:10:48,470 --> 00:10:46,880
transients um

349
00:10:50,630 --> 00:10:48,480
how is it you think you're going to be

350
00:10:51,670 --> 00:10:50,640
comfortable with uh with not going in

351
00:10:53,350 --> 00:10:51,680
there and

352
00:10:54,389 --> 00:10:53,360
even if it is dust or contamination not

353
00:10:56,470 --> 00:10:54,399
going in there and actually cleaning

354
00:10:58,630 --> 00:10:56,480
those contacts and making sure that that

355
00:11:00,550 --> 00:10:58,640
dust can't get back in there and another

356
00:11:02,630 --> 00:11:00,560
part of the question is i'm not clear

357
00:11:05,670 --> 00:11:02,640
was the voltage drop the multiphase

358
00:11:07,350 --> 00:11:05,680
voltage drop and the single phase spike

359
00:11:09,030 --> 00:11:07,360
were those two separate events at two

360
00:11:10,470 --> 00:11:09,040
separate times in the day or you're

361
00:11:12,150 --> 00:11:10,480
saying they both happen at the same time

362
00:11:13,509 --> 00:11:12,160
and you're trying to trace them to a

363
00:11:15,190 --> 00:11:13,519

single point failure

364
00:11:17,430 --> 00:11:15,200
let's see the they were two separate

365
00:11:19,750 --> 00:11:17,440
events at two separate times in the day

366
00:11:21,670 --> 00:11:19,760
um and but we think the cause of that

367
00:11:24,949 --> 00:11:21,680
was a common cause and that was a

368
00:11:26,310 --> 00:11:24,959
circuit breaker uh a contamination or or

369
00:11:27,509 --> 00:11:26,320
and when i say contamination that's

370
00:11:29,350 --> 00:11:27,519
that's being

371
00:11:31,829 --> 00:11:29,360
way over uh

372
00:11:33,590 --> 00:11:31,839
over negative on what's going on we have

373
00:11:35,910 --> 00:11:33,600
um uh hundreds of circuit breakers on

374
00:11:37,030 --> 00:11:35,920
the ship um and and they they this is

375
00:11:38,550 --> 00:11:37,040
the way they work they're they're a

376
00:11:40,389 --> 00:11:38,560
pressure sensitive you push it in you

377
00:11:41,750 --> 00:11:40,399
engage the metal contact uh it's very

378
00:11:44,069 --> 00:11:41,760
temperature sensitive it's very pressure

379
00:11:45,509 --> 00:11:44,079
sensitive uh in order to detect a

380
00:11:47,590 --> 00:11:45,519
current change and then and then pop

381
00:11:49,670 --> 00:11:47,600
open if it's if it's above the limit

382
00:11:52,069 --> 00:11:49,680
it's supposed to be so the the scenario

383
00:11:53,350 --> 00:11:52,079
being that that we have it's that it's

384
00:11:55,430 --> 00:11:53,360
that history of circuit breakers that

385
00:11:56,790 --> 00:11:55,440
gives us the confidence that if it is a

386
00:11:59,030 --> 00:11:56,800
circuit breaker the fact that we've

387
00:12:00,710 --> 00:11:59,040
engaged a solid contact uh the

388
00:12:02,550 --> 00:12:00,720

controller has now been powered up i

389
00:12:04,389 --> 00:12:02,560
think twice both nominal power-up

390
00:12:06,310 --> 00:12:04,399
signatures each time um the circuit

391
00:12:07,430 --> 00:12:06,320
breaker has been scrubbed uh i i don't

392
00:12:09,110 --> 00:12:07,440
we're probably up to at least a half a

393
00:12:11,030 --> 00:12:09,120
dozen times now every single time it

394
00:12:11,910 --> 00:12:11,040
re-engages so once that contamination

395
00:12:14,710 --> 00:12:11,920
clears

396
00:12:16,550 --> 00:12:14,720
it's a good breaker and we have

397
00:12:18,949 --> 00:12:16,560
to be honest quite a bit of data to show

398
00:12:20,310 --> 00:12:18,959
that that's the case with these so uh

399
00:12:22,069 --> 00:12:20,320
it's going to involve a little bit of

400
00:12:24,230 --> 00:12:22,079
risk acceptance uh but i don't think

401
00:12:25,750 --> 00:12:24,240
it's that big of a limb to go out on to

402
00:12:27,350 --> 00:12:25,760
accept that risk one of the things we

403
00:12:29,269 --> 00:12:27,360
need to see

404
00:12:31,430 --> 00:12:29,279
and i need this needs to move from

405
00:12:33,110 --> 00:12:31,440
what i know and what elements of the

406
00:12:34,949 --> 00:12:33,120
team know to

407
00:12:36,550 --> 00:12:34,959
a formal presentation and acceptance by

408
00:12:38,550 --> 00:12:36,560
the program of yup that is something we

409
00:12:40,389 --> 00:12:38,560
understand and and we do know that there

410
00:12:42,310 --> 00:12:40,399
is a a little bit of unknown there but

411
00:12:43,910 --> 00:12:42,320
we're willing to accept that we haven't

412
00:12:45,750 --> 00:12:43,920
had a chance to do that which is why

413
00:12:47,590 --> 00:12:45,760

again we need some more time to to make

414
00:12:49,350 --> 00:12:47,600
sure that we're not being a little too

415
00:12:50,550 --> 00:12:49,360
forward leaning with that and not just

416
00:12:51,990 --> 00:12:50,560
going on well we know the circuit

417
00:12:53,030 --> 00:12:52,000
breakers act like this so that has to be

418
00:12:54,949 --> 00:12:53,040
the problem we want to make sure that

419
00:12:57,750 --> 00:12:54,959
we're not doing that so

420
00:12:59,269 --> 00:12:57,760
um so that's kind of our confidence uh

421
00:13:00,470 --> 00:12:59,279
in the breaker the and the piece that

422
00:13:01,750 --> 00:13:00,480
we're really going to give them time is

423
00:13:03,430 --> 00:13:01,760
to draw that connection between those

424
00:13:05,430 --> 00:13:03,440
two separate events and how do you how

425
00:13:07,269 --> 00:13:05,440
