1
00:00:08,150 --> 00:00:05,510
good evening and welcome to our sts-133

2
00:00:09,830 --> 00:00:08,160
flight readiness review briefing we are

3
00:00:12,150 --> 00:00:09,840
happy to be here this evening and joined

4
00:00:17,109 --> 00:00:12,160
by nasa's associate administrator for

5
00:00:21,269 --> 00:00:18,870
shuttle launch integration manager mike

6
00:00:24,230 --> 00:00:21,279
moses good evening and shuttle launch

7
00:00:25,830 --> 00:00:24,240
director mike leinbach good evening

8
00:00:27,029 --> 00:00:25,840
we'll begin with opening comments and

9
00:00:29,269 --> 00:00:27,039
then we'll be happy to take your

10
00:00:31,750 --> 00:00:29,279
questions mr gerstenmaier

11
00:00:33,910 --> 00:00:31,760
thanks mike we had a

12
00:00:35,990 --> 00:00:33,920
really thorough review today and

13
00:00:40,709 --> 00:00:36,000

we set the 24th at

14
00:00:42,869 --> 00:00:40,719
4 50 p.m for the launch of discovery

15
00:00:45,910 --> 00:00:42,879
we had a good discussion about how all

16
00:00:48,470 --> 00:00:45,920
that goes with the atv and its docking

17
00:00:50,709 --> 00:00:48,480
and atv is continuing to do very well on

18
00:00:52,470 --> 00:00:50,719
orbit they did a collision of ordinance

19
00:00:54,229 --> 00:00:52,480
maneuver checkout today and that went

20
00:00:56,630 --> 00:00:54,239
extremely well

21
00:00:59,990 --> 00:00:56,640
if things go as planned about six hours

22
00:01:01,990 --> 00:01:00,000
before the the launch atv will dock to

23
00:01:04,070 --> 00:01:02,000
iss and then then we'll go ahead and

24
00:01:05,590 --> 00:01:04,080
then launch the shuttle right after that

25
00:01:07,030 --> 00:01:05,600
we took a look at it from an overall

26
00:01:08,870 --> 00:01:07,040
timeline standpoint make sure there were

27
00:01:10,550 --> 00:01:08,880
no conflicts with the on-orbit crew make

28
00:01:12,710 --> 00:01:10,560
sure we could get all the testing worked

29
00:01:15,030 --> 00:01:12,720
out and fit in and all that worked

30
00:01:16,710 --> 00:01:15,040
extremely well

31
00:01:18,469 --> 00:01:16,720
it's also a pretty interesting time

32
00:01:20,310 --> 00:01:18,479
overall with the station lots of

33
00:01:22,710 --> 00:01:20,320
activities going on

34
00:01:24,550 --> 00:01:22,720
as we were in the fr today the htv was

35
00:01:26,630 --> 00:01:24,560
moved from the nader port up to the

36
00:01:28,070 --> 00:01:26,640
zenith port that was important that

37
00:01:29,990 --> 00:01:28,080
clears the way for the shuttle to come

38
00:01:32,149 --> 00:01:30,000

up and dock the htv needed to be moved

39
00:01:33,749 --> 00:01:32,159
and that was done the power cable was

40
00:01:35,910 --> 00:01:33,759
also attached and i think the crew

41
00:01:37,270 --> 00:01:35,920
ingress is on monday back into the htv

42
00:01:38,870 --> 00:01:37,280
and they'll be able to to get in there

43
00:01:41,270 --> 00:01:38,880
to do some work

44
00:01:42,630 --> 00:01:41,280
sunday progress on docks so it's a it's

45
00:01:44,389 --> 00:01:42,640
a busy time

46
00:01:45,749 --> 00:01:44,399
uh we also spent a little bit of time in

47
00:01:47,990 --> 00:01:45,759
the flight readiness review and talked

48
00:01:49,030 --> 00:01:48,000
about the potential for a soyuz fly

49
00:01:52,550 --> 00:01:49,040
around

50
00:01:55,429 --> 00:01:52,560
we and take to take some pictures

51
00:01:56,789 --> 00:01:55,439
of the station we we didn't approve that

52
00:01:58,389 --> 00:01:56,799
today but we'll let the teams go ahead

53
00:02:00,230 --> 00:01:58,399
and continue to work at the worker

54
00:02:01,830 --> 00:02:00,240
during the on-orbit activities to see if

55
00:02:04,789 --> 00:02:01,840
it makes sense the russians will

56
00:02:06,389 --> 00:02:04,799
continue to evaluate it if it works out

57
00:02:08,150 --> 00:02:06,399
and works right we'll get a decision

58
00:02:10,309 --> 00:02:08,160
around flight day six if we want to go

59
00:02:12,150 --> 00:02:10,319
do that activity so

60
00:02:13,589 --> 00:02:12,160
we went over all the systems we spent

61
00:02:15,510 --> 00:02:13,599
quite a bit of time talking about the

62
00:02:17,670 --> 00:02:15,520
external tank and the stringers to make

63
00:02:19,350 --> 00:02:17,680

sure we were comfortable with the the

64
00:02:20,869 --> 00:02:19,360
modifications we've made to the tank

65
00:02:22,790 --> 00:02:20,879
make sure we've got everything in a good

66
00:02:24,309 --> 00:02:22,800
configuration

67
00:02:25,990 --> 00:02:24,319
i can't say enough about the work that

68
00:02:28,390 --> 00:02:26,000
the teams have done they did a

69
00:02:30,710 --> 00:02:28,400
tremendous job down here at the cape

70
00:02:33,110 --> 00:02:30,720
removing the foam installing the radius

71
00:02:35,110 --> 00:02:33,120
blocks making the modifications getting

72
00:02:37,110 --> 00:02:35,120
the orbiter back out at the pad the team

73
00:02:38,390 --> 00:02:37,120
just did a tremendous job and then the

74
00:02:40,470 --> 00:02:38,400
number of hours that were spent in

75
00:02:42,550 --> 00:02:40,480
various test facilities testing all the

76
00:02:44,070 --> 00:02:42,560
configurations of the stringers and the

77
00:02:45,589 --> 00:02:44,080
tank components to make sure they were

78
00:02:47,990 --> 00:02:45,599
really ready and we understood what was

79
00:02:49,910 --> 00:02:48,000
going on is just phenomenal so we had a

80
00:02:52,630 --> 00:02:49,920
very thorough review a very

81
00:02:53,990 --> 00:02:52,640
in-depth discussion on the tanks and and

82
00:02:56,790 --> 00:02:54,000
things are looking pretty good we're

83
00:02:58,630 --> 00:02:56,800
also are working now on et 122 and i

84
00:03:00,949 --> 00:02:58,640
think most of the modifications are are

85
00:03:02,630 --> 00:03:00,959
completed on that tank and we'll start

86
00:03:05,030 --> 00:03:02,640
getting it ready to go support the april

87
00:03:06,869 --> 00:03:05,040
19th launch so again the teams have done

88
00:03:09,589 --> 00:03:06,879

a great job i think we're ready to go

89
00:03:11,589 --> 00:03:09,599
next week and uh and we're ready for the

90
00:03:14,070 --> 00:03:11,599
launch so uh mike

91
00:03:15,350 --> 00:03:14,080
thanks bill so let's see yeah i can't

92
00:03:17,270 --> 00:03:15,360
even begin to

93
00:03:19,589 --> 00:03:17,280
to echo enough what bill said about the

94
00:03:22,070 --> 00:03:19,599
the work of the teams around the country

95
00:03:23,509 --> 00:03:22,080
led by our our external tank

96
00:03:25,270 --> 00:03:23,519
folks with lockheed martin at the

97
00:03:26,630 --> 00:03:25,280
michoud assembly facility just outside

98
00:03:28,309 --> 00:03:26,640
of new orleans and then at the marshall

99
00:03:30,149 --> 00:03:28,319
space flight center in huntsville

100
00:03:31,110 --> 00:03:30,159
alabama

101
00:03:35,430 --> 00:03:31,120
the

102
00:03:36,710 --> 00:03:35,440
into this is is really truly amazing um

103
00:03:38,070 --> 00:03:36,720
and then you couple that it's at the end

104
00:03:40,309 --> 00:03:38,080
of the program and we're done building

105
00:03:41,670 --> 00:03:40,319
tanks and we've effectively uh almost

106
00:03:44,229 --> 00:03:41,680
all but turned out the lights at that

107
00:03:45,910 --> 00:03:44,239
math facility uh to have this type of

108
00:03:47,910 --> 00:03:45,920
failure come in that requires a whole

109
00:03:49,990 --> 00:03:47,920
lot of tests and analysis is a real

110
00:03:52,229 --> 00:03:50,000
testament to the to the dedication and

111
00:03:54,630 --> 00:03:52,239
loyalty of those folks to to step up and

112
00:03:56,470 --> 00:03:54,640
and and really come out and help us uh

113
00:03:57,990 --> 00:03:56,480

including the the teams that had to come

114
00:04:00,309 --> 00:03:58,000
out here to kennedy to do the mods on

115
00:04:01,750 --> 00:04:00,319
the tank themselves you know we had

116
00:04:04,630 --> 00:04:01,760
folks come out right after the holidays

117
00:04:06,309 --> 00:04:04,640
and and get started on on on the

118
00:04:08,710 --> 00:04:06,319
modifications to the tank

119
00:04:10,070 --> 00:04:08,720
and then again the local ksc team who

120
00:04:11,990 --> 00:04:10,080
had to go through

121
00:04:13,830 --> 00:04:12,000
a whole lot of work we actually we were

122
00:04:15,110 --> 00:04:13,840
looking at it from a work time

123
00:04:16,469 --> 00:04:15,120
issue to make sure we hadn't had too

124
00:04:18,150 --> 00:04:16,479
many people working too long and you go

125
00:04:20,069 --> 00:04:18,160
all the way back to the

126
00:04:21,590 --> 00:04:20,079
november 5th launch attempt where we had

127
00:04:23,350 --> 00:04:21,600
the gup leak

128
00:04:25,189 --> 00:04:23,360
and that's that same mechanical team

129
00:04:26,550 --> 00:04:25,199
down here at kennedy who who works on

130
00:04:28,870 --> 00:04:26,560
the gup as they work on the rest of the

131
00:04:30,469 --> 00:04:28,880
et so not only do we have to tear the

132
00:04:32,629 --> 00:04:30,479
gup apart fix that leak put it back

133
00:04:34,310 --> 00:04:32,639
together but we had to initially we did

134
00:04:35,830 --> 00:04:34,320
repairs on the tank out at the pad and

135
00:04:37,590 --> 00:04:35,840
then decided we wanted to do a tanking

136
00:04:38,790 --> 00:04:37,600
test so we added instrumentation and

137
00:04:40,710 --> 00:04:38,800
then we

138
00:04:42,390 --> 00:04:40,720

recognized we needed to roll back had to

139
00:04:44,070 --> 00:04:42,400
do a modification and then roll back out

140
00:04:46,070 --> 00:04:44,080
and when we got back out there we hooked

141
00:04:47,749 --> 00:04:46,080
the gup all back up again so that team's

142
00:04:49,749 --> 00:04:47,759
been working really hard and have

143
00:04:51,030 --> 00:04:49,759
absolutely done an amazing job i i am

144
00:04:52,790 --> 00:04:51,040
very very proud

145
00:04:54,790 --> 00:04:52,800
of them and and the management team in

146
00:04:56,150 --> 00:04:54,800
on top of that structure to to make sure

147
00:04:57,670 --> 00:04:56,160
that those guys are getting what they

148
00:04:59,670 --> 00:04:57,680
need to get their job done

149
00:05:02,070 --> 00:04:59,680
um really really good job

150
00:05:03,990 --> 00:05:02,080
um we talked a little bit at fr uh you

151
00:05:05,830 --> 00:05:04,000
know since we've uh

152
00:05:07,110 --> 00:05:05,840
since we were last had our flight

153
00:05:08,150 --> 00:05:07,120
readiness review which was at the end of

154
00:05:10,390 --> 00:05:08,160
october

155
00:05:11,909 --> 00:05:10,400
um a couple of things technically we

156
00:05:13,909 --> 00:05:11,919
talked about you know we had a circuit

157
00:05:15,029 --> 00:05:13,919
breaker problem that led to a power

158
00:05:16,550 --> 00:05:15,039
anomaly and one of the main engine

159
00:05:17,990 --> 00:05:16,560
controllers and and we had talked that

160
00:05:19,270 --> 00:05:18,000
and we were ready to fly with it as is

161
00:05:20,790 --> 00:05:19,280
but since we had the downtime we went

162
00:05:22,710 --> 00:05:20,800
ahead and changed out all those circuit

163
00:05:24,150 --> 00:05:22,720

breakers 18 of them on one of the panels

164
00:05:25,430 --> 00:05:24,160
in the cockpit so we have all new

165
00:05:27,189 --> 00:05:25,440
circuit breakers in that system and

166
00:05:28,950 --> 00:05:27,199
everything's good there a lot of time

167
00:05:30,710 --> 00:05:28,960
and cycle stuff

168
00:05:32,790 --> 00:05:30,720
batteries that needed to be changed out

169
00:05:34,070 --> 00:05:32,800
components that have a clock on them

170
00:05:35,110 --> 00:05:34,080
when they need to be changed we had to

171
00:05:36,390 --> 00:05:35,120
look at each one of them to say does

172
00:05:38,390 --> 00:05:36,400
that really need to be changed right now

173
00:05:39,830 --> 00:05:38,400
or or was that requirement more from a

174
00:05:41,749 --> 00:05:39,840
more frequent use and since we hadn't

175
00:05:43,189 --> 00:05:41,759
launched were okay so we looked across

176
00:05:44,790 --> 00:05:43,199
the board at all the systems and and had

177
00:05:46,230 --> 00:05:44,800
a a handful of things that needed to be

178
00:05:47,590 --> 00:05:46,240
worked on and and the ground ops team

179
00:05:49,270 --> 00:05:47,600
here in florida really led that effort

180
00:05:52,629 --> 00:05:49,280
and did a a great job of keeping us on

181
00:05:53,670 --> 00:05:52,639
top of of that list and uh we kind of

182
00:05:55,909 --> 00:05:53,680
talk about it i don't know if you've

183
00:05:57,430 --> 00:05:55,919
seen the videos where they uh the the

184
00:05:59,350 --> 00:05:57,440
how you pay attention to a problem they

185
00:06:00,309 --> 00:05:59,360
show the the team passing a basketball

186
00:06:01,670 --> 00:06:00,319
back and forth you're supposed to count

187
00:06:03,670 --> 00:06:01,680
the number of times the basketball goes

188
00:06:04,790 --> 00:06:03,680

around and and meanwhile a bear or

189
00:06:06,309 --> 00:06:04,800
gorilla walks right through the middle

190
00:06:07,270 --> 00:06:06,319
of it and you usually don't notice that

191
00:06:08,870 --> 00:06:07,280
because you're paying attention to the

192
00:06:10,230 --> 00:06:08,880
basketball well the stringers were our

193
00:06:12,390 --> 00:06:10,240
basketball here and everybody was paying

194
00:06:13,670 --> 00:06:12,400
attention to it so the the the rest of

195
00:06:14,790 --> 00:06:13,680
the teams were really trying to focus on

196
00:06:16,390 --> 00:06:14,800
all the rest of the stuff to make sure

197
00:06:17,670 --> 00:06:16,400
we didn't miss anything and we reviewed

198
00:06:19,350 --> 00:06:17,680
that pretty good today in a high

199
00:06:20,870 --> 00:06:19,360
confidence that we were in great shape

200
00:06:22,469 --> 00:06:20,880
on the rest of the vehicle you know we

201
00:06:23,749 --> 00:06:22,479
swapped out the crew

202
00:06:25,510 --> 00:06:23,759
tim copra

203
00:06:27,990 --> 00:06:25,520
got replaced by steve bowen he's going

204
00:06:29,430 --> 00:06:28,000
to be doing the evas there's two evas he

205
00:06:31,590 --> 00:06:29,440
has completed all the training needed

206
00:06:32,710 --> 00:06:31,600
for that he's gotten his nbl runs he's

207
00:06:35,029 --> 00:06:32,720
gotten his

208
00:06:36,070 --> 00:06:35,039
vr lab runs and all the the desktops

209
00:06:38,469 --> 00:06:36,080
that he needs to walk through the

210
00:06:39,909 --> 00:06:38,479
procedures there um came right back up

211
00:06:41,830 --> 00:06:39,919
to speed no real issues and tim was

212
00:06:43,029 --> 00:06:41,840
right there helping him uh learn the

213
00:06:44,390 --> 00:06:43,039

tasks

214
00:06:46,309 --> 00:06:44,400
so we didn't really change any of the

215
00:06:49,749 --> 00:06:46,319
tasks on the evas the only real change

216
00:06:51,589 --> 00:06:49,759
happened um in the arm ops tim copra was

217
00:06:54,309 --> 00:06:51,599
going to be the backup

218
00:06:55,909 --> 00:06:54,319
arm operator on one of the the elc and

219
00:06:57,670 --> 00:06:55,919
pmm moves and then

220
00:06:59,350 --> 00:06:57,680
he was going to be primed on another so

221
00:07:01,510 --> 00:06:59,360
rather than trying to get steve bowen

222
00:07:03,749 --> 00:07:01,520
trained in arm ops we we switched over

223
00:07:05,510 --> 00:07:03,759
uh now that we have the 25s crew up

224
00:07:08,790 --> 00:07:05,520
there with with paulo naspoli katie

225
00:07:10,629 --> 00:07:08,800
coleman and uh dimitri condrey have um

226
00:07:11,830 --> 00:07:10,639
we're going to give them their tasks so

227
00:07:13,589 --> 00:07:11,840
katie's going to pick up some of those

228
00:07:15,350 --> 00:07:13,599
tasks they've been trained for arm

229
00:07:17,510 --> 00:07:15,360
operations so they'll pick up some of

230
00:07:18,710 --> 00:07:17,520
that all in all the crew was in really

231
00:07:20,950 --> 00:07:18,720
good shape and felt very very

232
00:07:23,270 --> 00:07:20,960
comfortable with this this crew change

233
00:07:25,510 --> 00:07:23,280
um and and so no no issues from uh from

234
00:07:27,029 --> 00:07:25,520
a readiness standpoint there

235
00:07:28,790 --> 00:07:27,039
and again the mission baseline hasn't

236
00:07:30,629 --> 00:07:28,800
changed we're still doing the pmm the

237
00:07:31,670 --> 00:07:30,639
permanent logistics module install you

238
00:07:34,469 --> 00:07:31,680

know that's the

239
00:07:36,309 --> 00:07:34,479
the mplm that we've last flew on sts-131

240
00:07:37,990 --> 00:07:36,319
it's been outfitted for permanent stay

241
00:07:40,950 --> 00:07:38,000
on station we're still going to put the

242
00:07:42,710 --> 00:07:40,960
elc the external cargo platform over uh

243
00:07:44,710 --> 00:07:42,720
that has a spare radiator and some empty

244
00:07:46,710 --> 00:07:44,720
cargo spots on it uh we're gonna do

245
00:07:47,909 --> 00:07:46,720
those two evas clean up a lot of the if

246
00:07:49,270 --> 00:07:47,919
you remember way back when we had that

247
00:07:51,670 --> 00:07:49,280
failed pump module on station there's

248
00:07:53,350 --> 00:07:51,680
still a few tasks waiting for these evas

249
00:07:55,510 --> 00:07:53,360
to come clean up and put that pump

250
00:07:58,710 --> 00:07:55,520
module back where it uh it stays until

251
00:08:00,390 --> 00:07:58,720
it's returned home on on sts-135

252
00:08:01,830 --> 00:08:00,400
that's all staying staying the same the

253
00:08:03,909 --> 00:08:01,840
only real change is what bill mentioned

254
00:08:07,589 --> 00:08:03,919
with the the possibility of doing a

255
00:08:09,270 --> 00:08:07,599
soyuz undock and fly about uh it's it's

256
00:08:10,469 --> 00:08:09,280
kind of akin to a soyuz relocate we're

257
00:08:12,150 --> 00:08:10,479
going to go back out a little further

258
00:08:13,830 --> 00:08:12,160
than that to get a little bit wider

259
00:08:15,110 --> 00:08:13,840
angle shot and again we're going to kind

260
00:08:17,510 --> 00:08:15,120
of work that through our normal approval

261
00:08:18,790 --> 00:08:17,520
process for how mission changes come in

262
00:08:20,790 --> 00:08:18,800
and make sure all the right procedures

263
00:08:22,469 --> 00:08:20,800

and all the right analysis is done uh

264
00:08:24,230 --> 00:08:22,479
and be good to go

265
00:08:25,270 --> 00:08:24,240
on the on the tank stringers we spent

266
00:08:26,469 --> 00:08:25,280
most of them

267
00:08:28,150 --> 00:08:26,479
the latter half of the morning and most

268
00:08:30,150 --> 00:08:28,160
of the afternoon talking about it there

269
00:08:32,870 --> 00:08:30,160
was uh you know i'd characterize it as

270
00:08:34,469 --> 00:08:32,880
as very good discussion and and and

271
00:08:37,029 --> 00:08:34,479
diving into all the details behind the

272
00:08:38,310 --> 00:08:37,039
data not uh not any real descent of

273
00:08:39,990 --> 00:08:38,320
anything you know

274
00:08:42,550 --> 00:08:40,000
this just really came down to two

275
00:08:44,389 --> 00:08:42,560
different aspects there's the um the

276
00:08:45,750 --> 00:08:44,399
failure mode and what caused it and how

277
00:08:47,350 --> 00:08:45,760
it occurred

278
00:08:48,949 --> 00:08:47,360
and and what we're really coming down to

279
00:08:51,190 --> 00:08:48,959
root cause or most probable root cause

280
00:08:53,829 --> 00:08:51,200
there is it's a stack up of small stuff

281
00:08:55,590 --> 00:08:53,839
um we learned that

282
00:08:57,350 --> 00:08:55,600
the way this part can be built the

283
00:08:59,350 --> 00:08:57,360
assembly stresses that can be put into

284
00:09:01,350 --> 00:08:59,360
it can really kind of lock up some

285
00:09:03,030 --> 00:09:01,360
stress if you think about it

286
00:09:04,710 --> 00:09:03,040
this is a metal stringer that's being

287
00:09:07,350 --> 00:09:04,720
riveted to a metal

288
00:09:09,750 --> 00:09:07,360

skin and it's intentionally bent up over

289
00:09:11,590 --> 00:09:09,760
this angled cord and as it's riveted

290
00:09:13,350 --> 00:09:11,600
down if the angles aren't exactly right

291
00:09:14,790 --> 00:09:13,360
and there's some gaps in there you're

292
00:09:16,150 --> 00:09:14,800
going to kind of squeeze it together a

293
00:09:18,389 --> 00:09:16,160
little harder and that kind of locks

294
00:09:20,870 --> 00:09:18,399
some stress into the part such that when

295
00:09:22,630 --> 00:09:20,880
we go and put a cryo load on it and this

296
00:09:24,870 --> 00:09:22,640
whole thing wants to shrink and that

297
00:09:26,470 --> 00:09:24,880
load goes up you've kind of taken away

298
00:09:28,230 --> 00:09:26,480
or i should say let's think of the other

299
00:09:29,670 --> 00:09:28,240
way you've added some extra load onto

300
00:09:31,110 --> 00:09:29,680
that that wasn't really supposed to be

301
00:09:32,310 --> 00:09:31,120
there in the first place

302
00:09:33,430 --> 00:09:32,320
we thought that was really going to be

303
00:09:35,670 --> 00:09:33,440
our problem right before christmas we

304
00:09:37,670 --> 00:09:35,680
kind of thought we had that root cause

305
00:09:40,389 --> 00:09:37,680
we set up a whole bunch of tests and

306
00:09:41,910 --> 00:09:40,399
making these assembly

307
00:09:43,750 --> 00:09:41,920
glitches

308
00:09:45,190 --> 00:09:43,760
intentionally we couldn't break the

309
00:09:46,790 --> 00:09:45,200
parts we weren't able to break them so

310
00:09:48,630 --> 00:09:46,800
we knew something wasn't quite right

311
00:09:49,590 --> 00:09:48,640
with that and we went back and looked

312
00:09:53,910 --> 00:09:49,600
and

313
00:09:55,990 --> 00:09:53,920

recognized that

314
00:09:57,750 --> 00:09:56,000
that we had some unstable crack growth

315
00:09:59,350 --> 00:09:57,760
due to low fracture toughness in some of

316
00:10:01,110 --> 00:09:59,360
the parts we took off the tank the

317
00:10:03,590 --> 00:10:01,120
failed parts we brought off the tank and

318
00:10:07,509 --> 00:10:03,600
then we started looking at other parts

319
00:10:09,430 --> 00:10:07,519
you know we had this is et138 uh et-139

320
00:10:11,509 --> 00:10:09,440
was in component

321
00:10:13,590 --> 00:10:11,519
fashion ready to be assembled and become

322
00:10:14,870 --> 00:10:13,600
an external tank as you know it with the

323
00:10:16,630 --> 00:10:14,880
oxygen tank the hydrogen tank and the

324
00:10:19,110 --> 00:10:16,640
inner tank bolted together so all the

325
00:10:21,030 --> 00:10:19,120
the inner tank panels were built or at

326
00:10:23,110 --> 00:10:21,040
least uh mostly built for that system so

327
00:10:25,350 --> 00:10:23,120
we had those parts to go look at as well

328
00:10:27,590 --> 00:10:25,360
and we did some testing and found that

329
00:10:29,990 --> 00:10:27,600
back uh probably in about 2000 or 2002

330
00:10:32,389 --> 00:10:30,000
timeframe we had two different

331
00:10:33,590 --> 00:10:32,399
batches of material come in the aluminum

332
00:10:35,590 --> 00:10:33,600
lithium material that's used to make

333
00:10:37,590 --> 00:10:35,600
these stringers that had a heat

334
00:10:39,990 --> 00:10:37,600
treatment that didn't quite get what we

335
00:10:41,750 --> 00:10:40,000
needed to in terms of properties

336
00:10:43,190 --> 00:10:41,760
this is one of those big picture lesson

337
00:10:44,550 --> 00:10:43,200
learned things that we're actually going

338
00:10:47,509 --> 00:10:44,560

to go right down and make sure as an

339
00:10:49,030 --> 00:10:47,519
agency we're going to grow from this

340
00:10:52,230 --> 00:10:49,040
when we designed the super lightweight

341
00:10:53,829 --> 00:10:52,240
tank we recognized that

342
00:10:55,590 --> 00:10:53,839
this is a very aluminum lithium was a

343
00:10:57,110 --> 00:10:55,600
very brutal material in the first place

344
00:10:59,910 --> 00:10:57,120
and so we did a whole lot of math to

345
00:11:01,590 --> 00:10:59,920
show that if we had cracked stringers

346
00:11:03,269 --> 00:11:01,600
structurally that tank would be okay and

347
00:11:05,350 --> 00:11:03,279
when they did that fail-safe analysis

348
00:11:07,269 --> 00:11:05,360
they found that you could have up to

349
00:11:09,430 --> 00:11:07,279
three of them in a row cracked and you

350
00:11:11,350 --> 00:11:09,440
still had no problems with uh with

351
00:11:12,870 --> 00:11:11,360
safety of the tank that was looking at

352
00:11:15,190 --> 00:11:12,880
it from a structural perspective so

353
00:11:17,990 --> 00:11:15,200
because of that we didn't really

354
00:11:18,949 --> 00:11:18,000
put a requirement in the books for uh

355
00:11:20,470 --> 00:11:18,959
crack

356
00:11:22,230 --> 00:11:20,480
problems so we didn't measure fracture

357
00:11:24,230 --> 00:11:22,240
toughness on the metal we weren't really

358
00:11:26,630 --> 00:11:24,240
worried about it we didn't recognize

359
00:11:29,350 --> 00:11:26,640
that a single crack would then lead to

360
00:11:30,710 --> 00:11:29,360
foam could lead to foam uh being pushed

361
00:11:32,069 --> 00:11:30,720
out of place which would then lead it to

362
00:11:34,150 --> 00:11:32,079
it liberating and becoming an integrated

363
00:11:35,829 --> 00:11:34,160

hazard and debris concern so this is one

364
00:11:38,310 --> 00:11:35,839
of those you can trace it all the way

365
00:11:39,910 --> 00:11:38,320
back to we didn't quite

366
00:11:41,509 --> 00:11:39,920
be as smart enough in the integrated

367
00:11:43,430 --> 00:11:41,519
analysis of a change as we should have

368
00:11:45,269 --> 00:11:43,440
been and it's a theme that gets repeated

369
00:11:46,870 --> 00:11:45,279
a lot in in human spaceflight and it's a

370
00:11:48,630 --> 00:11:46,880
reason why we are we try to make as

371
00:11:50,389 --> 00:11:48,640
rigorous as we can

372
00:11:52,790 --> 00:11:50,399
so we had some metal come in we we

373
00:11:54,230 --> 00:11:52,800
measure its ultimate strength and but we

374
00:11:55,670 --> 00:11:54,240
didn't put a maximum on that strength

375
00:11:57,829 --> 00:11:55,680
and these two heat lots we're at the

376
00:11:59,190 --> 00:11:57,839
maximum the highest strength material

377
00:12:01,110 --> 00:11:59,200
we've ever got you initially think

378
00:12:03,030 --> 00:12:01,120
that's a really good thing but that also

379
00:12:04,389 --> 00:12:03,040
means that metal is even more brittle

380
00:12:05,990 --> 00:12:04,399
the stronger it gets the the more

381
00:12:07,590 --> 00:12:06,000
brittle it gets and so

382
00:12:09,470 --> 00:12:07,600
it had really low fracture toughness and

383
00:12:12,069 --> 00:12:09,480
we found that scattered throughout

384
00:12:14,710 --> 00:12:12,079
et-137 which is the the tank we have

385
00:12:16,870 --> 00:12:14,720
right now and even going back to et-136

386
00:12:20,069 --> 00:12:16,880
and then a couple of stringers on tanks

387
00:12:22,550 --> 00:12:20,079
as far back as et-131 had this bad metal

388
00:12:24,470 --> 00:12:22,560

on it this low fracture toughness metal

389
00:12:26,550 --> 00:12:24,480
but we know low fracture toughness alone

390
00:12:28,629 --> 00:12:26,560
isn't enough to cause cracks because

391
00:12:30,629 --> 00:12:28,639
after we tanked this tank not every

392
00:12:31,829 --> 00:12:30,639
single stringer i forget the numbers

393
00:12:34,870 --> 00:12:31,839
there's probably

394
00:12:36,790 --> 00:12:34,880
close to 70 of them 77 of them

395
00:12:38,550 --> 00:12:36,800
that are this suspect metal we only had

396
00:12:40,069 --> 00:12:38,560
five cracks so we know fracture

397
00:12:41,990 --> 00:12:40,079
toughness alone also isn't the problem

398
00:12:44,069 --> 00:12:42,000
so you have assembly stress that that

399
00:12:45,509 --> 00:12:44,079
kind of adds residual uh stress into the

400