do you show that that's one cause that

426
00:13:08,870 --> 00:13:07,279
did that and again the engineering teams

427
00:13:10,389 --> 00:13:08,880
are pretty confident with that but they

428
00:13:14,230 --> 00:13:10,399
need to spend the time to make sure that

429
00:13:17,910 --> 00:13:16,310
marcia

430
00:13:20,389 --> 00:13:17,920
associated press

431
00:13:22,150 --> 00:13:20,399
pray for mike moses you mentioned

432
00:13:24,230 --> 00:13:22,160
is it an automatic if you had to go in

433
00:13:25,829 --> 00:13:24,240
and replace the circuit breaker or

434
00:13:27,829 --> 00:13:25,839
controller is that an automatic roll

435
00:13:29,829 --> 00:13:27,839
back then at that point and you

436
00:13:31,990 --> 00:13:29,839
mentioned wanting to get look at all the

437
00:13:34,710 --> 00:13:32,000
options of what if you're wrong what if

438
00:13:36,629 --> 00:13:34,720

you are wrong and the circuit breaker

439
00:13:39,430 --> 00:13:36,639
doesn't work properly then what happens

440
00:13:41,030 --> 00:13:39,440
sure so on the repair um you know the

441
00:13:43,590 --> 00:13:41,040
teams have been working in parallel to

442
00:13:44,949 --> 00:13:43,600
develop repair plans um we haven't had a

443
00:13:47,189 --> 00:13:44,959
chance to look at him and scrum them i'm

444
00:13:48,629 --> 00:13:47,199
not sure rollback is on the table at all

445
00:13:51,189 --> 00:13:48,639
to be honest we haven't really looked

446
00:13:52,870 --> 00:13:51,199
that far down um we're kind of piecing

447
00:13:55,590 --> 00:13:52,880
this off in the in the window we have we

448
00:13:57,189 --> 00:13:55,600
know ends on this on the seventh so so

449
00:13:58,790 --> 00:13:57,199
anything that's a longer term kind of

450
00:14:01,030 --> 00:13:58,800
thing like an engine replacement is a

451
00:14:02,230 --> 00:14:01,040
two-week endeavor right so so there's no

452
00:14:04,550 --> 00:14:02,240
real need to talk about that one right

453
00:14:05,990 --> 00:14:04,560
now because we know that doesn't fit um

454
00:14:07,750 --> 00:14:06,000
there are ways to be creative with it

455
00:14:08,949 --> 00:14:07,760
but but again i'm not sure it really

456
00:14:10,389 --> 00:14:08,959
buys you much if we're looking at our

457
00:14:12,470 --> 00:14:10,399
next launch window opening up uh

458
00:14:14,150 --> 00:14:12,480
december 1st around there so so from

459
00:14:16,470 --> 00:14:14,160
that standpoint we haven't gone very far

460
00:14:18,150 --> 00:14:16,480
down the if we are gnaring which is why

461
00:14:19,829 --> 00:14:18,160
we're kind of going to focus on what do

462
00:14:21,750 --> 00:14:19,839
i have in front of me that i can do in

463
00:14:23,350 --> 00:14:21,760

this period and that is understanding

464
00:14:25,750 --> 00:14:23,360
the problem i actually have and again

465
00:14:27,509 --> 00:14:25,760
it's a lot like the uh like the leaks we

466
00:14:29,110 --> 00:14:27,519
had both in the in the hydrazine system

467
00:14:31,350 --> 00:14:29,120
and in the in the gaseous helium and

468
00:14:32,949 --> 00:14:31,360
nitrogen systems

469
00:14:34,310 --> 00:14:32,959
do a lot of work to repair it but unless

470
00:14:36,150 --> 00:14:34,320
you know what you're trying to repair in

471
00:14:37,990 --> 00:14:36,160
the first place you might be causing

472
00:14:39,430 --> 00:14:38,000
more problems in the first place so

473
00:14:41,269 --> 00:14:39,440
it's not time to repair something

474
00:14:43,750 --> 00:14:41,279
because we haven't yet identified

475
00:14:45,189 --> 00:14:43,760
exactly what the problem is to know that

476
00:14:46,790 --> 00:14:45,199
that's something that that is the

477
00:14:48,949 --> 00:14:46,800
problem we could go spend all this time

478
00:14:50,710 --> 00:14:48,959
replacing a circuit breaker only to find

479
00:14:52,870 --> 00:14:50,720
that that maybe we were wrong and that

480
00:14:54,389 --> 00:14:52,880
is not the common cause so before we go

481
00:14:55,430 --> 00:14:54,399
kick off all that effort let's go spend

482
00:14:57,910 --> 00:14:55,440
some time make sure we understand our

483
00:14:59,990 --> 00:14:57,920
risks um as to the what if we're wrong

484
00:15:01,430 --> 00:15:00,000
and the consequences you know we'll hear

485
00:15:03,430 --> 00:15:01,440
some details tomorrow but but

486
00:15:05,430 --> 00:15:03,440
fundamentally uh on the basic level the

487
00:15:06,790 --> 00:15:05,440
engine needs only one controller to run

488
00:15:08,710 --> 00:15:06,800

and it has a backup controller if it

489
00:15:09,590 --> 00:15:08,720
needs it and mark can chime in if i get

490
00:15:10,629 --> 00:15:09,600
this wrong

491
00:15:13,509 --> 00:15:10,639
um

492
00:15:17,110 --> 00:15:13,519
so the uh uh basically if the circuit

493
00:15:18,870 --> 00:15:17,120
breaker then fails uh or introduces uh

494
00:15:20,470 --> 00:15:18,880
worst case would be a hard failure uh

495
00:15:23,189 --> 00:15:20,480
but to be honest the controllers aren't

496
00:15:24,550 --> 00:15:23,199
very tolerant of a big voltage change

497
00:15:26,310 --> 00:15:24,560
and they're not resettable so once they

498
00:15:28,550 --> 00:15:26,320
drop off they're they're done and so

499
00:15:30,230 --> 00:15:28,560
that controller would power itself down

500
00:15:32,389 --> 00:15:30,240
and now you in this case you're talking