00:12:47,269 --> 00:12:45,519
parts and then you have fracture

401
00:12:49,430 --> 00:12:47,279
toughness which lowers the capability of

402
00:12:51,190 --> 00:12:49,440
that part when those two lines cross you

403
00:12:52,710 --> 00:12:51,200
you crack a stringer

404
00:12:54,790 --> 00:12:52,720
and so that's that's what happened to us

405
00:12:56,230 --> 00:12:54,800
so this mod we put on really is just

406
00:12:57,910 --> 00:12:56,240
kind of if you want to think of it's a

407
00:12:59,990 --> 00:12:57,920
big metal band-aid and big is not the

408
00:13:01,430 --> 00:13:00,000
right word it's about six inches long

409
00:13:02,550 --> 00:13:01,440
we kind of added it on top of these

410
00:13:04,790 --> 00:13:02,560
rivets

411
00:13:06,230 --> 00:13:04,800
so that the the stress is taken up and

412
00:13:08,389 --> 00:13:06,240
given some extra reinforcement in that

413
00:13:10,870 --> 00:13:08,399

location and and we don't have that

414
00:13:13,829 --> 00:13:10,880
problem when we hit that cryo loading uh

415
00:13:15,829 --> 00:13:13,839
shock on the oxidizer the lo2 flange

416
00:13:17,350 --> 00:13:15,839
which is at the top of the inner tank we

417
00:13:19,430 --> 00:13:17,360
talked a lot about the hydrogen flange

418
00:13:21,670 --> 00:13:19,440
and why doesn't that flange also exhibit

419
00:13:23,590 --> 00:13:21,680
the same type as it bends in why isn't

420
00:13:25,350 --> 00:13:23,600
it cracking none of our x-rays today

421
00:13:27,350 --> 00:13:25,360
have shown any cracks on that side and

422
00:13:29,269 --> 00:13:27,360
what we we learned was this assembly

423
00:13:31,509 --> 00:13:29,279
stress that happens on the

424
00:13:33,430 --> 00:13:31,519
the lo2 side at the top of the stringer

425
00:13:35,430 --> 00:13:33,440
when we lay this part up you start at

426
00:13:37,110 --> 00:13:35,440
the bottom which is the hydrogen side

427
00:13:38,710 --> 00:13:37,120
and then you rivet from there up and so

428
00:13:41,030 --> 00:13:38,720
any kind of misalignment any kind of

429
00:13:42,790 --> 00:13:41,040
extra length any kind of shims that

430
00:13:44,470 --> 00:13:42,800
aren't quite right propagate themselves

431
00:13:46,310 --> 00:13:44,480
and manifest at the end of the stringer

432
00:13:48,230 --> 00:13:46,320
on the oxide but they're locked in and

433
00:13:49,829 --> 00:13:48,240
controlled pretty well on the hydrogen

434
00:13:51,750 --> 00:13:49,839
side so we're not seeing the assembly

435
00:13:53,110 --> 00:13:51,760
stresses on the hydrogen side even

436
00:13:54,870 --> 00:13:53,120
though those material properties are

437
00:13:56,790 --> 00:13:54,880
lower there's just not enough stress in

438
00:13:59,189 --> 00:13:56,800

the system to make it break

439
00:14:01,590 --> 00:13:59,199
so that that said we spent a lot of time

440
00:14:03,430 --> 00:14:01,600
being rigorous as we needed to be to go

441
00:14:05,509 --> 00:14:03,440
do the analysis and the tests to make

442
00:14:08,069 --> 00:14:05,519
sure that all that theory held up

443
00:14:10,150 --> 00:14:08,079
that even with the worst case

444
00:14:11,590 --> 00:14:10,160
dispersions that we truly understood the

445
00:14:13,509 --> 00:14:11,600
system and that that hydrogen flange

446
00:14:15,189 --> 00:14:13,519
wouldn't break because we did not modify

447
00:14:16,949 --> 00:14:15,199
it and that the modification we put on

448
00:14:18,710 --> 00:14:16,959
the top of the tank on the lo2 side

449
00:14:20,389 --> 00:14:18,720
wasn't going to do any harm

450
00:14:21,509 --> 00:14:20,399
and and all those results came back it

451
00:14:23,590 --> 00:14:21,519
took us a while to get through all the

452
00:14:25,590 --> 00:14:23,600
data today and again we kind of talked

453
00:14:30,150 --> 00:14:25,600
about the actual number was the factor

454
00:14:31,670 --> 00:14:30,160
of safety 1.5 or 1.4 or 1.42 at the end

455
00:14:33,910 --> 00:14:31,680
of the day we recognize that the the

456
00:14:35,910 --> 00:14:33,920
ability to nail that number down exactly

457
00:14:37,430 --> 00:14:35,920
is just not going to happen there's a

458
00:14:39,670 --> 00:14:37,440
lot of variables here and we kind of

459
00:14:41,990 --> 00:14:39,680
bounded it by

460
00:14:43,590 --> 00:14:42,000
a risk assessment to say what are the

461
00:14:45,750 --> 00:14:43,600
likely failure modes what are the likely

462
00:14:47,509 --> 00:14:45,760
causes and and we really kind of got

463
00:14:49,030 --> 00:14:47,519

very good agreement from the community

464
00:14:51,030 --> 00:14:49,040
and then in our independent teams who

465
00:14:52,310 --> 00:14:51,040
were looking over our shoulder that we

466
00:14:54,150 --> 00:14:52,320
had a rigorous approach and they were

467
00:14:55,910 --> 00:14:54,160
happy with our analysis and we ended up

468
00:14:57,590 --> 00:14:55,920
with a unanimous goal to be ready to fly

469
00:14:58,710 --> 00:14:57,600
this tank now we're going to keep doing

470
00:15:00,430 --> 00:14:58,720
the math we're going to keep working

471
00:15:04,150 --> 00:15:00,440
we're going to keep testing

472
00:15:06,470 --> 00:15:04,160
et-122 is the next one up on sts-134

473
00:15:07,990 --> 00:15:06,480
that tank was built way before

474
00:15:08,710 --> 00:15:08,000
this tank

475
00:15:10,150 --> 00:15:08,720
but

476
00:15:11,269 --> 00:15:10,160
so we know it didn't have metal coming

477
00:15:12,870 --> 00:15:11,279
from that heat lot but the one thing

478
00:15:14,550 --> 00:15:12,880
we're missing there is

479
00:15:16,150 --> 00:15:14,560
metal sitting on the shelf at the at the

480
00:15:18,389 --> 00:15:16,160
plant that we can then go test and make

481
00:15:19,430 --> 00:15:18,399
sure that it really isn't a bad fracture

482
00:15:21,430 --> 00:15:19,440
toughness because like i said at the

483
00:15:24,069 --> 00:15:21,440
beginning we weren't ever measuring

484
00:15:26,389 --> 00:15:24,079
fracture toughness we don't think it is

485
00:15:27,590 --> 00:15:26,399
bad metal but we can't prove it in the

486
00:15:28,870 --> 00:15:27,600
in the time that we've been going on

487
00:15:30,069 --> 00:15:28,880
here that the teams think they have a

488
00:15:31,910 --> 00:15:30,079

good link and will be able to show us

489
00:15:34,230 --> 00:15:31,920
that that metal is truly good metal and

490
00:15:35,350 --> 00:15:34,240
and this is not a problem for et-122 but

491
00:15:37,350 --> 00:15:35,360
we want to kind of back that up with

492
00:15:38,710 --> 00:15:37,360
some testing and uh and now that we get

493
00:15:40,550 --> 00:15:38,720
this flight behind us we'll go do that

494
00:15:42,230 --> 00:15:40,560
before we fly the next tank but we went

495
00:15:43,189 --> 00:15:42,240
ahead and added the modification to that

496
00:15:45,430 --> 00:15:43,199
tank

497
00:15:47,990 --> 00:15:45,440
just as a stop gap to say let's be safe

498
00:15:50,389 --> 00:15:48,000
we know that fixes the the the ox flange

499
00:15:53,509 --> 00:15:50,399
et-138 is our last tank flying on

500
00:15:55,269 --> 00:15:53,519
sts-135 it's a sister tank to et-137

501
00:15:57,269 --> 00:15:55,279
sent out the pad right now it will need

502
00:15:58,230 --> 00:15:57,279
the modification on the the ox flange

503
00:16:00,069 --> 00:15:58,240
and we're going to keep doing all the

504
00:16:01,350 --> 00:16:00,079
math to make sure we understand truly

505
00:16:02,389 --> 00:16:01,360
what's going on

506
00:16:05,430 --> 00:16:02,399
and see if we need to be a little

507
00:16:06,870 --> 00:16:05,440
smarter or we can we can understand the

508
00:16:09,189 --> 00:16:06,880
the actual risk we're flying with on

509
00:16:11,990 --> 00:16:09,199
that tank but at the end of the day a

510
00:16:13,430 --> 00:16:12,000
really good summary of where we stand

511
00:16:16,150 --> 00:16:13,440
we feel we have very high confidence

512
00:16:17,670 --> 00:16:16,160
when you when you boil it down the uh we

513
00:16:19,430 --> 00:16:17,680

looked at what what's going to happen if

514
00:16:21,189 --> 00:16:19,440
we're wrong and we do get a crack

515
00:16:22,949 --> 00:16:21,199
the arrow loads on this thing on the

516
00:16:24,629 --> 00:16:22,959
hydrogen side or such that most of those

517
00:16:25,910 --> 00:16:24,639
stringers are being pushed down by the

518
00:16:27,990 --> 00:16:25,920
arrow loads so you're not worried about

519
00:16:29,590 --> 00:16:28,000
foam liberation and the size of foam

520
00:16:31,509 --> 00:16:29,600
that would come off would be kind of

521
00:16:33,749 --> 00:16:31,519
bounded by what potentially could be

522
00:16:35,910 --> 00:16:33,759
lost there from other mechanisms of foam

523
00:16:38,949 --> 00:16:35,920
loss that's not saying that a foam loss

524
00:16:40,389 --> 00:16:38,959
from a cracked hydrogen stringer is okay

525
00:16:42,389 --> 00:16:40,399
but we feel that the risk there is

526
00:16:44,230 --> 00:16:42,399
acceptable to us and it's it's in that

527
00:16:45,910 --> 00:16:44,240
accepted risk category we understand it

528
00:16:48,069 --> 00:16:45,920
we know the likelihood of it and it's

529
00:16:48,949 --> 00:16:48,079
very low so we're good to fly

530
00:16:50,870 --> 00:16:48,959
um

531
00:16:53,910 --> 00:16:50,880
let's see what else uh the the big piece

532
00:16:55,269 --> 00:16:53,920
of that is kind of we showed that uh if

533
00:16:56,710 --> 00:16:55,279
if we're gonna get cracks we're gonna be

534
00:16:57,910 --> 00:16:56,720
able to see them during tanking um

535
00:16:59,749 --> 00:16:57,920
there's plenty of time for the final

536
00:17:02,150 --> 00:16:59,759
inspection team to notice those the

537
00:17:03,990 --> 00:17:02,160
camera crews that uh or that we have otv

538
00:17:05,510 --> 00:17:04,000

cameras that are scanning the tank we'll

539
00:17:07,110 --> 00:17:05,520
see this right away long before we lift

540
00:17:08,470 --> 00:17:07,120
off and if we do see

541
00:17:09,990 --> 00:17:08,480
a crack on those flanges we would

542
00:17:12,230 --> 00:17:10,000
obviously be no go for that for that day

543
00:17:13,829 --> 00:17:12,240
and and we're not worried about lifting

544
00:17:15,590 --> 00:17:13,839
off we just wanted to make sure that

545
00:17:16,870 --> 00:17:15,600
during ascent that load couldn't

546
00:17:18,470 --> 00:17:16,880
couldn't cause a crack or cause one to

547
00:17:20,230 --> 00:17:18,480
propagate and grow big enough

548
00:17:21,829 --> 00:17:20,240
to cause foam and we showed that that

549
00:17:23,669 --> 00:17:21,839
was fairly well bounded as well and and

550
00:17:25,590 --> 00:17:23,679
not not a big risk to us

551
00:17:26,870 --> 00:17:25,600
um so there's a a kind of a brief

552
00:17:28,230 --> 00:17:26,880
summary of what's been about three

553
00:17:29,590 --> 00:17:28,240
months worth of work

554
00:17:32,070 --> 00:17:29,600
um and really you've kind of heard

555
00:17:34,470 --> 00:17:32,080
interim reports from from john shannon

556
00:17:36,390 --> 00:17:34,480
as we've gone along that that we still

557
00:17:37,750 --> 00:17:36,400
kept learning every single day and we've

558
00:17:39,270 --> 00:17:37,760
just really turned the corner here in

559
00:17:40,870 --> 00:17:39,280
the last month where we think we finally

560
00:17:42,950 --> 00:17:40,880
bounded the problem we pulled it all

561
00:17:45,029 --> 00:17:42,960
together today and showed that to the to

562
00:17:46,150 --> 00:17:45,039
the agency and again got that unanimous

563
00:17:48,150 --> 00:17:46,160

consent that we're in a really good

564
00:17:50,630 --> 00:17:48,160
posture to fly so with that we're ready

565
00:17:52,150 --> 00:17:50,640
to move to the mission phase um turn it

566
00:17:54,070 --> 00:17:52,160
over to mike and his team to get us

567
00:17:56,150 --> 00:17:54,080
launched in orbit and we talked a little

568
00:17:58,230 --> 00:17:56,160
bit about the range and and you know you

569
00:17:59,909 --> 00:17:58,240
guys saw that we had that uh there's no

570
00:18:01,510 --> 00:17:59,919
way we're gonna launch on the 24th if

571
00:18:03,029 --> 00:18:01,520
atv doesn't launch on their first

572
00:18:04,710 --> 00:18:03,039
attempt and then they didn't and we're

573
00:18:05,830 --> 00:18:04,720
ready to go on the 24th

574
00:18:07,430 --> 00:18:05,840
and i've decided i'm not going to tell

575
00:18:09,110 --> 00:18:07,440
you guys about launch windows ever again

576
00:18:10,150 --> 00:18:09,120
because no matter what i'll somehow lie

577
00:18:11,909 --> 00:18:10,160
to you

578
00:18:13,750 --> 00:18:11,919
but what happened is just like just like

579
00:18:14,950 --> 00:18:13,760
what happens every time

580
00:18:16,230 --> 00:18:14,960
there's a lot of math that has to go

581
00:18:17,590 --> 00:18:16,240
into finding out whether it's a legal

582
00:18:19,510 --> 00:18:17,600
launch window or not so you kind of take

583
00:18:20,789 --> 00:18:19,520
the first cut through and when you get

584
00:18:22,230 --> 00:18:20,799
pushed into saying hey i need a little

585
00:18:23,830 --> 00:18:22,240
better answer you go sharpen your pencil

586
00:18:25,750 --> 00:18:23,840
and you look at it so we looked at the

587
00:18:28,230 --> 00:18:25,760
loads and the analysis the thermal

588
00:18:30,230 --> 00:18:28,240

effects and the power profiles and found

589
00:18:32,230 --> 00:18:30,240
that uh you know the generic round rule

590
00:18:34,549 --> 00:18:32,240
that said you want 24 hours spacing

591
00:18:36,950 --> 00:18:34,559
between the docking and the uh and the

592
00:18:38,470 --> 00:18:36,960
launch of a vehicle to know uh it's okay

593
00:18:41,029 --> 00:18:38,480
we decided here we're gonna be okay so

594
00:18:42,470 --> 00:18:41,039
the atv is gonna dock about six hours

595
00:18:44,470 --> 00:18:42,480
before we launch

596
00:18:46,470 --> 00:18:44,480
we will have tanked the vehicle if they

597
00:18:48,549 --> 00:18:46,480
run into a problem in docking

598
00:18:50,310 --> 00:18:48,559
we will talk about that in real time if

599
00:18:51,909 --> 00:18:50,320
it's a problem that looks like they can

600
00:18:54,150 --> 00:18:51,919
resolve and come back and fix in a few

601
00:18:55,430 --> 00:18:54,160
days we'll stand down and scrub off for

602
00:18:56,390 --> 00:18:55,440
the day to let them have that chance to

603
00:18:57,590 --> 00:18:56,400
get docked

604
00:18:59,990 --> 00:18:57,600
the station program really would like

605
00:19:01,270 --> 00:19:00,000
the atv present for this mission if it

606
00:19:02,310 --> 00:19:01,280
looks like it's a little bigger problem

607
00:19:04,390 --> 00:19:02,320
or something that needs a little more

608
00:19:05,669 --> 00:19:04,400
time to solve we'll let the atv move out

609
00:19:07,430 --> 00:19:05,679
to a parking orbit and we'll go ahead

610
00:19:08,710 --> 00:19:07,440
and launch the shuttle on time

611
00:19:10,070 --> 00:19:08,720
we've talked about the mechanisms we're

612
00:19:11,909 --> 00:19:10,080
going to do and that's that's all ready

613
00:19:13,909 --> 00:19:11,919

to pull the trigger on so

614
00:19:15,830 --> 00:19:13,919
we're not going to talk about uh

615
00:19:17,510 --> 00:19:15,840
whether what it means if atv can't dock

616
00:19:18,789 --> 00:19:17,520
we still might launch that day we might

617
00:19:19,830 --> 00:19:18,799
not we'll have to talk about that one in

618
00:19:21,990 --> 00:19:19,840
real time

619
00:19:23,830 --> 00:19:22,000
um and uh and that's really all i had so

620
00:19:25,510 --> 00:19:23,840
mike you kind of like i said we want to

621
00:19:27,270 --> 00:19:25,520
focus now on flying

622
00:19:28,950 --> 00:19:27,280
rather than the analysis so that might

623
00:19:30,950 --> 00:19:28,960
lead us into that discussion okay thanks

624
00:19:32,390 --> 00:19:30,960
mike well from a processing perspective

625
00:19:33,590 --> 00:19:32,400
we're in outstanding shape out the

626
00:19:35,350 --> 00:19:33,600
launch pad

627
00:19:36,549 --> 00:19:35,360
we're expecting to perform the final

628
00:19:38,310 --> 00:19:36,559
close out of the aft compartment the

629
00:19:40,789 --> 00:19:38,320
orbiter tomorrow we got all that work

630
00:19:42,630 --> 00:19:40,799
done today and powered down the ship now

631
00:19:44,150 --> 00:19:42,640
so we're able to give the team a full

632
00:19:45,590 --> 00:19:44,160
two days off

633
00:19:46,710 --> 00:19:45,600
we will come in sunday afternoon and

634
00:19:49,350 --> 00:19:46,720
pressurize

635
00:19:51,909 --> 00:19:49,360
the copvs our high pressure gas bottles

636
00:19:54,630 --> 00:19:51,919
on the ship that's a hazardous task that

637
00:19:56,070 --> 00:19:54,640
we do late in the pad flow so we expose

638
00:19:58,390 --> 00:19:56,080

a minimum amount of people to that

639
00:19:59,830 --> 00:19:58,400
hazard and then that should go fine

640
00:20:01,990 --> 00:19:59,840
sunday afternoon sunday evening and

641
00:20:05,190 --> 00:20:02,000
monday afternoon at uh at three o'clock

642
00:20:07,270 --> 00:20:05,200
we'll pick up the countdown for sts-133

643
00:20:09,750 --> 00:20:07,280
meanwhile over in the opf endeavour is

644
00:20:11,669 --> 00:20:09,760
doing extremely well uh her her opf flow

645
00:20:13,350 --> 00:20:11,679
is essentially over she's up on the

646
00:20:14,950 --> 00:20:13,360
orbit of transporter system ready to

647
00:20:16,549 --> 00:20:14,960
roll over to the vab

648
00:20:18,710 --> 00:20:16,559
which will occur on the 28th of this

649
00:20:19,750 --> 00:20:18,720
month and then out to the pad on the

650
00:20:22,230 --> 00:20:19,760
10th of

651
00:20:23,669 --> 00:20:22,240
march for the for the april 19th launch

652
00:20:24,870 --> 00:20:23,679
so everything's going extremely well in

653
00:20:26,230 --> 00:20:24,880
endeavor too

654
00:20:28,870 --> 00:20:26,240
just like to take the opportunity to

655
00:20:30,630 --> 00:20:28,880
thank the the 103 team both locally and

656
00:20:32,710 --> 00:20:30,640
around the country who who

657
00:20:35,029 --> 00:20:32,720
as mike said paid attention to not just

658
00:20:36,710 --> 00:20:35,039
the the the 800 pound gorilla but to

659
00:20:39,029 --> 00:20:36,720
everything else in the in the processing

660
00:20:41,029 --> 00:20:39,039
flow that has to go exactly right

661
00:20:43,110 --> 00:20:41,039
we met every day as we always do during

662
00:20:44,390 --> 00:20:43,120
an integrated flow laid out all the

663
00:20:46,710 --> 00:20:44,400

additional tasks that we wanted to

664
00:20:49,990 --> 00:20:46,720
perform and uh the team just responded

665
00:20:51,750 --> 00:20:50,000
an extremely great fashion

666
00:20:53,110 --> 00:20:51,760
that all with all the descript all the

667
00:20:54,789 --> 00:20:53,120
distractions that are going on in the

668
00:20:56,950 --> 00:20:54,799
program right now i'm very very proud of

669
00:20:58,230 --> 00:20:56,960
the 103 team so everything's going

670
00:20:59,750 --> 00:20:58,240
really really well looking forward to

671
00:21:02,549 --> 00:20:59,760
the countdown starting monday and a lift

672
00:21:03,750 --> 00:21:02,559
off next thursday thanks all right mike

673
00:21:05,350 --> 00:21:03,760
thank you

674
00:21:07,190 --> 00:21:05,360
we'll take questions first here in

675
00:21:08,950 --> 00:21:07,200
florida

676
00:21:10,549 --> 00:21:08,960
bill harwood

677
00:21:12,070 --> 00:21:10,559
well thanks i've got a couple of

678
00:21:13,750 --> 00:21:12,080
questions if i could bill hard with cbs

679
00:21:15,669 --> 00:21:13,760
news

680
00:21:17,270 --> 00:21:15,679
for mike moses i guess

681
00:21:18,630 --> 00:21:17,280
realizing you don't have an exact factor

682
00:21:20,549 --> 00:21:18,640
of safety i mean obviously it's greater

683
00:21:22,310 --> 00:21:20,559
than one i'm assuming and can you talk

684
00:21:23,350 --> 00:21:22,320
about where the relative risk lies for

685
00:21:24,630 --> 00:21:23,360
cracks it's

686
00:21:26,390 --> 00:21:24,640
i'm it's my understanding it's from the

687
00:21:27,830 --> 00:21:26,400
thermal shock of fueling

688
00:21:29,750 --> 00:21:27,840

that you have a better chance of making

689
00:21:30,470 --> 00:21:29,760
something happen than ascent loads could

690
00:21:32,310 --> 00:21:30,480
you

691
00:21:34,549 --> 00:21:32,320
explain the difference in that and the

692
00:21:36,630 --> 00:21:34,559
second question i had was

693
00:21:38,310 --> 00:21:36,640
was about docking the day the atv i mean

694
00:21:39,590 --> 00:21:38,320
launching the day atv gets there

695
00:21:41,270 --> 00:21:39,600
obviously you're putting a cycle on the

696
00:21:43,270 --> 00:21:41,280
tank and you're assuming that they're

697
00:21:45,510 --> 00:21:43,280
gonna i mean i'm assuming that the risk

698
00:21:47,190 --> 00:21:45,520
of putting another cycle on this tank is

699
00:21:49,430 --> 00:21:47,200
outweighed by the need to get off on the

700
00:21:50,710 --> 00:21:49,440
24th i'm not sure i understand why it

701
00:21:52,390 --> 00:21:50,720
would make a difference if you just went

702
00:21:53,510 --> 00:21:52,400
on the 25th and let those guys get out

703
00:21:54,789 --> 00:21:53,520
of the way so

704
00:21:55,909 --> 00:21:54,799
okay well let me handle the second one

705
00:21:57,990 --> 00:21:55,919
first um

706
00:21:59,510 --> 00:21:58,000
uh so back when we we originally uh

707
00:22:02,870 --> 00:21:59,520
partnered these agreements with the issa

708
00:22:04,070 --> 00:22:02,880
folks and atv um at the time uh we still

709
00:22:05,270 --> 00:22:04,080
weren't sure exactly what was happening

710
00:22:07,110 --> 00:22:05,280
on the range schedule down here in

711
00:22:09,190 --> 00:22:07,120
florida as to what our actual uh

712
00:22:10,710 --> 00:22:09,200
capability but you know we have from uh

713
00:22:12,950 --> 00:22:10,720

from a station shuttle program

714
00:22:14,870 --> 00:22:12,960
constraints standpoint our launch window

715
00:22:16,230 --> 00:22:14,880
is from the 24th to about the 6th of

716
00:22:17,590 --> 00:22:16,240
march

717
00:22:18,950 --> 00:22:17,600
when we sat down and looked at the range

718
00:22:20,950 --> 00:22:18,960
schedules there's a there's an atlas

719
00:22:23,110 --> 00:22:20,960
launch and then a delta launch also in

720
00:22:24,630 --> 00:22:23,120
that same two-week period

721
00:22:27,190 --> 00:22:24,640
and our landing was going to conflict

722
00:22:29,909 --> 00:22:27,200
with the delta launch and so we got

723
00:22:31,110 --> 00:22:29,919
approved for 24 25 and 26 on the range

724
00:22:32,470 --> 00:22:31,120
but we wouldn't have a whole lot more

725
00:22:34,470 --> 00:22:32,480
room than that before we run right into

726
00:22:35,590 --> 00:22:34,480
their launch with our landing so when it

727
00:22:37,110 --> 00:22:35,600
looked like we only really had a

728
00:22:38,950 --> 00:22:37,120
three-day window to launch now we wanted

729
00:22:40,950 --> 00:22:38,960
to go back and say hey you know we gave

730
00:22:42,710 --> 00:22:40,960
atv four days to try but we only have

731
00:22:44,549 --> 00:22:42,720
three for shuttle this isn't working out

732
00:22:45,990 --> 00:22:44,559
so well let's see where we can where we

733
00:22:48,149 --> 00:22:46,000
can push and squeeze so we are getting

734
00:22:49,590 --> 00:22:48,159
squeezed a little bit um i would say

735
00:22:51,510 --> 00:22:49,600
that doesn't mean we're

736
00:22:54,149 --> 00:22:51,520
we're pressured to launch in the 24 25

737
00:22:55,750 --> 00:22:54,159
26 time frame after the atlas goes we

738
00:22:56,870 --> 00:22:55,760

can come back in on

739
00:22:59,110 --> 00:22:56,880
on

740
00:23:00,870 --> 00:22:59,120
march 6th and again just like i kind of

741
00:23:03,029 --> 00:23:00,880
alluded to we said march 6 was the cut

742
00:23:04,789 --> 00:23:03,039
off but that cutoff was because 24s was

743
00:23:06,310 --> 00:23:04,799
going to undock the soyuz was going to

744
00:23:07,909 --> 00:23:06,320
undock we're doing all the work right

745
00:23:09,590 --> 00:23:07,919
now to let them undock to do this fly

746
00:23:12,070 --> 00:23:09,600
around that work will allow us to let

747
00:23:13,669 --> 00:23:12,080
them undock and then go land so we can

748
00:23:16,950 --> 00:23:13,679
stretch that launch window out probably

749
00:23:19,029 --> 00:23:16,960
to the 11th or so before we run into htv

750
00:23:20,390 --> 00:23:19,039
trying to undock so

751
00:23:22,070 --> 00:23:20,400
we have a lot of room at the back end of

752
00:23:23,669 --> 00:23:22,080
this window it's just not a lot at the

753
00:23:25,990 --> 00:23:23,679
front so if we want to maximize our

754
00:23:27,830 --> 00:23:26,000
opportunities and again with all the

755
00:23:30,390 --> 00:23:27,840
tdrs scheduling work the the russian

756
00:23:31,669 --> 00:23:30,400
work the esa work the japanese work

757
00:23:33,110 --> 00:23:31,679
our shuttle work and then all the other

758
00:23:34,470 --> 00:23:33,120
work on the range it'd be kind of nice

759
00:23:36,710 --> 00:23:34,480
to have it happen on the day you planned

760
00:23:38,230 --> 00:23:36,720
it rather than just constantly reworking

761
00:23:40,950 --> 00:23:38,240
it all so we'd really like to try to

762
00:23:42,710 --> 00:23:40,960
keep the 24th if we can

763
00:23:44,789 --> 00:23:42,720

so that's kind of what drove us to to

764
00:23:46,390 --> 00:23:44,799
look at that we still have 10 cycles

765
00:23:48,470 --> 00:23:46,400
left on the tank plus a launch so

766
00:23:49,430 --> 00:23:48,480
there's no no worry about using one up

767
00:23:51,750 --> 00:23:49,440
there

768
00:23:53,750 --> 00:23:51,760
and if you look at the true risk to the

769
00:23:55,190 --> 00:23:53,760
atv not docking

770
00:23:56,789 --> 00:23:55,200
they're either going to have a problem

771
00:23:59,190 --> 00:23:56,799
in their in their rendezvous systems

772
00:24:01,269 --> 00:23:59,200
that you find out pretty much right away

773
00:24:03,029 --> 00:24:01,279
or it's going to be a docking mechanism

774
00:24:04,390 --> 00:24:03,039
problem when you first get there neither

775
00:24:06,310 --> 00:24:04,400
of those two problems have shown up

776
00:24:07,750 --> 00:24:06,320
they're using uh you know russian

777
00:24:09,590 --> 00:24:07,760
pedigree hardware and the docking system

778
00:24:11,350 --> 00:24:09,600
they're going to the the sm aft port

779
00:24:12,870 --> 00:24:11,360
which is a very well known docking port

780
00:24:14,230 --> 00:24:12,880
so the actual risk of them having a

781
00:24:16,070 --> 00:24:14,240
problem during docking that would make

782
00:24:17,990 --> 00:24:16,080
us need to bail out of that launch are

783
00:24:19,590 --> 00:24:18,000
extremely low

784
00:24:21,750 --> 00:24:19,600
like i said from a planning and ground

785
00:24:23,269 --> 00:24:21,760
rules perspective you you try not to put

786
00:24:24,789 --> 00:24:23,279
yourself there if you can avoid it but

787
00:24:25,830 --> 00:24:24,799
if you if if it's something to do as

788
00:24:27,750 --> 00:24:25,840

long as you look at what you're really

789
00:24:29,190 --> 00:24:27,760
doing and we did in this case it's not

790
00:24:30,390 --> 00:24:29,200
that big a deal so so that worked out

791
00:24:32,630 --> 00:24:30,400
pretty good for us

792
00:24:34,710 --> 00:24:32,640
um on the tank side and and from a

793
00:24:37,350 --> 00:24:34,720
factor safety when we're really at risk

794
00:24:38,470 --> 00:24:37,360
kind of what made this problem hard is

795
00:24:39,830 --> 00:24:38,480
is uh

796
00:24:41,430 --> 00:24:39,840
you know there's uh there's a set of

797
00:24:42,950 --> 00:24:41,440
fasteners and really the way this works

798
00:24:44,390 --> 00:24:42,960