501
00:15:34,710 --> 00:15:32,399
about the redundant controller on engine

502
00:15:36,629 --> 00:15:34,720
three i believe i don't quote me on that

503
00:15:38,949 --> 00:15:36,639
one because i don't remember exactly oh

504
00:15:41,430 --> 00:15:38,959
right here ssme3 engine three

505
00:15:43,030 --> 00:15:41,440
um so uh from that standpoint that's not

506
00:15:44,949 --> 00:15:43,040
a big deal that's just that one failure

507
00:15:46,790 --> 00:15:44,959
and we have the redundancy if a second

508
00:15:48,150 --> 00:15:46,800
failure came in and took out the primary

509
00:15:49,590 --> 00:15:48,160
controller on that engine so now you'd

510
00:15:51,269 --> 00:15:49,600
have both controllers lost that engine

511
00:15:52,949 --> 00:15:51,279
would shut down but it's a graceful

512
00:15:54,629 --> 00:15:52,959
shutdown and contained that's the way

513
00:15:56,069 --> 00:15:54,639

it's supposed to shut down

514
00:15:58,230 --> 00:15:56,079
and so you'd lose an engine if that

515
00:15:59,350 --> 00:15:58,240
happened now now you go to when does it

516
00:16:00,550 --> 00:15:59,360
happen when does the first failure

517
00:16:02,230 --> 00:16:00,560
happen when does the second failure

518
00:16:04,150 --> 00:16:02,240
happen and and then the consequence of

519
00:16:06,870 --> 00:16:04,160
losing an engine that by itself is also

520
00:16:08,069 --> 00:16:06,880
not necessarily a bad day

521
00:16:09,749 --> 00:16:08,079
we're going to go understand all that

522
00:16:11,509 --> 00:16:09,759
rationale and redundancy

523
00:16:14,310 --> 00:16:11,519
that gives us confidence to fly but but

524
00:16:16,069 --> 00:16:14,320
again fundamentally we don't often use

525
00:16:17,350 --> 00:16:16,079
our redundancy as the reason why we can

526
00:16:18,790 --> 00:16:17,360
go ahead and fly we like to understand

527
00:16:20,150 --> 00:16:18,800
that we have a good clean system before

528
00:16:21,990 --> 00:16:20,160
we start

529
00:16:23,350 --> 00:16:22,000
but the other piece of this that's going

530
00:16:25,350 --> 00:16:23,360
to be good is we have the ability to

531
00:16:27,670 --> 00:16:25,360
monitor this right up and through main

532
00:16:29,990 --> 00:16:27,680
engine ignition and even srb ignition to

533
00:16:31,350 --> 00:16:30,000
know if if the problem does reoccur if

534
00:16:33,990 --> 00:16:31,360
it did reoccur that would probably give

535
00:16:35,030 --> 00:16:34,000
us pause but again we need to tie

536
00:16:37,509 --> 00:16:35,040
that and that's one of the forward

537
00:16:39,110 --> 00:16:37,519
actions coming out of tonight was uh if

538
00:16:40,389 --> 00:16:39,120

it occurs again what's that mean what

539
00:16:41,670 --> 00:16:40,399
are you going to do about it and so the

540
00:16:43,110 --> 00:16:41,680
teams are going to build that story for

541
00:16:43,990 --> 00:16:43,120
us as well

542
00:16:47,670 --> 00:16:44,000
bill

543
00:16:50,389 --> 00:16:47,680
you um but just to follow marsha's

544
00:16:52,790 --> 00:16:50,399
question if if it's anything other than

545
00:16:54,069 --> 00:16:52,800
develop rationale to fly as is

546
00:16:55,509 --> 00:16:54,079
are we out of here in this current

547
00:16:57,509 --> 00:16:55,519
window in other words can you replace a

548
00:16:59,749 --> 00:16:57,519
circuit breaker or a panel

549
00:17:01,030 --> 00:16:59,759
um and and get that done and still get

550
00:17:03,990 --> 00:17:01,040
an opportunity at the end of the window

551
00:17:05,429 --> 00:17:04,000
or or is it fly as is or nothing in this

552
00:17:07,510 --> 00:17:05,439
window

553
00:17:09,270 --> 00:17:07,520
well see the teams are developing that

554
00:17:11,510 --> 00:17:09,280
plan to uh to change out the circuit

555
00:17:12,949 --> 00:17:11,520
breaker i can tell you it would require

556
00:17:14,710 --> 00:17:12,959
powering down the ship before we go

557
00:17:16,630 --> 00:17:14,720
after that circuit breaker and the panel

558
00:17:18,470 --> 00:17:16,640
that it's on before you power down the

559
00:17:19,909 --> 00:17:18,480
ship you have to get the cryogenics off

560
00:17:22,150 --> 00:17:19,919
for the fuel cells so we'd have to

561
00:17:23,590 --> 00:17:22,160
de-service prsd

562
00:17:25,270 --> 00:17:23,600
then power down

563
00:17:27,750 --> 00:17:25,280

power down the ship

564
00:17:29,669 --> 00:17:27,760
get into that work reload prsd get back

565
00:17:31,110 --> 00:17:29,679
into launch countdown it'd be very very

566
00:17:32,390 --> 00:17:31,120
tight i can tell you the guys are

567
00:17:33,750 --> 00:17:32,400
working are looking at that plan right

568
00:17:35,029 --> 00:17:33,760
now i don't have the answer for it i can

569
00:17:36,390 --> 00:17:35,039
tell you it'd be very tight though

570
00:17:37,669 --> 00:17:36,400
that's it would be a lot of work and

571
00:17:38,789 --> 00:17:37,679
that's what mike was getting into

572
00:17:40,710 --> 00:17:38,799
earlier

573
00:17:42,230 --> 00:17:40,720
is is the value of that worth the risk

574
00:17:43,830 --> 00:17:42,240
of doing all that work you're opening up

575
00:17:45,510 --> 00:17:43,840
this panel you're changing out a circuit

576
00:17:47,750 --> 00:17:45,520
breaker not knowing that the circuit

577
00:17:49,830 --> 00:17:47,760
breaker is exactly the problem right now

578
00:17:51,110 --> 00:17:49,840