is the stringer comes up and then it

799
00:24:46,470 --> 00:24:44,400
kind of bends out a little bit as it

800
00:24:48,310 --> 00:24:46,480
goes across what we call a cord and that

801
00:24:51,590 --> 00:24:48,320
cord is the big chunk of metal that then

802
00:24:53,750 --> 00:24:51,600
bolts to the the uh the oxygen tank um

803
00:24:55,830 --> 00:24:53,760
the liquid oxygen tank as that liquid

804
00:24:58,310 --> 00:24:55,840
oxygen tank shrinks it puts stress into

805
00:25:00,149 --> 00:24:58,320
these fasteners in this in this uh in

806
00:25:01,190 --> 00:25:00,159
this cord that are that are on the

807
00:25:02,950 --> 00:25:01,200
stringer

808
00:25:05,190 --> 00:25:02,960
and each fastener sees a different load

809
00:25:07,430 --> 00:25:05,200
at different times so the top couple see

810
00:25:09,029 --> 00:25:07,440
the highest load during that initial

811
00:25:10,549 --> 00:25:09,039
thermal shock when the when the liquid

812
00:25:12,789 --> 00:25:10,559
level passes over and this thing shrinks

813
00:25:14,470 --> 00:25:12,799

right up and it kind of pulls and tears

814
00:25:16,470 --> 00:25:14,480
at those top couple fasteners

815
00:25:17,669 --> 00:25:16,480
once the locks tank is fully loaded and

816
00:25:19,830 --> 00:25:17,679
you have the whole weight of that tank

817
00:25:22,470 --> 00:25:19,840
now pushing down on the inner tank the

818
00:25:24,950 --> 00:25:22,480
next set of fasteners three four five

819
00:25:26,789 --> 00:25:24,960
six seven eight start to see the highest

820
00:25:28,789 --> 00:25:26,799
load so once you're fully loaded and

821
00:25:30,870 --> 00:25:28,799
then lifting off they start to see the

822
00:25:32,870 --> 00:25:30,880
highest load so at different times we

823
00:25:34,470 --> 00:25:32,880
screen different fasteners the the

824
00:25:35,990 --> 00:25:34,480
fractography and the failure analysis

825
00:25:38,310 --> 00:25:36,000
show that these cracks are starting up

826
00:25:40,070 --> 00:25:38,320
in the tops of the stringers so we're

827
00:25:41,750 --> 00:25:40,080
confident that loading is a good screen

828
00:25:43,750 --> 00:25:41,760
but it's not a proof screen for us we

829
00:25:46,149 --> 00:25:43,760
can't the analysis shows that it's not a

830
00:25:47,750 --> 00:25:46,159
100 screen to say all fasteners will be

831
00:25:50,149 --> 00:25:47,760
cleared no cracks can occur after we've

832
00:25:52,470 --> 00:25:50,159
loaded the tank ascent still could cause

833
00:25:53,909 --> 00:25:52,480
a few cracks so that's why we went ahead

834
00:25:57,430 --> 00:25:53,919
put this radius block mod on there just

835
00:25:59,190 --> 00:25:57,440
to to lock that down so uh with this mod

836
00:26:00,630 --> 00:25:59,200
we're not going to see cracks the uh

837
00:26:01,909 --> 00:26:00,640
we've added capability almost doubled

838
00:26:04,149 --> 00:26:01,919

the capability and strength of these

839
00:26:04,870 --> 00:26:04,159
things um based on all the testing we've

840
00:26:06,870 --> 00:26:04,880
done

841
00:26:08,549 --> 00:26:06,880
and so we know that the the oxide is is

842
00:26:09,510 --> 00:26:08,559
in really good shape on the hydrogen

843
00:26:11,190 --> 00:26:09,520
side

844
00:26:12,870 --> 00:26:11,200
the analysis is we're not in a factor

845
00:26:14,950 --> 00:26:12,880
safety one because that would say that

846
00:26:16,070 --> 00:26:14,960
you're probably cracking we know that

847
00:26:17,750 --> 00:26:16,080
we're not cracking because we've tanked

848
00:26:19,190 --> 00:26:17,760
twice we've x-rayed

849
00:26:20,549 --> 00:26:19,200
but again we don't want to just rely on

850
00:26:22,789 --> 00:26:20,559
that small data set so we did all the

851
00:26:24,549 --> 00:26:22,799
analysis and that's where the fuzz on

852
00:26:25,350 --> 00:26:24,559
what the number really is starts to come

853
00:26:26,950 --> 00:26:25,360
in

854
00:26:28,630 --> 00:26:26,960
because it's not the normal weight when

855
00:26:29,909 --> 00:26:28,640
you normally compute a factor of safety

856
00:26:31,669 --> 00:26:29,919
you're doing it from an analysis

857
00:26:34,149 --> 00:26:31,679
standpoint and you're doing it as a

858
00:26:35,909 --> 00:26:34,159
design tool to then allow you margin to

859
00:26:37,269 --> 00:26:35,919
be wrong in that design this is kind of

860
00:26:39,190 --> 00:26:37,279
a more test

861
00:26:40,789 --> 00:26:39,200
factor of safety in fact it's probably

862
00:26:41,830 --> 00:26:40,799
not even fair to call it a factor of

863
00:26:44,149 --> 00:26:41,840

safety the

864
00:26:46,149 --> 00:26:44,159
the academics would probably cringe at

865
00:26:47,750 --> 00:26:46,159
us using it that way but

866
00:26:49,190 --> 00:26:47,760
but it's really more of a test test

867
00:26:51,029 --> 00:26:49,200
derived margin that you're able to show

868
00:26:53,750 --> 00:26:51,039
in the part and that number is greater

869
00:26:55,029 --> 00:26:53,760
than one um we have rules in the books

870
00:26:56,549 --> 00:26:55,039
to say what that number has to be when

871
00:26:57,830 --> 00:26:56,559
you're designing something and that's

872
00:26:59,269 --> 00:26:57,840
kind of what happened you know we could

873
00:27:01,029 --> 00:26:59,279
go back and forth as to are we meeting

874
00:27:02,310 --> 00:27:01,039
that rule or not we know we're not

875
00:27:03,990 --> 00:27:02,320
because we're we're cracking we

876
00:27:06,310 --> 00:27:04,000
shouldn't be cracking so we know the

877
00:27:07,830 --> 00:27:06,320
design is a little deficient here and

878
00:27:10,870 --> 00:27:07,840
it's not the design so much as it is the

879
00:27:12,230 --> 00:27:10,880
bad metal that's causing that problem

880
00:27:15,350 --> 00:27:12,240
but rather than bicker about whether the

881
00:27:16,870 --> 00:27:15,360
number's 1.5 1.4 we just kind of said

882
00:27:18,070 --> 00:27:16,880
you know there's a cloud on that number

883
00:27:20,630 --> 00:27:18,080
so we're going to accept that it's less

884
00:27:22,470 --> 00:27:20,640
than what's needed and we're going to go

885
00:27:24,230 --> 00:27:22,480
lay out the risks and and the reasons

886
00:27:28,870 --> 00:27:24,240
why we're okay to fly i don't know if

887
00:27:32,710 --> 00:27:30,549
okay fair enough

888
00:27:34,710 --> 00:27:32,720

marcia dunn yes marsha done associated

889
00:27:37,110 --> 00:27:34,720
press probably for bill or mike moses

890
00:27:39,830 --> 00:27:37,120
for the soyuz fly around if it's done is

891
00:27:41,590 --> 00:27:39,840
that simply for historic

892
00:27:43,990 --> 00:27:41,600
photography purposes or is there some

893
00:27:46,389 --> 00:27:44,000
engineering technical aspect of it

894
00:27:48,470 --> 00:27:46,399
there's an engineering technical aspect

895
00:27:51,269 --> 00:27:48,480
you know we do the shuttle fly around we

896
00:27:52,950 --> 00:27:51,279
get a chance to see the station kind of

897
00:27:54,549 --> 00:27:52,960
if you look at it you know we fly around

898
00:27:56,070 --> 00:27:54,559
this way with this fly around we're

899
00:27:57,750 --> 00:27:56,080
gonna get a chance to see some some

900
00:28:00,149 --> 00:27:57,760
portions of the trust in some areas that

901
00:28:01,830 --> 00:28:00,159
we've not seen before so we'll get a

902
00:28:03,750 --> 00:28:01,840
chance from an engineering standpoint to

903
00:28:05,430 --> 00:28:03,760
capture some images of some areas that

904
00:28:07,190 --> 00:28:05,440
we have not looked at which we would

905
00:28:08,950 --> 00:28:07,200
like to go look at so there's that piece

906
00:28:10,870 --> 00:28:08,960
which we think is good

907
00:28:12,470 --> 00:28:10,880
we also look at this as

908
00:28:13,830 --> 00:28:12,480
some when the shuttle retires in the

909
00:28:15,909 --> 00:28:13,840
future we're going to want to go ahead

910
00:28:17,590 --> 00:28:15,919
and continue to do fly arounds we use

911
00:28:20,230 --> 00:28:17,600
that data a lot from the shuttle fly

912
00:28:22,950 --> 00:28:20,240
around to go look for micro meteoroid

913
00:28:24,950 --> 00:28:22,960

debris to the to the station we also

914
00:28:26,630 --> 00:28:24,960
look for blankets that are degrading we

915
00:28:28,789 --> 00:28:26,640
look for the radiator you know that

916
00:28:30,630 --> 00:28:28,799
that's popped up so we use it as an

917
00:28:32,470 --> 00:28:30,640
engineering evaluation of the overall

918
00:28:33,909 --> 00:28:32,480
external health of the station we're

919
00:28:36,149 --> 00:28:33,919
going to want to do the same thing when

920
00:28:37,909 --> 00:28:36,159
the shuttle retires with the soyuz so in

921
00:28:39,590 --> 00:28:37,919
a sense this is preparation for that

922
00:28:40,870 --> 00:28:39,600
activity it allows us to gain some

923
00:28:43,190 --> 00:28:40,880
experience of how we would do it with

924
00:28:45,990 --> 00:28:43,200
the soyuz how we would minimize the the

925
00:28:48,230 --> 00:28:46,000
impact of the soyuz departure to still

926
00:28:50,389 --> 00:28:48,240
get that fly around kind of data so we

927
00:28:51,990 --> 00:28:50,399
look at it as an engineering evaluation

928
00:28:54,070 --> 00:28:52,000
and and the way we've got it scheduled

929
00:28:56,310 --> 00:28:54,080
is it's kind of a

930
00:28:58,950 --> 00:28:56,320
you know it's okay from a flight uh

931
00:29:00,389 --> 00:28:58,960
readiness reviews board standpoint but

932
00:29:01,830 --> 00:29:00,399
it's really up to the team to see what

933
00:29:03,909 --> 00:29:01,840
happens if we have to do a focused

934
00:29:06,149 --> 00:29:03,919
inspection or we have any other things

935
00:29:08,310 --> 00:29:06,159
that go long on the evas we will not go

936
00:29:10,070 --> 00:29:08,320
do this soyuz fly around the russians

937
00:29:11,990 --> 00:29:10,080
still have to review it they've taken a

938
00:29:13,750 --> 00:29:12,000

cursory look at it it looks okay from

939
00:29:15,510 --> 00:29:13,760
their standpoint but they still have got

940
00:29:17,669 --> 00:29:15,520
to go give their formal blessing and

941
00:29:19,430 --> 00:29:17,679
agree to it the crew's seen some of the

942
00:29:21,110 --> 00:29:19,440
procedures they've looked at it and if

943
00:29:23,029 --> 00:29:21,120
they don't like it they'll wave off so

944
00:29:25,269 --> 00:29:23,039
it's not a guarantee by any chance we'll

945
00:29:27,190 --> 00:29:25,279
go do this but if everything comes out

946
00:29:29,430 --> 00:29:27,200
the right way we'll go we'll go do this

947
00:29:31,750 --> 00:29:29,440
to capture the images both from kind of

948
00:29:34,070 --> 00:29:31,760
a historical perspective it's important

949
00:29:36,710 --> 00:29:34,080
because you know we will have the atv

950
00:29:38,789 --> 00:29:36,720
there the japanese audit excuse me the

951
00:29:41,110 --> 00:29:38,799
european automated transfer vehicle the

952
00:29:43,430 --> 00:29:41,120
japanese htv

953
00:29:44,950 --> 00:29:43,440
progress will be there soyuz will be

954
00:29:47,430 --> 00:29:44,960
there and the shuttle will be there so

955
00:29:49,110 --> 00:29:47,440
it's a it's a pretty unique period in

956
00:29:50,950 --> 00:29:49,120
the history of station with all these

957
00:29:52,710 --> 00:29:50,960
vehicles here to capture some images of

958
00:29:54,310 --> 00:29:52,720
that so that has an aspect to it but

959
00:29:55,750 --> 00:29:54,320
there's also this engineering aspect to

960
00:29:57,350 --> 00:29:55,760
capture some data of some areas we

961
00:29:59,269 --> 00:29:57,360
haven't seen before

962
00:30:01,029 --> 00:29:59,279
um thank you and for mike kleinbach i'm

963
00:30:02,870 --> 00:30:01,039

just wondering um since this is

964
00:30:05,590 --> 00:30:02,880
discovery's last flight

965
00:30:08,870 --> 00:30:05,600
has the past four months seem to be sort

966
00:30:11,190 --> 00:30:08,880
of a reprieve for the team working on it

967
00:30:13,269 --> 00:30:11,200
and letting it be there longer for them

968
00:30:16,149 --> 00:30:13,279
to work on and and you mentioned the

969
00:30:18,789 --> 00:30:16,159
distractions i'm just wondering how you

970
00:30:21,190 --> 00:30:18,799
expect that if at all to play out

971
00:30:22,950 --> 00:30:21,200
this year in particular next week

972
00:30:24,870 --> 00:30:22,960
well i don't expect the distractions to

973
00:30:26,950 --> 00:30:24,880
come in at all i mean i i i've said

974
00:30:29,269 --> 00:30:26,960
before and repeat again today that when

975
00:30:31,190 --> 00:30:29,279
we get on console as a launch team

976
00:30:32,870 --> 00:30:31,200
and the processing people out the launch

977
00:30:34,789 --> 00:30:32,880
pad and in the orbital processing

978
00:30:36,710 --> 00:30:34,799
facility and and indeed elsewhere around

979
00:30:39,430 --> 00:30:36,720
the center when they're on the job

980
00:30:41,669 --> 00:30:39,440
they're they're 100 focused on that job

981
00:30:43,750 --> 00:30:41,679
i i don't worry about that a bit

982
00:30:46,149 --> 00:30:43,760
uh the distractions come when they're

983
00:30:47,590 --> 00:30:46,159
when they're off the job site itself and

984
00:30:49,590 --> 00:30:47,600
and then you know we talk about the

985
00:30:51,590 --> 00:30:49,600
future and and that's where that's where

986
00:30:53,909 --> 00:30:51,600
some of the emotions kick in when we're

987
00:30:55,350 --> 00:30:53,919
on console next thursday it will not be

988
00:30:56,789 --> 00:30:55,360

an issue at all we'll be able to launch

989
00:30:58,389 --> 00:30:56,799
perfectly safely

990
00:31:00,310 --> 00:30:58,399
we also have a process in place called

991
00:31:02,230 --> 00:31:00,320
the shuttle workforce council where we

992
00:31:03,990 --> 00:31:02,240
in management get together monthly

993
00:31:06,310 --> 00:31:04,000
both on the nasa and the contractor side

994
00:31:08,549 --> 00:31:06,320
and and look system by system

995
00:31:10,630 --> 00:31:08,559
uh the workforce levels the experience

996
00:31:12,630 --> 00:31:10,640
of of all the people in those systems

997
00:31:14,789 --> 00:31:12,640
and can we safely support processing and

998
00:31:16,789 --> 00:31:14,799
launch and right now we are green across

999
00:31:18,070 --> 00:31:16,799
the board and so yeah there have been

1000
00:31:19,830 --> 00:31:18,080
some layoffs but we still have

1001
00:31:23,029 --> 00:31:19,840
sufficient people here to to perform the

1002
00:31:25,669 --> 00:31:23,039
jobs perfectly safely so no issue there

1003
00:31:27,750 --> 00:31:25,679
um the reprieve i don't know it'd be

1004
00:31:30,549 --> 00:31:27,760
you like to open christmas presents on

1005
00:31:32,310 --> 00:31:30,559
december 25th you know maybe

1006
00:31:34,950 --> 00:31:32,320
it'd be like opening christmas presents

1007
00:31:37,029 --> 00:31:34,960
a week late i guess i don't know it uh

1008
00:31:38,870 --> 00:31:37,039
people people enjoy the launch uh we

1009
00:31:40,789 --> 00:31:38,880
need to get on and and do this get to

1010
00:31:42,470 --> 00:31:40,799
scurvy on orbit perform her last mission

1011
00:31:44,470 --> 00:31:42,480
and bring her home and and get into

1012
00:31:45,590 --> 00:31:44,480
transition and retirement reprieve i

1013
00:31:46,389 --> 00:31:45,600

don't know if that's the right word for

1014
00:31:52,070 --> 00:31:46,399
it

1015
00:31:53,669 --> 00:31:52,080
what we'll get next thursday

1016
00:31:54,950 --> 00:31:53,679
okay we'll take a question from todd

1017
00:31:56,870 --> 00:31:54,960
halverson and then we'll go to the

1018
00:31:58,789 --> 00:31:56,880
johnson space center for questions all

1019
00:32:01,509 --> 00:31:58,799
right thanks todd halverson of florida

1020
00:32:03,110 --> 00:32:01,519
today for i think mike moses um

1021
00:32:06,149 --> 00:32:03,120
whenever you

1022
00:32:08,149 --> 00:32:06,159
do modifications that are as extensive

1023
00:32:10,710 --> 00:32:08,159
as what you've done with the external

1024
00:32:12,950 --> 00:32:10,720
tank in this case there always has to be

1025
00:32:16,149 --> 00:32:12,960
a concern that you might introduce a

1026
00:32:17,909 --> 00:32:16,159
hazard that goes unrecognized

1027
00:32:20,389 --> 00:32:17,919
i i'm wondering what about this

1028
00:32:23,269 --> 00:32:20,399
situation right here makes you feel

1029
00:32:24,710 --> 00:32:23,279
confident that this tank is safe to go

1030
00:32:27,350 --> 00:32:24,720
fly

1031
00:32:29,990 --> 00:32:27,360
that's a good question so we you know we

1032
00:32:31,990 --> 00:32:30,000
made the decision to modify this tank uh

1033
00:32:33,909 --> 00:32:32,000
back in the in the early january time

1034
00:32:36,630 --> 00:32:33,919
frame and we spent a lot of time before

1035
00:32:38,310 --> 00:32:36,640
we made that go uh working on tests and

1036
00:32:40,549 --> 00:32:38,320
analysis to show that very thing that we

1037
00:32:44,710 --> 00:32:40,559
would do no harm uh and that we would be

1038
00:32:45,990 --> 00:32:44,720

okay so on the surface literally um you

1039
00:32:48,549 --> 00:32:46,000
know you have to take the foam off and

1040
00:32:50,310 --> 00:32:48,559
then reapply it and so we looked at the

1041
00:32:52,870 --> 00:32:50,320
the amount of sprays that were required

1042
00:32:54,710 --> 00:32:52,880
how those foam bonds would go with each

1043
00:32:56,230 --> 00:32:54,720
other you know the the flange of the

1044
00:32:58,870 --> 00:32:56,240
tank is one of the last things closed

1045
00:32:59,990 --> 00:32:58,880
out and it's a spray done automated at

1046
00:33:02,470 --> 00:33:00,000
the assembly plant and here we'd be

1047
00:33:03,750 --> 00:33:02,480
doing it manually um we talked about the

1048
00:33:05,029 --> 00:33:03,760
the amount of material being sprayed and

1049
00:33:06,389 --> 00:33:05,039
it's in family with everything we've

1050
00:33:08,310 --> 00:33:06,399
done here before

1051
00:33:10,549 --> 00:33:08,320
in florida and what we did was the the

1052
00:33:12,149 --> 00:33:10,559
teams at michoud basically practiced on

1053
00:33:13,990 --> 00:33:12,159
test panels to develop the procedures

1054
00:33:15,909 --> 00:33:14,000
they would use we came down here dryer

1055
00:33:17,110 --> 00:33:15,919
ran them and then and then executed it

1056
00:33:19,269 --> 00:33:17,120
and so we kind of followed all our

1057
00:33:20,789 --> 00:33:19,279
normal processes for how we repair foam

1058
00:33:22,470 --> 00:33:20,799
uh and so that that gave us good

1059
00:33:23,590 --> 00:33:22,480
confidence that that we were able to

1060
00:33:25,750 --> 00:33:23,600
take the foam off in the first place

1061
00:33:27,509 --> 00:33:25,760
because we know we can go put it back on

1062
00:33:29,269 --> 00:33:27,519
safely that's a little different than

1063
00:33:30,710 --> 00:33:29,279

the hydrogen flange if we it's one of

1064
00:33:33,110 --> 00:33:30,720
the reasons we're not wanting to do

1065
00:33:35,990 --> 00:33:33,120
anything to the hydrogen flange um the

1066
00:33:37,430 --> 00:33:36,000
difference is the the ox flange um the

1067
00:33:39,350 --> 00:33:37,440
bottom it's at the bottom of the tank so

1068
00:33:40,470 --> 00:33:39,360
during ascent there's always cryo there

1069
00:33:43,110 --> 00:33:40,480
it's always nice and cold on the

1070
00:33:45,669 --> 00:33:43,120
backside and so the temperatures kind of

1071
00:33:46,789 --> 00:33:45,679
it's got this nice cold back face on it

1072
00:33:48,549 --> 00:33:46,799
and so you're not worried about this

1073
00:33:50,870 --> 00:33:48,559
cryo-pumping loss where the little

1074
00:33:52,789 --> 00:33:50,880
pockets of air liquidize and then as you

1075
00:33:54,950 --> 00:33:52,799
go up they flash and push and pop the

1076
00:33:56,710 --> 00:33:54,960
foam off the tank on the hydrogen side

1077
00:33:58,470 --> 00:33:56,720
that's the top of the tank so it's cold

1078
00:34:00,470 --> 00:33:58,480
and liquid at the very beginning but

1079
00:34:02,389 --> 00:34:00,480
within the first couple

1080
00:34:04,470 --> 00:34:02,399
minutes of ascent that that level's

1081
00:34:05,909 --> 00:34:04,480
dropping in the tank that now gets warm

1082
00:34:07,909 --> 00:34:05,919
and that heats up and now you can have

1083
00:34:09,589 --> 00:34:07,919
these cryo-pumping effects we learned

1084
00:34:11,349 --> 00:34:09,599
that lesson pretty well during all the

1085
00:34:13,589 --> 00:34:11,359
the return to flight stuff for for after

1086
00:34:15,349 --> 00:34:13,599
columbia and so we're not confident that

1087
00:34:17,510 --> 00:34:15,359
we'd be able to close that flange back

1088
00:34:19,349 --> 00:34:17,520

out if we took foam off there in large

1089
00:34:22,149 --> 00:34:19,359
quantities because that's a very well

1090
00:34:23,430 --> 00:34:22,159
controlled minimizes all the voids and

1091
00:34:24,869 --> 00:34:23,440
it's just not the same rigor that we

1092
00:34:26,550 --> 00:34:24,879
could do here it's not to say we

1093
00:34:27,990 --> 00:34:26,560
couldn't we just decided rapidly we

1094
00:34:28,950 --> 00:34:28,000
didn't need to go there so we wanted to

1095
00:34:30,470 --> 00:34:28,960
make sure

1096
00:34:31,909 --> 00:34:30,480
uh let's show that we can analyze our

1097
00:34:33,669 --> 00:34:31,919
way out of the hydrogen side if we have

1098
00:34:35,109 --> 00:34:33,679
to and we did

1099
00:34:36,629 --> 00:34:35,119
so that's the foam part so that's that

1100
00:34:38,149 --> 00:34:36,639
was my first concern is before we do

1101
00:34:40,710 --> 00:34:38,159
anything can i put it back together the

1102
00:34:42,629 --> 00:34:40,720
right way and then on the mod side this

1103
00:34:44,310 --> 00:34:42,639
mods very much in family with other

1104
00:34:46,790 --> 00:34:44,320
things they do to the tank

1105
00:34:49,430 --> 00:34:46,800
when they have damage either the the

1106
00:34:51,750 --> 00:34:49,440
riveting tool kind of jumps off and and

1107
00:34:54,069 --> 00:34:51,760
smacks into the side of a stringer or it

1108
00:34:56,310 --> 00:34:54,079
gets handling damage or a crack develops

1109
00:34:58,069 --> 00:34:56,320
um this is this is the way they repair

1110
00:35:00,710 --> 00:34:58,079
that they uh they pull it off they put a

1111
00:35:02,790 --> 00:35:00,720
doubler on they put a radius block on so

1112
00:35:04,390 --> 00:35:02,800
it's a known process the guys doing the

1113
00:35:05,510 --> 00:35:04,400

work did it the same exact way they

1114
00:35:07,270 --> 00:35:05,520
would have done it had this happened at

1115
00:35:09,270 --> 00:35:07,280
the plant we just now did it to every

1116
00:35:11,510 --> 00:35:09,280
stringer instead of three or four

1117
00:35:14,950 --> 00:35:11,520
stringers on every tank um and then

1118
00:35:17,109 --> 00:35:14,960
lastly uh we did all the math to show

1119
00:35:18,950 --> 00:35:17,119
with actual test and analysis that it

1120
00:35:20,550 --> 00:35:18,960
didn't actually do any harm

1121
00:35:22,710 --> 00:35:20,560
in all the tests we did to find the root

1122
00:35:24,470 --> 00:35:22,720
cause we then took all those runs and

1123
00:35:26,069 --> 00:35:24,480
did them again with the mod on to show

1124
00:35:27,670 --> 00:35:26,079
that it didn't cause the same problem

1125
00:35:29,750 --> 00:35:27,680
again so once we figured out how to

1126
00:35:31,670 --> 00:35:29,760
recreate the failures in the lab we then

1127
00:35:33,589 --> 00:35:31,680
modified those just like we modified the

1128
00:35:35,190 --> 00:35:33,599
tank and ran the test again and showed

1129
00:35:37,270 --> 00:35:35,200
ultimate capability was was greatly

1130
00:35:38,870 --> 00:35:37,280
improved

1131
00:35:40,310 --> 00:35:38,880
you back up to the what makes me sleep

1132
00:35:42,069 --> 00:35:40,320
good tonight is the common sense part

1133
00:35:44,069 --> 00:35:42,079
you know we're putting this little thin

1134
00:35:45,589 --> 00:35:44,079
piece of aluminum band-aid on the part

1135
00:35:47,270 --> 00:35:45,599
of the stringer that's wrapped up over a

1136
00:35:49,589 --> 00:35:47,280
big thick aluminum cord so if you look

1137
00:35:51,270 --> 00:35:49,599
at the the total flexure of the system

1138
00:35:52,790 --> 00:35:51,280

we're basically adding a little tiny bit

1139
00:35:55,109 --> 00:35:52,800
of aluminum on top of a big thick piece

1140
00:35:55,829 --> 00:35:55,119
of aluminum so just common sense wise

1141
00:35:57,109 --> 00:35:55,839
you look at that and you feel

1142
00:35:58,230 --> 00:35:57,119
comfortable with it

1143
00:35:59,270 --> 00:35:58,240
that's a good thing but it's also the

1144
00:36:01,349 --> 00:35:59,280
bad thing because that's when you stop

1145
00:36:02,870 --> 00:36:01,359
to say okay now what am i missing and i

1146
00:36:04,230 --> 00:36:02,880
think we did all the homework there to

1147
00:36:05,670 --> 00:36:04,240
show that we're not missing anything we

1148
00:36:07,750 --> 00:36:05,680
really are truly doing no harm on this

1149
00:36:10,310 --> 00:36:07,760
one i think i'd add a little bit to what

1150
00:36:12,390 --> 00:36:10,320
mike said we really tested this very

1151
00:36:13,589 --> 00:36:12,400
rigorously we actually changed the

1152
00:36:15,030 --> 00:36:13,599
loading because what you're worried

1153
00:36:17,349 --> 00:36:15,040
about when you put a little piece in to

1154
00:36:19,270 --> 00:36:17,359
stiffen an area have you now transferred

1155
00:36:21,589 --> 00:36:19,280
that load to another area that you

1156
00:36:23,910 --> 00:36:21,599
didn't intend for that load to move to

1157
00:36:25,589 --> 00:36:23,920
so they did extensive testing where we

1158
00:36:27,109 --> 00:36:25,599
looked at that from a visual standpoint

1159
00:36:29,750 --> 00:36:27,119
we got to watch a movie where you could

1160
00:36:31,510 --> 00:36:29,760
actually watch the load get transferred

1161
00:36:33,750 --> 00:36:31,520
to those other areas to make sure that

1162
00:36:35,670 --> 00:36:33,760
there was not an adverse effect of that

1163
00:36:37,589 --> 00:36:35,680

occurring then they actually changed the

1164
00:36:38,310 --> 00:36:37,599
way they loaded so they actually loaded

1165
00:36:43,109 --> 00:36:38,320
the

1166
00:36:44,870 --> 00:36:43,119
doubler or no little band-aid put on top

1167
00:36:46,710 --> 00:36:44,880
of it to see what would happen if that

1168
00:36:48,790 --> 00:36:46,720
occurred and then they did extensive

1169
00:36:50,550 --> 00:36:48,800
finite element analysis to go look at

1170
00:36:52,230 --> 00:36:50,560
what this does from a math standpoint it

1171
00:36:54,390 --> 00:36:52,240
compared the modification with and

1172
00:36:56,390 --> 00:36:54,400
without the stringer and then another

1173
00:36:59,109 --> 00:36:56,400
piece just to be even doubly sure is

1174
00:37:01,510 --> 00:36:59,119
that had limitations in the model so the

1175
00:37:03,910 --> 00:37:01,520
nesc is off running a different math

1176
00:37:06,710 --> 00:37:03,920
model that will do exactly the same kind

1177
00:37:08,870 --> 00:37:06,720
of thing to see if they can

1178
00:37:10,069 --> 00:37:08,880
find something else this model that they

1179
00:37:12,390 --> 00:37:10,079
ran had

1180
00:37:15,109 --> 00:37:12,400
elastic or that's where the metal uh you

1181
00:37:16,710 --> 00:37:15,119
know yields but then returns back we

1182
00:37:18,710 --> 00:37:16,720
think it goes into the plastic region

1183
00:37:21,270 --> 00:37:18,720
where it takes a set or stays in a bent

1184
00:37:23,190 --> 00:37:21,280
configuration the nesc model will look

1185
00:37:25,030 --> 00:37:23,200
at that plastic configuration and see if

1186
00:37:26,550 --> 00:37:25,040
that causes any problems and we didn't

1187
00:37:28,230 --> 00:37:26,560