we may be chasing the wrong thing and so

579
00:17:55,590 --> 00:17:51,120
we really want to understand where the

580
00:17:59,270 --> 00:17:56,549
l4

581
00:18:00,470 --> 00:17:59,280
so yeah left hand side behind the

582
00:18:02,630 --> 00:18:00,480
commander

583
00:18:04,630 --> 00:18:02,640
um and just to expand right so you guys

584
00:18:05,990 --> 00:18:04,640
don't go write the articles that say

585
00:18:07,270 --> 00:18:06,000
shuttle's pressing ahead with schedule

586
00:18:09,510 --> 00:18:07,280
pressure because they must fly in this

587
00:18:11,430 --> 00:18:09,520
window that didn't factor at all into my

588
00:18:13,430 --> 00:18:11,440

decision

589
00:18:15,830 --> 00:18:13,440
if i'da had a like mike said we talked

590
00:18:17,669 --> 00:18:15,840
before the mmt if i'd have had two weeks

591
00:18:19,029 --> 00:18:17,679
of launch time i still would have made

592
00:18:20,870 --> 00:18:19,039
this decision tonight because we don't

593
00:18:22,870 --> 00:18:20,880
yet understand enough what to do next

594
00:18:24,630 --> 00:18:22,880
and so tonight lets everybody understand

595
00:18:26,310 --> 00:18:24,640
it tomorrow we see what the action is if

596
00:18:28,310 --> 00:18:26,320
tomorrow we come in and go we either

597
00:18:30,549 --> 00:18:28,320
still don't understand it or we

598
00:18:31,750 --> 00:18:30,559
understand it and we need to fix it then

599
00:18:33,750 --> 00:18:31,760
we're going to go do that we're not

600
00:18:35,669 --> 00:18:33,760
going to just go fly as is but so when i

601
00:18:37,830 --> 00:18:35,679
say we're going to go focus on flies is

602
00:18:39,990 --> 00:18:37,840
that's not to preserve schedule that's

603
00:18:41,350 --> 00:18:40,000
really to understand the problem first

604
00:18:43,110 --> 00:18:41,360
and we kind of talked about this when we

605
00:18:44,390 --> 00:18:43,120
were talking about the uh about the

606
00:18:45,669 --> 00:18:44,400
leaks fix the problem and then set the

607
00:18:47,270 --> 00:18:45,679
launch date so we're going to go

608
00:18:48,630 --> 00:18:47,280
understand the problem and decide if we

609
00:18:49,909 --> 00:18:48,640
have to fix it and then we'll talk about

610
00:18:51,590 --> 00:18:49,919
the launch date

611
00:18:54,070 --> 00:18:51,600
irene thanks

612
00:18:56,310 --> 00:18:54,080
irene klotz with uh reuters uh two i

613
00:18:58,870 --> 00:18:56,320

guess launch window questions um

614
00:19:01,350 --> 00:18:58,880
thursday would the weather be a factor

615
00:19:03,029 --> 00:19:01,360
um in whether you decide to press ahead

616
00:19:04,390 --> 00:19:03,039
if assuming the flight rationale works

617
00:19:05,190 --> 00:19:04,400
out and

618
00:19:11,029 --> 00:19:05,200
did

619
00:19:13,029 --> 00:19:11,039
monday as a launch option see on the

620
00:19:13,990 --> 00:19:13,039
opening up monday um i haven't heard i

621
00:19:15,990 --> 00:19:14,000
haven't talked to them i know they're

622
00:19:16,950 --> 00:19:16,000
working that in the background um kind

623
00:19:18,549 --> 00:19:16,960
of the

624
00:19:19,990 --> 00:19:18,559
uh the the guideline i gave them was

625
00:19:21,270 --> 00:19:20,000
after a couple of scrubs then they

626
00:19:23,430 --> 00:19:21,280
should start turning up the heat we i

627
00:19:24,789 --> 00:19:23,440
think we've now passed that criteria so

628
00:19:26,630 --> 00:19:24,799
i suspect tomorrow they'll start turning

629
00:19:27,909 --> 00:19:26,640
up the heat and see where that falls um

630
00:19:29,510 --> 00:19:27,919
and so i can't i can't answer whether

631
00:19:30,789 --> 00:19:29,520
the eighth is is good or not and that's

632
00:19:32,630 --> 00:19:30,799
a pretty big complicated problem it's

633
00:19:34,870 --> 00:19:32,640
not just jsc it's the russians and the

634
00:19:37,190 --> 00:19:34,880
isis program and the partners so we'll

635
00:19:38,470 --> 00:19:37,200
go we'll go talk about that at a at

636
00:19:39,830 --> 00:19:38,480
length but i'm not ready to have that

637
00:19:40,710 --> 00:19:39,840
discussion just yet so i can't answer

638
00:19:42,789 --> 00:19:40,720

that one

639
00:19:44,630 --> 00:19:42,799
on the um on i just drew a blank on your

640
00:19:47,029 --> 00:19:44,640
first question i'm sorry

641
00:19:51,750 --> 00:19:48,789
uh let's see personally i don't like to

642
00:19:54,150 --> 00:19:51,760
do that um i would be very hesitant on a

643
00:19:57,270 --> 00:19:54,160
more than 24 hour forecast to go make a

644
00:19:59,909 --> 00:19:57,280
decision uh we've tanked before with 70

645
00:20:02,549 --> 00:19:59,919
no go we've tanked with 80 90 no go and

646
00:20:04,310 --> 00:20:02,559
and had a really good day that day um so

647
00:20:05,669 --> 00:20:04,320
we'll play that one by ear

648
00:20:06,870 --> 00:20:05,679
i'll probably take that one down to the

649
00:20:08,549 --> 00:20:06,880
wire and we'll go to the tanking meeting

650
00:20:10,070 --> 00:20:08,559
and decide if for the weather that's

651
00:20:11,909 --> 00:20:10,080
about to hit us in 12 hours is it the

652
00:20:13,029 --> 00:20:11,919
right thing to do um so no i'm not going

653
00:20:14,149 --> 00:20:13,039
to factor the weather in ahead of time

654
00:20:15,190 --> 00:20:14,159
on that one

655
00:20:19,590 --> 00:20:15,200
todd

656
00:20:22,549 --> 00:20:19,600
if i could the first i guess are both

657
00:20:26,230 --> 00:20:22,559
for mike moses

658
00:20:27,669 --> 00:20:26,240
if this voltage irregularity uh cropped

659
00:20:30,310 --> 00:20:27,679
up during

660
00:20:33,510 --> 00:20:30,320
main engine startup after the engines

661
00:20:36,549 --> 00:20:33,520
ignited would would it in and of itself

662
00:20:38,710 --> 00:20:36,559
caused an engine shutdown on the pad is

663
00:20:40,950 --> 00:20:38,720

it within

664
00:20:42,710 --> 00:20:40,960
specification i i just don't understand

665
00:20:44,230 --> 00:20:42,720
that yeah the magnitude of the signature

666
00:20:45,750 --> 00:20:44,240
we saw uh would not have caused any

667
00:20:47,350 --> 00:20:45,760
problems it's within tolerance of the

668
00:20:49,669 --> 00:20:47,360
system to handle it we didn't violate

669
00:20:51,029 --> 00:20:49,679
any limits we didn't violate any lcc's

670
00:20:53,909 --> 00:20:51,039
uh launch commit criteria we didn't

671
00:20:55,750 --> 00:20:53,919
violate any spec on the box so um this

672
00:20:58,390 --> 00:20:55,760
is just a due diligence of a signature

673
00:20:59,909 --> 00:20:58,400
that that is somewhat unexplained and

674
00:21:02,390 --> 00:20:59,919
somewhat unexpected

675
00:21:03,909 --> 00:21:02,400
but by itself clearly passes the limit

676
00:21:05,990 --> 00:21:03,919
and had this occurred at a period where

677
00:21:07,830 --> 00:21:06,000
we we couldn't take action to stop and

678
00:21:09,029 --> 00:21:07,840
talk about it like at main engine start

679
00:21:11,029 --> 00:21:09,039
it would have actually not affected the

680
00:21:14,310 --> 00:21:11,039
system at all and and it would have

681
00:21:16,789 --> 00:21:14,320
lifted off just fine okay and and i was

682
00:21:19,830 --> 00:21:16,799
curious as to what it is you need to

683
00:21:22,149 --> 00:21:19,840
hear as the chairman of the mmt to

684
00:21:23,510 --> 00:21:22,159
have the confidence to

685
00:21:25,510 --> 00:21:23,520
go ahead and press ahead what do you

686
00:21:26,789 --> 00:21:25,520
need to hear in this story

687
00:21:28,070 --> 00:21:26,799
well i kind of laid that out at the

688
00:21:30,470 --> 00:21:28,080

beginning

689
00:21:32,230 --> 00:21:30,480
we basically need to talk uh about an

690
00:21:34,310 --> 00:21:32,240
integrated end-to-end understanding of

691
00:21:36,710 --> 00:21:34,320
the problem and that we we haven't drawn

692
00:21:39,029 --> 00:21:36,720
the dots to say that that this two

693
00:21:40,870 --> 00:21:39,039
separate signatures is one problem

694
00:21:42,789 --> 00:21:40,880
and that that's actually physically

695
00:21:44,149 --> 00:21:42,799
explainable um i think there's a fair

696
00:21:46,549 --> 00:21:44,159
bit of historical data that guys can

697
00:21:48,870 --> 00:21:46,559
bring to the table to help us show that

698
00:21:51,270 --> 00:21:48,880
that while maybe not noticed before this

699
00:21:53,350 --> 00:21:51,280
is probably not an uncommon signature

700
00:21:55,590 --> 00:21:53,360
we're literally talking about a 40 ohm

701
00:21:57,430 --> 00:21:55,600
change in resistance in the circuit and

702
00:21:59,590 --> 00:21:57,440
if if you if you know your electronics

703
00:22:01,430 --> 00:21:59,600
which i don't um that's nothing i mean

704
00:22:03,110 --> 00:22:01,440
that's that's hardly anything

705
00:22:04,310 --> 00:22:03,120
and so the fact that we've never really

706
00:22:06,310 --> 00:22:04,320
seen it before

707
00:22:09,350 --> 00:22:06,320
maybe is not because we weren't looking

708
00:22:10,549 --> 00:22:09,360
at this level of detail before um and so

709
00:22:12,390 --> 00:22:10,559
so we might be able to pull something

710
00:22:13,830 --> 00:22:12,400
out of the hat that just says hey this

711
00:22:15,190 --> 00:22:13,840
actually is very explainable and it's a

712
00:22:16,710 --> 00:22:15,200
known condition and we're good that

713
00:22:19,029 --> 00:22:16,720

would obviously give me great confidence

714
00:22:21,190 --> 00:22:19,039
to fly and so the the ability to draw

715
00:22:22,630 --> 00:22:21,200
that connection uh that we do truly

716
00:22:24,390 --> 00:22:22,640
actually physically have an explanation

717
00:22:26,310 --> 00:22:24,400
for the problem and that it's not just a

718
00:22:29,430 --> 00:22:26,320
convenient explanation is really what

719
00:22:31,430 --> 00:22:29,440
i'm personally looking for tomorrow

720
00:22:33,750 --> 00:22:31,440
in the back please mark ratterman from

721
00:22:35,510 --> 00:22:33,760
talking space for mike moses

722
00:22:37,590 --> 00:22:35,520
is the problem that you're describing in

723
00:22:40,070 --> 00:22:37,600
looking at historical data is that

724
00:22:41,430 --> 00:22:40,080
something that's easy difficult is it

725
00:22:43,909 --> 00:22:41,440
something you have

726
00:22:45,909 --> 00:22:43,919
tools to do or does it require recall

727
00:22:47,510 --> 00:22:45,919
from individuals on the team

728
00:22:49,110 --> 00:22:47,520
no it's and mike can talk to the process

729
00:22:51,909 --> 00:22:49,120
it's actually very easy to do in fact by

730
00:22:53,830 --> 00:22:51,919
the time we hit the mmt i think they had

731
00:22:55,029 --> 00:22:53,840
finished reviewing this flow's worth of

732
00:22:56,149 --> 00:22:55,039
data every time that circuit breaker has

733
00:22:58,070 --> 00:22:56,159