consider that a constraint to flight

1188
00:37:30,069 --> 00:37:28,240

that that work gets done because of the

1189
00:37:32,550 --> 00:37:30,079
testing we've done but they're off

1190
00:37:34,230 --> 00:37:32,560
running that as well so so we are we

1191
00:37:35,910 --> 00:37:34,240
were very cognizant that we could be

1192
00:37:38,150 --> 00:37:35,920
doing something here that takes a

1193
00:37:40,950 --> 00:37:38,160
situation that was bounded and creates a

1194
00:37:42,069 --> 00:37:40,960
situation that we don't understand so i

1195
00:37:44,710 --> 00:37:42,079
would tell you the teams did a

1196
00:37:46,310 --> 00:37:44,720
phenomenal job of of doing this testing

1197
00:37:48,390 --> 00:37:46,320
and pulling the work together and i i

1198
00:37:50,470 --> 00:37:48,400
couldn't be prouder of what they've done

1199
00:37:52,870 --> 00:37:50,480
how they worked as a you know a combined

1200
00:37:55,990 --> 00:37:52,880
group from from marshall and langley and

1201
00:37:57,990 --> 00:37:56,000
jsc and the maf team came and pulled

1202
00:38:00,310 --> 00:37:58,000
together and really did a phenomenal job

1203
00:38:01,670 --> 00:38:00,320
and and to mike's point

1204
00:38:03,430 --> 00:38:01,680
you know a lot of these folks some of

1205
00:38:05,750 --> 00:38:03,440
them in the tank world have been were

1206
00:38:07,510 --> 00:38:05,760
laid off they were already in other jobs

1207
00:38:09,510 --> 00:38:07,520
and we called them back to come back and

1208
00:38:11,670 --> 00:38:09,520
do some of this work and they were glad

1209
00:38:13,589 --> 00:38:11,680
to come back and they gave it their all

1210
00:38:15,990 --> 00:38:13,599
to make this this vehicle ready to go

1211
00:38:18,069 --> 00:38:16,000
fly so when i think about the space

1212
00:38:20,069 --> 00:38:18,079
flight team i i think back of all those

1213
00:38:22,550 --> 00:38:20,079

folks that i that i've seen at math and

1214
00:38:24,230 --> 00:38:22,560
the folks that spent many hours you know

1215
00:38:26,230 --> 00:38:24,240
a lot of time over the holidays over the

1216
00:38:28,470 --> 00:38:26,240
christmas time over uh new year's

1217
00:38:29,990 --> 00:38:28,480
working this problem and there was no

1218
00:38:31,430 --> 00:38:30,000
question about their dedication to what

1219
00:38:33,589 --> 00:38:31,440
they were doing they really want to see

1220
00:38:36,310 --> 00:38:33,599
this vehicle fly and help out space

1221
00:38:37,990 --> 00:38:36,320
station and move forward

1222
00:38:41,190 --> 00:38:38,000
let's go to johnson space center in

1223
00:38:45,349 --> 00:38:42,990
hi this is robert perlman with

1224
00:38:46,470 --> 00:38:45,359
collectspace.com uh with two questions

1225
00:38:48,950 --> 00:38:46,480
if i may

1226
00:38:51,510 --> 00:38:48,960
um for mike moses

1227
00:38:52,550 --> 00:38:51,520
between november and now has the iss

1228
00:38:54,870 --> 00:38:52,560
program

1229
00:38:57,190 --> 00:38:54,880
requested any additional payloads to be

1230
00:38:59,349 --> 00:38:57,200
added to the mid-deck to fixes for their

1231
00:39:01,510 --> 00:38:59,359
systems or anything else

1232
00:39:04,390 --> 00:39:01,520
let's see i think we've uh we might have

1233
00:39:06,150 --> 00:39:04,400
put a new fluid jumper on board um for

1234
00:39:08,950 --> 00:39:06,160
one of the esa modules and other than

1235
00:39:11,109 --> 00:39:08,960
that i don't think there was anything um

1236
00:39:13,510 --> 00:39:11,119
the only real changeouts were uh in

1237
00:39:15,589 --> 00:39:13,520
regard to the crew swap to get the right

1238
00:39:18,069 --> 00:39:15,599

sizing m using gloves

1239
00:39:20,710 --> 00:39:18,079
and then personal gear on board for uh

1240
00:39:23,829 --> 00:39:20,720
for steve bowen

1241
00:39:25,910 --> 00:39:23,839
great and for bill gerstenmaier i'm just

1242
00:39:28,630 --> 00:39:25,920
wondering if during the fr today there

1243
00:39:31,910 --> 00:39:28,640
was any discussion about the impact to

1244
00:39:33,990 --> 00:39:31,920
the mission if there was any if um if

1245
00:39:36,470 --> 00:39:34,000
mar on march 4th the government was

1246
00:39:38,390 --> 00:39:36,480
unable to pass a new budget and

1247
00:39:40,630 --> 00:39:38,400
there was a government furlough was

1248
00:39:42,790 --> 00:39:40,640
there any talk about that today no we

1249
00:39:44,390 --> 00:39:42,800
didn't discuss that

1250
00:39:46,150 --> 00:39:44,400
okay let's go to the phone bridge where

1251
00:39:47,990 --> 00:39:46,160
i believe denise ciao is standing by

1252
00:39:50,550 --> 00:39:48,000
with a question

1253
00:39:52,310 --> 00:39:50,560
hi thanks denise ciao with space.com um

1254
00:39:53,670 --> 00:39:52,320
with a question for bill gerstenmaier uh

1255
00:39:55,829 --> 00:39:53,680
you mentioned that it's sort of a unique

1256
00:39:57,270 --> 00:39:55,839
time right now um in the space station's

1257
00:39:58,870 --> 00:39:57,280
history with all the international

1258
00:40:00,150 --> 00:39:58,880
partners having vehicles present and

1259
00:40:01,990 --> 00:40:00,160
docked there

1260
00:40:04,069 --> 00:40:02,000
and with discovery bringing some of the

1261
00:40:05,349 --> 00:40:04,079
last the pmn the last american edition i

1262
00:40:07,750 --> 00:40:05,359
was wondering if you could just comment

1263
00:40:10,390 --> 00:40:07,760

on the significance of that

1264
00:40:12,150 --> 00:40:10,400
yeah this is a pretty amazing time if

1265
00:40:14,950 --> 00:40:12,160
you think about it

1266
00:40:18,390 --> 00:40:14,960
you know if you look in the last month

1267
00:40:21,030 --> 00:40:18,400
you know we've had the japanese

1268
00:40:23,750 --> 00:40:21,040
htv launch from tanegashima we had a

1269
00:40:25,910 --> 00:40:23,760
progress vehicle launch from from russia

1270
00:40:28,230 --> 00:40:25,920
we've just had the esa automated

1271
00:40:30,150 --> 00:40:28,240
transfer vehicle launched from kuru

1272
00:40:32,069 --> 00:40:30,160
french guyana and then we're going to

1273
00:40:34,390 --> 00:40:32,079
have the shuttle launch

1274
00:40:36,390 --> 00:40:34,400
here as well so here we will have

1275
00:40:38,790 --> 00:40:36,400
launches from from

1276
00:40:39,910 --> 00:40:38,800
the kennedy space center uh

1277
00:40:43,030 --> 00:40:39,920
karoo

1278
00:40:44,790 --> 00:40:43,040
tanigashima and baikonur all within a

1279
00:40:46,950 --> 00:40:44,800
one-month period so

1280
00:40:49,349 --> 00:40:46,960
you talk about a pretty amazing time of

1281
00:40:51,430 --> 00:40:49,359
all these folks keeping track of all the

1282
00:40:53,190 --> 00:40:51,440
activities that have to occur and and

1283
00:40:55,270 --> 00:40:53,200
keeping the space station operational

1284
00:40:57,349 --> 00:40:55,280
it's a pretty amazing time and

1285
00:40:59,990 --> 00:40:57,359
and again you should watch the video

1286
00:41:01,030 --> 00:41:00,000
associated with this flight of the evas

1287
00:41:04,630 --> 00:41:01,040
and

1288
00:41:06,550 --> 00:41:04,640

what we're really doing in space station

1289
00:41:08,630 --> 00:41:06,560
look where the crew has to go all over

1290
00:41:10,470 --> 00:41:08,640
this truss and what they are doing out

1291
00:41:12,870 --> 00:41:10,480
on the outside of space station

1292
00:41:14,470 --> 00:41:12,880
i think maybe we take it for granted but

1293
00:41:16,630 --> 00:41:14,480
you need to step back and think about

1294
00:41:18,550 --> 00:41:16,640
what's going on in space to think about

1295
00:41:20,710 --> 00:41:18,560
all these vehicles launching in one

1296
00:41:22,309 --> 00:41:20,720
month from all these remote places all

1297
00:41:24,630 --> 00:41:22,319
these international control centers

1298
00:41:27,030 --> 00:41:24,640
working together this extremely

1299
00:41:29,349 --> 00:41:27,040
choreographed two series of evas that

1300
00:41:31,589 --> 00:41:29,359
are phenomenal across the truss

1301
00:41:33,349 --> 00:41:31,599
you think about space operations this is

1302
00:41:36,150 --> 00:41:33,359
probably the most intense space

1303
00:41:37,990 --> 00:41:36,160
operations time ever in in our history

1304
00:41:40,069 --> 00:41:38,000
and and we just kind of take it for

1305
00:41:41,190 --> 00:41:40,079
granted that it's just happening but i

1306
00:41:43,430 --> 00:41:41,200
think that the teams have done a

1307
00:41:44,550 --> 00:41:43,440
phenomenal job of working things they

1308
00:41:47,030 --> 00:41:44,560
you know we were supposed to have a

1309
00:41:48,390 --> 00:41:47,040
pallet to put the cargo on from htv it

1310
00:41:50,630 --> 00:41:48,400
was supposed to be delivered by the

1311
00:41:52,710 --> 00:41:50,640
shuttle if the shuttle didn't make it

1312
00:41:54,309 --> 00:41:52,720
so so dexter and the spiderman is

1313
00:41:56,069 --> 00:41:54,319

holding two components waiting for the

1314
00:41:58,710 --> 00:41:56,079
pallet to be delivered by the shuttle

1315
00:42:00,309 --> 00:41:58,720
and they'll get moved over to the proper

1316
00:42:02,550 --> 00:42:00,319
pallet when the time comes but that was

1317
00:42:04,710 --> 00:42:02,560
not trivial for the teams to figure out

1318
00:42:07,030 --> 00:42:04,720
how to move all that stuff around as we

1319
00:42:08,870 --> 00:42:07,040
talked about today the htv was moved

1320
00:42:10,390 --> 00:42:08,880
from the port where it docked originally

1321
00:42:12,309 --> 00:42:10,400
on the nader and it's now sitting up at

1322
00:42:13,829 --> 00:42:12,319
the top on the zenith right and and i

1323
00:42:15,589 --> 00:42:13,839
don't know how much that got covered and

1324
00:42:17,190 --> 00:42:15,599
it got we had to have a cable that was

1325
00:42:19,190 --> 00:42:17,200
built on orbit installed because the

1326
00:42:21,030 --> 00:42:19,200
cable we were going to use was stowed in

1327
00:42:22,790 --> 00:42:21,040
the pmm on the shuttle and it wasn't

1328
00:42:25,670 --> 00:42:22,800
there so the crew manufactured a cable

1329
00:42:27,670 --> 00:42:25,680
to hook power up to the htv on orbit so

1330
00:42:31,270 --> 00:42:27,680
this team is operating in an

1331
00:42:33,349 --> 00:42:31,280
international uh amazing

1332
00:42:36,630 --> 00:42:33,359
system of operations and activities to

1333
00:42:38,630 --> 00:42:36,640
just keep all the bits and pieces

1334
00:42:40,309 --> 00:42:38,640
working and moving forward and what a

1335
00:42:41,910 --> 00:42:40,319
great team and what a great time in

1336
00:42:44,470 --> 00:42:41,920
space flight

1337
00:42:46,230 --> 00:42:44,480
denise did you have a follow-up question

1338
00:42:47,829 --> 00:42:46,240

no that's all thank you okay thank you

1339
00:42:50,309 --> 00:42:47,839
we're back here at kennedy we have about

1340
00:42:52,630 --> 00:42:50,319
five minutes left in the briefing um and

1341
00:42:56,550 --> 00:42:52,640
we'll go to dan billow

1342
00:42:57,990 --> 00:42:56,560
dan billow wesh tv uh i want to just ask

1343
00:43:00,870 --> 00:42:58,000
you to elaborate a little bit more on

1344
00:43:03,510 --> 00:43:00,880
the atv docking versus the shuttle

1345
00:43:05,510 --> 00:43:03,520
launch that day it i take it there's

1346
00:43:07,589 --> 00:43:05,520
nothing that you're concerned too

1347
00:43:08,950 --> 00:43:07,599
concerned about that that

1348
00:43:10,870 --> 00:43:08,960
could be subtle

1349
00:43:13,030 --> 00:43:10,880
that could happen with an atv docking

1350
00:43:15,270 --> 00:43:13,040
that might manifest itself hours later

1351
00:43:16,950 --> 00:43:15,280
or something like that i mean what what

1352
00:43:19,030 --> 00:43:16,960
protocol do you take to kind of make

1353
00:43:20,710 --> 00:43:19,040
sure that the bases are covered in

1354
00:43:22,630 --> 00:43:20,720
and that you know what would trip the

1355
00:43:24,069 --> 00:43:22,640
trigger to say

1356
00:43:25,349 --> 00:43:24,079
we've got a problem we can't launch or

1357
00:43:27,829 --> 00:43:25,359
we can't dock

1358
00:43:30,550 --> 00:43:27,839
well i could take a piece of that

1359
00:43:31,589 --> 00:43:30,560
you know as the atv approaches you know

1360
00:43:33,589 --> 00:43:31,599
it's going

1361
00:43:35,030 --> 00:43:33,599
today for example it did a practice

1362
00:43:37,030 --> 00:43:35,040
collision avoidance maneuver so we're

1363
00:43:39,510 --> 00:43:37,040

testing all the thruster systems we're

1364
00:43:41,030 --> 00:43:39,520
testing the com systems so we will know

1365
00:43:43,190 --> 00:43:41,040
pretty much in advance if there's

1366
00:43:45,349 --> 00:43:43,200
something going on from an overall atv

1367
00:43:46,870 --> 00:43:45,359
standpoint and so we'll we'll know that

1368
00:43:49,349 --> 00:43:46,880
ahead of time probably even at the

1369
00:43:51,270 --> 00:43:49,359
tanking meeting that michael chair if

1370
00:43:52,790 --> 00:43:51,280
there's any major problem that could be

1371
00:43:54,390 --> 00:43:52,800
delaying the docking and we can make a

1372
00:43:56,710 --> 00:43:54,400
decision even before we start loading

1373
00:43:58,150 --> 00:43:56,720
the tank but when we're that close to

1374
00:44:00,230 --> 00:43:58,160
docking we will have checked out the

1375
00:44:02,550 --> 00:44:00,240
majority of the systems on the atv and

1376
00:44:04,390 --> 00:44:02,560
there will be understood it comes in and

1377
00:44:05,510 --> 00:44:04,400
docks it uses the

1378
00:44:07,670 --> 00:44:05,520
russian

1379
00:44:09,109 --> 00:44:07,680
system to dock to the back part of the

1380
00:44:11,589 --> 00:44:09,119
service module

1381
00:44:14,550 --> 00:44:11,599
it pretty much just

1382
00:44:16,309 --> 00:44:14,560
bangs in and it attaches to the end it

1383
00:44:18,790 --> 00:44:16,319
becomes pretty obvious whether you're

1384
00:44:20,390 --> 00:44:18,800
successful in docking or not

1385