been shut cycled and i think they've

734
00:22:59,590 --> 00:22:58,080
been in the one or two flows before that

735
00:23:01,270 --> 00:22:59,600
the main engine guys are already five or

736
00:23:04,149 --> 00:23:01,280
six flights back in history looking at

737
00:23:05,750 --> 00:23:04,159
their problems um the we call it it's a

738
00:23:07,909 --> 00:23:05,760

praca database which is a problem

739
00:23:09,110 --> 00:23:07,919
reporting and accounting and i remember

740
00:23:11,190 --> 00:23:09,120
the last day is corrective action

741
00:23:12,870 --> 00:23:11,200
corrective action thank you

742
00:23:14,630 --> 00:23:12,880
that database is an easily searchable

743
00:23:15,909 --> 00:23:14,640
tool we're able to put in uh circuit

744
00:23:17,590 --> 00:23:15,919
breaker part numbers main engine

745
00:23:18,710 --> 00:23:17,600
controller part numbers and it'll flag

746
00:23:20,070 --> 00:23:18,720
every instance of a problem that

747
00:23:21,510 --> 00:23:20,080
affected those and they could be

748
00:23:23,190 --> 00:23:21,520
screened pretty quickly

749
00:23:25,110 --> 00:23:23,200
the teams have done that

750
00:23:27,750 --> 00:23:25,120
via that we've we've learned that on on

751
00:23:29,990 --> 00:23:27,760
sts 90 and i forget exactly when in the

752
00:23:31,510 --> 00:23:30,000
count but uh the the problem that we saw

753
00:23:33,669 --> 00:23:31,520
initially where we we throw the switch

754
00:23:35,750 --> 00:23:33,679
and one of the phases doesn't come on uh

755
00:23:37,669 --> 00:23:35,760
happened in that flow and it wasn't in a

756
00:23:39,029 --> 00:23:37,679
condition that was known then

757
00:23:40,390 --> 00:23:39,039
and the failure analysis that went along

758
00:23:41,350 --> 00:23:40,400
with that we're able to look at it and

759
00:23:42,870 --> 00:23:41,360
build on

760
00:23:44,549 --> 00:23:42,880
and then and i forget which flight it

761
00:23:46,149 --> 00:23:44,559
was too but the uh

762
00:23:47,590 --> 00:23:46,159
the potential of this voltage drop-off

763
00:23:49,590 --> 00:23:47,600

has happened before

764
00:23:51,510 --> 00:23:49,600
at that time it was it was correlated to

765
00:23:53,190 --> 00:23:51,520
an actual brush where they bumped the

766
00:23:54,950 --> 00:23:53,200
circuit breaker that circuit break

767
00:23:57,269 --> 00:23:54,960
bumped momentarily made it hiccup which

768
00:23:58,310 --> 00:23:57,279
then induced this scenario so again we

769
00:23:59,990 --> 00:23:58,320
have a very good physics-based

770
00:24:02,390 --> 00:24:00,000
understanding that the circuit breaker

771
00:24:03,669 --> 00:24:02,400
can cause these problems but but let's

772
00:24:05,269 --> 00:24:03,679
make sure we've got all those ducks in a

773
00:24:07,350 --> 00:24:05,279
row so to answer your question of how

774
00:24:09,269 --> 00:24:07,360
hard it is it's actually pretty easy

775
00:24:10,789 --> 00:24:09,279
the hard part is it's a lot of data and

776
00:24:12,230 --> 00:24:10,799
there's a lot to talk about and that's

777
00:24:14,149 --> 00:24:12,240
kind of what i mean i think the answers

778
00:24:15,510 --> 00:24:14,159
were all there today but we hadn't yet

779
00:24:17,269 --> 00:24:15,520
had a time to pull it together and

780
00:24:21,269 --> 00:24:17,279
organize it and make sure it it does

781
00:24:24,950 --> 00:24:23,350
greg dobbs from hd television of the

782
00:24:26,950 --> 00:24:24,960
several reasons why launch windows

783
00:24:29,110 --> 00:24:26,960
sometimes come to an end what's the

784
00:24:31,190 --> 00:24:29,120
reason this time why is sunday the last

785
00:24:33,350 --> 00:24:31,200
day until december let's see this one is

786
00:24:34,950 --> 00:24:33,360
a beta cutout so that's the solar angle

787
00:24:36,630 --> 00:24:34,960
that the sun makes on the orbit um when

788
00:24:38,390 --> 00:24:36,640

we're docked to the space station the

789
00:24:39,990 --> 00:24:38,400
shuttle itself can't do much to control

790
00:24:41,990 --> 00:24:40,000
the uh the temperatures the sun hits the

791
00:24:43,750 --> 00:24:42,000
same part every time and it overheats a

792
00:24:45,669 --> 00:24:43,760
few components on the shuttle if we were

793
00:24:48,149 --> 00:24:45,679
undocked we'd we'd kind of do a barbecue

794
00:24:49,830 --> 00:24:48,159
roll to keep the heat evenly spread but

795
00:24:51,990 --> 00:24:49,840
when we're done station we can't that

796
00:24:53,590 --> 00:24:52,000
that limit used to be 60 degrees i think

797
00:24:55,590 --> 00:24:53,600
they've been looking at increasing it to

798
00:24:57,350 --> 00:24:55,600
65 so that's kind of what we're talking

799
00:24:59,430 --> 00:24:57,360
about if of do we have a little wiggle

800
00:25:01,669 --> 00:24:59,440
room to maybe get a couple extra degrees

801
00:25:03,029 --> 00:25:01,679
and give us one more launch attempt

802
00:25:05,510 --> 00:25:03,039
but that's really the cutout for this

803
00:25:08,950 --> 00:25:05,520
one is that beta angle

804
00:25:12,630 --> 00:25:10,390
mark kirkman interspace news again i'm

805
00:25:13,830 --> 00:25:12,640
sorry um and your answer to todd i got a

806
00:25:16,470 --> 00:25:13,840
little confused in how this first

807
00:25:18,870 --> 00:25:16,480
presented itself it did were you not

808
00:25:21,029 --> 00:25:18,880
able to power dcub at all initially and

809
00:25:23,269 --> 00:25:21,039
then it magically powered itself up and

810
00:25:25,110 --> 00:25:23,279
then you cycled the breakers

811
00:25:26,950 --> 00:25:25,120
yeah so we pushed well all three

812
00:25:28,470 --> 00:25:26,960
breakers were in and then the power up

813
00:25:29,990 --> 00:25:28,480

is to turn the switch on a single

814
00:25:31,430 --> 00:25:30,000
three-phase switch and so we threw that

815
00:25:33,350 --> 00:25:31,440
switch and when that happened the

816
00:25:35,350 --> 00:25:33,360
controller did not come up and and the

817
00:25:37,430 --> 00:25:35,360
data pulls to understand why that

818
00:25:40,390 --> 00:25:37,440
happened revealed that phase b did not

819
00:25:41,669 --> 00:25:40,400
uh no power went out on phase b so

820
00:25:43,269 --> 00:25:41,679
while the teams were doing that data

821
00:25:45,110 --> 00:25:43,279
pull to try to understand why phase b

822
00:25:46,630 --> 00:25:45,120
didn't come on you saw phase a and c

823
00:25:48,870 --> 00:25:46,640
pick up a little bit of the extra

824
00:25:49,990 --> 00:25:48,880
induced load uh understand that we don't

825
00:25:51,590 --> 00:25:50,000
have a

826
00:25:52,789 --> 00:25:51,600
short circuit anything going on while

827
00:25:54,950 --> 00:25:52,799
the teams were doing that it took about

828
00:25:56,070 --> 00:25:54,960
an hour and 40 minutes and and when they

829
00:25:57,830 --> 00:25:56,080
went back to the troubleshooting plan

830
00:25:59,430 --> 00:25:57,840
which would be to cycle breakers

831
00:26:01,590 --> 00:25:59,440
the controller was on and it wasn't that

832
00:26:03,430 --> 00:26:01,600
it magically came on but basically the

833
00:26:04,470 --> 00:26:03,440
theory is that that that contamination

834
00:26:06,470 --> 00:26:04,480
basically

835
00:26:08,070 --> 00:26:06,480
uh the spring assisted circuit breaker

836
00:26:10,470 --> 00:26:08,080
pushed through that last little bit of

837
00:26:12,549 --> 00:26:10,480
of oil or carbon whatever happened to be

838
00:26:14,310 --> 00:26:12,559

on the on the contact uh or that the you

839
00:26:17,190 --> 00:26:14,320
know the dielectric just became overcome

840
00:26:19,029 --> 00:26:17,200
and a connection was made and so so

841
00:26:20,950 --> 00:26:19,039
that's the signature we saw we then

842
00:26:22,230 --> 00:26:20,960
after that scrubbed that breaker by

843
00:26:24,310 --> 00:26:22,240
pulling it out pushing back in pull out

844
00:26:25,430 --> 00:26:24,320
pushing back in five times with a mark

845
00:26:27,110 --> 00:26:25,440
measuring the currents making sure

846
00:26:28,470 --> 00:26:27,120
everything looked fine from that point

847
00:26:30,789 --> 00:26:28,480
on everything looked perfect with that

848
00:26:32,630 --> 00:26:30,799
power up the signatures the traces uh

849
00:26:34,390 --> 00:26:32,640
the main engine controllers diagnostics

850
00:26:35,750 --> 00:26:34,400
everything from there on was was fine so

851
00:26:39,110 --> 00:26:35,760
that first initial signature was really

852
00:26:40,630 --> 00:26:39,120
just a delayed power up because of a

853
00:26:43,430 --> 00:26:40,640
not completely made connection on one of

854
00:26:43,440 --> 00:26:46,710
irene

855
00:26:51,669 --> 00:26:49,029
thanks just out of curiosity under that

856
00:26:54,710 --> 00:26:51,679
scenario if this transient should happen

857
00:26:56,310 --> 00:26:54,720
again would that fit with this flight

858
00:26:58,149 --> 00:26:56,320
rationale you think is going to be

859
00:26:59,590 --> 00:26:58,159
pulled together or would it

860
00:27:00,870 --> 00:26:59,600
sort of knock that

861
00:27:02,390 --> 00:27:00,880
out of the

862
00:27:05,029 --> 00:27:02,400
no it would fit very well actually the

863
00:27:06,630 --> 00:27:05,039

the the historical

864
00:27:07,750 --> 00:27:06,640
consequences of these type of problems

865
00:27:09,669 --> 00:27:07,760
in circuit breakers are that when you

866
00:27:11,350 --> 00:27:09,679
scrub them you've you eliminate that

867
00:27:13,590 --> 00:27:11,360
problem in it and it now is a good latch

868
00:27:15,190 --> 00:27:13,600
breaker and that won't happen again

869
00:27:16,549 --> 00:27:15,200
the part that's making us pause and why

870
00:27:19,190 --> 00:27:16,559
we didn't just press right ahead and we

871
00:27:22,070 --> 00:27:19,200
go to fly is that a few hours later we

872
00:27:23,350 --> 00:27:22,080
saw that circuit breaker uh

873
00:27:25,110 --> 00:27:23,360
for lack of a better word kind of

874
00:27:27,110 --> 00:27:25,120
dribble the voltage a little bit and we

875
00:27:28,389 --> 00:27:27,120
don't know exactly why that happened

876
00:27:30,070 --> 00:27:28,399
because we haven't ever noticed it

877
00:27:32,149 --> 00:27:30,080
before it might be because we weren't

878
00:27:33,669 --> 00:27:32,159
looking before it might be because we

879
00:27:34,950 --> 00:27:33,679
don't quite understand the failure mode

880
00:27:37,029 --> 00:27:34,960
and that's what we need to find out so

881
00:27:38,389 --> 00:27:37,039
the the concept of if this was just that

882
00:27:39,990 --> 00:27:38,399
breaker we scrubbed it and it made a

883
00:27:41,909 --> 00:27:40,000
good contact the teams were ready to go

884
00:27:43,430 --> 00:27:41,919
that that's we're good with that problem

885
00:27:45,269 --> 00:27:43,440