00:44:22,069 --> 00:44:20,400
there's not a lot of mechanisms once

1386
00:44:23,589 --> 00:44:22,079
it's attached if it's not attached

1387
00:44:25,270 --> 00:44:23,599
properly and it's a soft dock

1388
00:44:27,349 --> 00:44:25,280

configuration and that's an obvious

1389
00:44:29,510 --> 00:44:27,359
no-go we would we would scrub out and

1390
00:44:31,670 --> 00:44:29,520
not launch if it hard docks it'll be

1391
00:44:34,230 --> 00:44:31,680
obvious to us right away we want to do a

1392
00:44:35,910 --> 00:44:34,240
little thruster test on the atv and

1393
00:44:37,510 --> 00:44:35,920
we'll try to probably do that before the

1394
00:44:39,829 --> 00:44:37,520
shuttle actually comes up and docks i

1395
00:44:41,190 --> 00:44:39,839
think we changed actually in the fr we

1396
00:44:42,790 --> 00:44:41,200
talked about it one way then after the

1397
00:44:44,150 --> 00:44:42,800
meeting that the teams thought about it

1398
00:44:45,990 --> 00:44:44,160
some more and they'll do a little

1399
00:44:47,910 --> 00:44:46,000
thruster test so there's very little

1400
00:44:50,470 --> 00:44:47,920
risk of us not knowing whether this is

1401
00:44:51,910 --> 00:44:50,480
successful or not when it occurs it'll

1402
00:44:53,589 --> 00:44:51,920
be pretty cut and dried whether we can

1403
00:44:55,270 --> 00:44:53,599
launch or not we'll we'll have the right

1404
00:44:57,990 --> 00:44:55,280
discussions the right time to talk about

1405
00:44:59,829 --> 00:44:58,000
it and i would say it also you know when

1406
00:45:01,349 --> 00:44:59,839
we make the flight rules

1407
00:45:03,349 --> 00:45:01,359
you know we have to worry about crew

1408
00:45:06,470 --> 00:45:03,359
sleep shifting we have to worry about

1409
00:45:07,910 --> 00:45:06,480
crew timelines we have to worry about

1410
00:45:10,150 --> 00:45:07,920
tdrs coverage

1411
00:45:11,910 --> 00:45:10,160
and and to carry that in a generic sense

1412
00:45:13,190 --> 00:45:11,920
you really want that spacing but then

1413
00:45:15,670 --> 00:45:13,200

when you're into the actual mission

1414
00:45:17,270 --> 00:45:15,680
specifics you know the exact conditions

1415
00:45:19,589 --> 00:45:17,280
of where the satellites are you know the

1416
00:45:21,190 --> 00:45:19,599
actual crew sleep shift time frames you

1417
00:45:22,870 --> 00:45:21,200
know all these activities and then you

1418
00:45:24,630 --> 00:45:22,880
can go look and say hey in this unique

1419
00:45:27,829 --> 00:45:24,640
situation doesn't make sense to go do

1420
00:45:30,309 --> 00:45:27,839
this so we see it as a as a good kind of

1421
00:45:32,470 --> 00:45:30,319
risk decision that we would like to get

1422
00:45:34,309 --> 00:45:32,480
three opportunities for the shuttle to

1423
00:45:36,630 --> 00:45:34,319
launch this gives us the first one and

1424
00:45:38,309 --> 00:45:36,640
we see that the chances of us

1425
00:45:39,910 --> 00:45:38,319
having a problem with atv low enough

1426
00:45:41,990 --> 00:45:39,920
that it makes sense to move forward and

1427
00:45:43,990 --> 00:45:42,000
if we do we can react to it and it's

1428
00:45:46,230 --> 00:45:44,000
it's an extra cycle on the tank and and

1429
00:45:47,829 --> 00:45:46,240
we're where we need to be okay we'll

1430
00:45:50,870 --> 00:45:47,839
take uh take one question from bill

1431
00:45:52,550 --> 00:45:50,880
harwood and and wrap up with marcia dunn

1432
00:45:53,910 --> 00:45:52,560
mike uh you guys had some problems with

1433
00:45:55,829 --> 00:45:53,920
the gup when you were hooking it back up

1434
00:45:56,870 --> 00:45:55,839
after roll out and i guess you swapped

1435
00:45:58,950 --> 00:45:56,880
out a seal

1436
00:46:01,190 --> 00:45:58,960
are you confident that when you guys i

1437
00:46:03,430 --> 00:46:01,200
mean obviously you're confident but but

1438
00:46:04,710 --> 00:46:03,440

given the vacaries of that system why

1439
00:46:07,109 --> 00:46:04,720
are you confident

1440
00:46:09,589 --> 00:46:07,119
yeah so what we learned um

1441
00:46:11,510 --> 00:46:09,599
after the uh the scrub back on november

1442
00:46:13,030 --> 00:46:11,520
5th

1443
00:46:14,630 --> 00:46:13,040
well let me let me back up you for that

1444
00:46:16,309 --> 00:46:14,640
so after the first set of gup scrubs we

1445
00:46:17,430 --> 00:46:16,319
had on on two different missions we

1446
00:46:18,630 --> 00:46:17,440
learned that the we call it

1447
00:46:20,950 --> 00:46:18,640
concentricity which is kind of the

1448
00:46:22,790 --> 00:46:20,960
alignment of the the plate on the tank

1449
00:46:25,430 --> 00:46:22,800
itself with the ground carrier plate

1450
00:46:27,190 --> 00:46:25,440
that we bolt to that here at kennedy

1451
00:46:28,870 --> 00:46:27,200
and making sure they're properly aligned

1452
00:46:30,150 --> 00:46:28,880
with each other and that the holes in

1453
00:46:32,710 --> 00:46:30,160
each of them line up so that there's a

1454
00:46:34,470 --> 00:46:32,720
nice straight hole through

1455
00:46:36,230 --> 00:46:34,480
we we learned that that alignment was

1456
00:46:37,910 --> 00:46:36,240
pretty key and so we changed our

1457
00:46:39,910 --> 00:46:37,920
processes to check it measured make sure

1458
00:46:41,670 --> 00:46:39,920
we tweaked it just right and then we had

1459
00:46:43,829 --> 00:46:41,680
the the scrub for the leak here on this

1460
00:46:45,990 --> 00:46:43,839
one and we learned that the qd that we

1461
00:46:48,230 --> 00:46:46,000
plug into that hole has a bellow spring

1462
00:46:50,710 --> 00:46:48,240
inside it and a little bullnose

1463
00:46:52,710 --> 00:46:50,720

and a probe and and that can have an

1464
00:46:54,550 --> 00:46:52,720
alignment within the cutie itself which

1465
00:46:55,349 --> 00:46:54,560
can then cause that concentricity to

1466
00:46:56,710 --> 00:46:55,359
either

1467
00:46:58,309 --> 00:46:56,720
move to one side or the other so what

1468
00:47:00,069 --> 00:46:58,319
might look like a nice sweet spot down

1469
00:47:02,069 --> 00:47:00,079
the middle alignment when you hook this

1470
00:47:03,829 --> 00:47:02,079
qd up it kind of bends it a little bit

1471
00:47:05,270 --> 00:47:03,839
now pushes it down towards the the

1472
00:47:06,950 --> 00:47:05,280
limits where you might open up and gap

1473
00:47:08,710 --> 00:47:06,960
and leak and and that's what happened so

1474
00:47:10,550 --> 00:47:08,720
we learned

1475
00:47:12,390 --> 00:47:10,560
if i want to be i want to be pretty

1476
00:47:13,829 --> 00:47:12,400
crude about it we learned the second

1477
00:47:15,030 --> 00:47:13,839
piece of the puzzle that we didn't know

1478
00:47:17,030 --> 00:47:15,040
about the first time we had the league

1479
00:47:19,510 --> 00:47:17,040
so it took two failures to make us see

1480
00:47:21,349 --> 00:47:19,520
both halves of the of the puzzle uh and

1481
00:47:23,510 --> 00:47:21,359
so now we're we did it we did a whole

1482
00:47:24,790 --> 00:47:23,520
extensive review and now we truly do

1483
00:47:25,670 --> 00:47:24,800
believe we have the whole complete

1484
00:47:27,349 --> 00:47:25,680
picture

1485
00:47:29,109 --> 00:47:27,359
and that we can line this up properly

1486
00:47:30,790 --> 00:47:29,119
every single time we do now a whole lot

1487
00:47:33,270 --> 00:47:30,800
of optics measurements on all the parts

1488
00:47:34,630 --> 00:47:33,280

ahead of time match them all up to say

1489
00:47:36,069 --> 00:47:34,640
with the alignments we see on the tank

1490
00:47:38,069 --> 00:47:36,079
and the alignments we see in the in the

1491
00:47:39,510 --> 00:47:38,079
disconnect what's the right combination

1492
00:47:41,589 --> 00:47:39,520
of parts to give you the alignment right

1493
00:47:43,349 --> 00:47:41,599
down the middle um and then we did a

1494
00:47:44,950 --> 00:47:43,359
bunch of offline testing to show that

1495
00:47:46,230 --> 00:47:44,960
that all the movement and the twang and

1496
00:47:47,670 --> 00:47:46,240
the vent arm hooking up and pulling

1497
00:47:49,190 --> 00:47:47,680
around won't move that alignment once

1498
00:47:51,109 --> 00:47:49,200
you get if you can get it good and solid

1499
00:47:52,549 --> 00:47:51,119
to begin with it'll stay there

1500
00:47:54,069 --> 00:47:52,559
and so we have very high confidence that

1501
00:47:55,670 --> 00:47:54,079
we have a good seal when we got out to

1502
00:47:57,349 --> 00:47:55,680
the pad we hooked it up we went back and

1503
00:47:59,030 --> 00:47:57,359
did some data reviews and and there were

1504
00:48:01,030 --> 00:47:59,040
some things there that caused us to to

1505
00:48:02,549 --> 00:48:01,040
question it uh we've since done the math

1506
00:48:04,309 --> 00:48:02,559
to show that we didn't move anything and

1507
00:48:05,750 --> 00:48:04,319
that that was a perfectly good aligned

1508
00:48:07,670 --> 00:48:05,760
system but there was a little bit of

1509
00:48:09,670 --> 00:48:07,680
question there and and we knew by going

1510
00:48:11,030 --> 00:48:09,680
back to the new procedures and processes

1511
00:48:12,790 --> 00:48:11,040
we could remove some of that uncertainty

1512
00:48:14,870 --> 00:48:12,800
so we chose to redo it and just

1513
00:48:16,630 --> 00:48:14,880

basically start back at square one again

1514
00:48:19,030 --> 00:48:16,640
and and so i'm highly confident you know

1515
00:48:20,630 --> 00:48:19,040
we were we kind of gave it a 99.9 chance

1516
00:48:22,230 --> 00:48:20,640
heading into the tanking test and that

1517
00:48:23,670 --> 00:48:22,240
was our proof in the pudding we followed

1518
00:48:25,349 --> 00:48:23,680
the exact same process and procedure to

1519
00:48:26,549 --> 00:48:25,359
hook it back up again so i expect the

1520
00:48:28,309 --> 00:48:26,559
exact same result that we'll have a nice

1521
00:48:30,870 --> 00:48:28,319
tight system

1522
00:48:33,190 --> 00:48:30,880
marcia marsha done associated press for

1523
00:48:35,109 --> 00:48:33,200
either bill or mike moses um regarding

1524
00:48:37,109 --> 00:48:35,119
tim copra um

1525
00:48:39,270 --> 00:48:37,119
did you manage to get his own food

1526
00:48:41,349 --> 00:48:39,280
preferences and his own clothes on

1527
00:48:42,950 --> 00:48:41,359
borders i'm sorry

1528
00:48:45,750 --> 00:48:42,960
are they still on board or did you get

1529
00:48:47,990 --> 00:48:45,760
steve bowen's stuff on board and is tim

1530
00:48:49,510 --> 00:48:48,000
cobra coming for the launch do you know

1531
00:48:50,870 --> 00:48:49,520
i don't know if copper is coming for the

1532
00:48:53,030 --> 00:48:50,880
launch

1533
00:48:54,790 --> 00:48:53,040
we did swap out all the preference

1534
00:48:57,349 --> 00:48:54,800
equipment i think on the food question

1535
00:48:58,630 --> 00:48:57,359
if i looked at the exact math i think uh

1536
00:48:59,990 --> 00:48:58,640
steve chose to keep some of the same

1537
00:49:01,750 --> 00:49:00,000
menu item so i'm not sure we changed out

1538
00:49:03,109 --> 00:49:01,760

a whole lot of menu items

1539
00:49:05,270 --> 00:49:03,119
but yeah he certainly had input we had

1540
00:49:07,670 --> 00:49:05,280
plenty of time to take care of that

1541
00:49:12,069 --> 00:49:07,680
yeah and one other thing to this evening

1542
00:49:13,670 --> 00:49:12,079
at 7 23 if you go outside at 66 degrees

1543
00:49:15,270 --> 00:49:13,680
above the southwest you'll get a chance

1544
00:49:16,870 --> 00:49:15,280
to see station fly over the kennedy

1545
00:49:18,630 --> 00:49:16,880
space center tonight so we ought to go

1546
00:49:20,150 --> 00:49:18,640
do that here in a couple minutes

1547
00:49:22,549 --> 00:49:20,160
and then if you happen to be in houston

1548
00:49:25,270 --> 00:49:22,559
on saturday you get a special treat it's

1549
00:49:27,990 --> 00:49:25,280
6 47 you get to see the space station

1550
00:49:29,750 --> 00:49:28,000
fly over and then at 6 52 on saturday

1551
00:49:31,510 --> 00:49:29,760
night you'll get a chance to see atv

1552
00:49:33,750 --> 00:49:31,520
chasing the space station and catching

1553
00:49:35,270 --> 00:49:33,760
up so the folks in houston get a treat i

1554
00:49:37,430 --> 00:49:35,280
checked here in florida and it doesn't

1555
00:49:38,950 --> 00:49:37,440
doesn't happen here but you can you can

1556
00:49:41,589 --> 00:49:38,960
the guys in florida get a chance to go

1557
00:49:43,109 --> 00:49:41,599
see both the atv and the htv so it's

1558
00:49:44,630 --> 00:49:43,119
it's neat for us to actually go see our

1559
00:49:46,309 --> 00:49:44,640
hardware in orbit and actually see it

1560
00:49:47,670 --> 00:49:46,319
flying overhead you know sometimes we

1561
00:49:49,349 --> 00:49:47,680
see all the view graphs in the meetings

1562
00:49:51,030 --> 00:49:49,359
and we're not sure it's real so it's

1563
00:49:52,549 --> 00:49:51,040

it's even nice for us to go outside

1564
00:49:53,670 --> 00:49:52,559
occasionally and make sure that it's

1565
00:49:55,829 --> 00:49:53,680
really there and it's doing what all

1566
00:49:57,270 --> 00:49:55,839
those guys told us in these meetings so

1567
00:49:59,349 --> 00:49:57,280
that's our confirmation to show that

1568
00:50:02,470 --> 00:49:59,359
orbital mechanics really works so so you

1569
00:50:03,990 --> 00:50:02,480
should do that tonight at 7 23.

1570
00:50:04,710 --> 00:50:04,000
all right and with that we will wrap it

1571
00:50:07,349 --> 00:50:04,720
up

1572
00:50:09,109 --> 00:50:07,359
our next televised event for sts-133

1573
00:50:10,630 --> 00:50:09,119
will be the arrival of the flight crew

1574
00:50:13,670 --> 00:50:10,640
on sunday

1575
00:50:15,829 --> 00:50:13,680
at 3 45 pm eastern time here at kennedy

1576
00:50:19,270 --> 00:50:15,839
space center once again our launch is

1577
00:50:21,670 --> 00:50:19,280
set for thursday february 24th at 4 50

1578
00:50:23,829 --> 00:50:21,680
pm eastern time and you can keep up with