we've we've cleared that and it's okay

886
00:27:49,029 --> 00:27:45,279
to fly that happens a fair bit uh on

887
00:27:52,549 --> 00:27:51,190
is that would that be an issue yeah so

888
00:27:54,549 --> 00:27:52,559

as some of the other questions said if

889
00:27:55,669 --> 00:27:54,559
this reoccurred as is it doesn't violate

890
00:27:56,789 --> 00:27:55,679
any limits it doesn't hurt the

891
00:27:58,630 --> 00:27:56,799
controller the controller would meant

892
00:27:59,830 --> 00:27:58,640
just fine so if it reoccurred at the

893
00:28:01,590 --> 00:27:59,840
magnitude we saw it there'd be no

894
00:28:04,149 --> 00:28:01,600
problem whatsoever

895
00:28:05,830 --> 00:28:04,159
we just want to make sure we're not

896
00:28:07,750 --> 00:28:05,840
that if it gets worse what's going to

897
00:28:08,950 --> 00:28:07,760
happen if it happens at the wrong time

898
00:28:11,029 --> 00:28:08,960
what's going to happen is there a way it

899
00:28:12,870 --> 00:28:11,039
can manifest itself differently

900
00:28:13,750 --> 00:28:12,880
affect multiple controllers you know

901
00:28:15,350 --> 00:28:13,760
we're going to answer all those

902
00:28:17,190 --> 00:28:15,360
questions before we're ready to fly and

903
00:28:18,549 --> 00:28:17,200
not just go on the well if it repeats

904
00:28:20,389 --> 00:28:18,559
itself it's going to be okay so that

905
00:28:21,909 --> 00:28:20,399
one's okay you know we need to know why

906
00:28:24,389 --> 00:28:21,919
it happened and what happens if it gets

907
00:28:28,389 --> 00:28:26,630
bill i assume the commander listened

908
00:28:30,310 --> 00:28:28,399
into the mmt did he have any comments on

909
00:28:31,909 --> 00:28:30,320
any of this and where you guys are going

910
00:28:33,669 --> 00:28:31,919
uh let's see typically the the crew's

911
00:28:35,990 --> 00:28:33,679
not actually part of the mmt we do have

912
00:28:37,430 --> 00:28:36,000
a flight crew rep on the team and and uh

913
00:28:39,590 --> 00:28:37,440

and and so he was definitely there and

914
00:28:40,870 --> 00:28:39,600
involved again today's mmt wasn't a

915
00:28:42,870 --> 00:28:40,880
question and answer session it was more

916
00:28:44,389 --> 00:28:42,880
of a lay out the problem recognizing

917
00:28:45,669 --> 00:28:44,399
that we're not ready to present and and

918
00:28:47,350 --> 00:28:45,679
given the teams the action to go back

919
00:28:49,269 --> 00:28:47,360
and gather that data but they have been

920
00:28:51,430 --> 00:28:49,279
following all day long and and plan on

921
00:28:53,110 --> 00:28:51,440
following overnight so as far as

922
00:28:54,950 --> 00:28:53,120
commander lindsay and what his personal

923
00:28:56,830 --> 00:28:54,960
level of knowledge is i don't yet know

924
00:28:59,510 --> 00:28:56,840
but uh we will be tagging up with him

925
00:29:00,789 --> 00:28:59,520
later for mike

926
00:29:02,230 --> 00:29:00,799
obviously this is the last flow for

927
00:29:03,830 --> 00:29:02,240
discovering you guys it's turned into a

928
00:29:05,750 --> 00:29:03,840
little bit of a drama i guess with the

929
00:29:07,029 --> 00:29:05,760
valve issues you guys have had and the

930
00:29:08,389 --> 00:29:07,039
troubleshooting any disappointment on

931
00:29:09,190 --> 00:29:08,399
the team or is it just another day at

932
00:29:16,389 --> 00:29:09,200
the

933
00:29:17,990 --> 00:29:16,399
you fly when you're ready and you don't

934
00:29:20,389 --> 00:29:18,000
if you're not and we're not ready to go

935
00:29:21,909 --> 00:29:20,399
now um discovery's not going out easy

936
00:29:23,669 --> 00:29:21,919
she's giving us a little bit of trouble

937
00:29:25,350 --> 00:29:23,679
but that's fine she'll fly perfectly

938
00:29:27,430 --> 00:29:25,360

when she does and you know this is the

939
00:29:28,470 --> 00:29:27,440
way it it lines up right the

940
00:29:29,909 --> 00:29:28,480
every step of the way through the

941
00:29:31,909 --> 00:29:29,919
countdown and it's built the way it is

942
00:29:33,029 --> 00:29:31,919
for just that purpose you do a lot of

943
00:29:34,070 --> 00:29:33,039
checks ahead of time before you get to

944
00:29:36,149 --> 00:29:34,080
the pad when you get to the pad you

945
00:29:38,149 --> 00:29:36,159
check it out but ultimately it's all

946
00:29:39,909 --> 00:29:38,159
leading towards all those parts and all

947
00:29:42,389 --> 00:29:39,919
those pieces and all those electronics

948
00:29:43,590 --> 00:29:42,399
all come on at the very end and so as we

949
00:29:45,110 --> 00:29:43,600
get closer and closer to launch we're

950
00:29:47,669 --> 00:29:45,120
testing more and more of those systems

951
00:29:49,430 --> 00:29:47,679
and revealing sometimes uh hiccups in

952
00:29:50,710 --> 00:29:49,440
those systems so we still have a long

953
00:29:51,990 --> 00:29:50,720
way to go for launch

954
00:29:55,990 --> 00:29:52,000
they got that whole big tanking thing to

955
00:30:01,830 --> 00:29:58,789
are there any further questions

956
00:30:03,990 --> 00:30:01,840
well that will conclude our sts-133

957
00:30:05,990 --> 00:30:04,000
status briefing for tonight

958
00:30:08,470 --> 00:30:06,000
updates to the briefing schedules and

959
00:30:11,190 --> 00:30:08,480
countdown will be on our web page at

960
00:30:13,110 --> 00:30:11,200
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