
Johnso

1
00:00:08,710 --> 00:00:06,630
good morning from the johnson space

2
00:00:11,589 --> 00:00:08,720
center in houston texas i'm nasa's josh

3
00:00:13,110 --> 00:00:11,599
byerly coming up in march expedition 35

4
00:00:14,870 --> 00:00:13,120
onboard the international space station

5
00:00:16,550 --> 00:00:14,880
will get kicked off and it's going to be

6
00:00:18,790 --> 00:00:16,560
an incredibly busy time with quite a

7
00:00:20,390 --> 00:00:18,800
number of visiting vehicles spacewalks

8
00:00:22,390 --> 00:00:20,400
that are planned for the crew and also a

9
00:00:23,670 --> 00:00:22,400
ton of science here to give us more

10
00:00:26,950 --> 00:00:23,680
details about what's ahead for

11
00:00:28,630 --> 00:00:26,960
expeditions 35 and 36 is mike safradini

12
00:00:31,429 --> 00:00:28,640
the international space station program

13
00:00:33,670 --> 00:00:31,439

manager as well as tony cicacci nasa

14
00:00:35,830 --> 00:00:33,680
flight director and we are also joined

15
00:00:37,430 --> 00:00:35,840
by dr julie robinson the space station

16
00:00:38,950 --> 00:00:37,440
program scientist we're going to hear

17
00:00:40,150 --> 00:00:38,960
from each one of them and then we'll

18
00:00:41,190 --> 00:00:40,160
take some questions we'll start with

19
00:00:43,510 --> 00:00:41,200
mike

20
00:00:46,150 --> 00:00:43,520
so good morning it's good to be here

21
00:00:47,830 --> 00:00:46,160
again and talk about the iss program and

22
00:00:48,950 --> 00:00:47,840
where we're headed for the next few

23
00:00:50,389 --> 00:00:48,960
months

24
00:00:53,350 --> 00:00:50,399
in fact we're going to discuss with you

25
00:00:56,229 --> 00:00:53,360
today increments 35 and 36 as well and

26
00:00:58,790 --> 00:00:56,239
that takes us towards to towards the end

27
00:01:00,869 --> 00:00:58,800
of the summer of this year and so of

28
00:01:03,750 --> 00:01:00,879
course quite a bit going on

29
00:01:06,149 --> 00:01:03,760
uh before tony tony walks you through uh

30
00:01:07,590 --> 00:01:06,159
the details of those increments and and

31
00:01:09,910 --> 00:01:07,600
julie talks to you about the research

32
00:01:12,390 --> 00:01:09,920
involved i thought i'd just give you a

33
00:01:14,230 --> 00:01:12,400
a few uh highlights of near-term

34
00:01:15,510 --> 00:01:14,240
activities and and talk a little bit

35
00:01:16,390 --> 00:01:15,520
about the vehicles that are about to

36
00:01:18,950 --> 00:01:16,400
come

37
00:01:20,950 --> 00:01:18,960
to iss during that period

38
00:01:22,950 --> 00:01:20,960

on board everything's going very well we

39
00:01:26,230 --> 00:01:22,960
have a few uh minor anomalies we work

40
00:01:29,270 --> 00:01:26,240
through that's not uh unusual we have

41
00:01:31,830 --> 00:01:29,280
one of the ku band systems has a

42
00:01:34,550 --> 00:01:31,840
transmit problem or from an iss

43
00:01:36,149 --> 00:01:34,560
perspective a receive problem

44
00:01:37,670 --> 00:01:36,159
that we're

45
00:01:39,749 --> 00:01:37,680
working through

46
00:01:41,590 --> 00:01:39,759
probably end up being a failed

47
00:01:43,429 --> 00:01:41,600
transceiver that will have to change out

48
00:01:44,950 --> 00:01:43,439
as part of an eba

49
00:01:46,789 --> 00:01:44,960
at some point of course we have two

50
00:01:48,630 --> 00:01:46,799
systems and so we've got all the calm we

51
00:01:51,270 --> 00:01:48,640
need right now

52
00:01:52,870 --> 00:01:51,280
and so we'll have to talk about when we

53
00:01:54,469 --> 00:01:52,880
finally finish our failure investigation

54
00:01:56,389 --> 00:01:54,479
what we do with that

55
00:01:58,230 --> 00:01:56,399
we do have in the columbus module one of

56
00:02:00,789 --> 00:01:58,240
the coolant pumps is down again that's a

57
00:02:02,469 --> 00:02:00,799
redundant pump that we found out when we

58
00:02:03,830 --> 00:02:02,479
were swapping over just to check out the

59
00:02:06,389 --> 00:02:03,840
system

60
00:02:08,229 --> 00:02:06,399
so it's it's been nagging us a little

61
00:02:10,630 --> 00:02:08,239
bit and so we'll we'll work through that

62
00:02:11,830 --> 00:02:10,640
a bit and decide where what what next

63
00:02:12,869 --> 00:02:11,840

steps

64
00:02:14,470 --> 00:02:12,879
should be

65
00:02:16,070 --> 00:02:14,480
on our power systems largely

66
00:02:18,229 --> 00:02:16,080
everything's going well in the power in

67
00:02:19,750 --> 00:02:18,239
the power side we've had a few anomalies

68
00:02:20,949 --> 00:02:19,760
over the past few months that we've

69
00:02:22,550 --> 00:02:20,959
sorted out

70
00:02:25,589 --> 00:02:22,560
however one of our we call them

71
00:02:28,710 --> 00:02:25,599
sequential shunt units on the starboard

72
00:02:30,949 --> 00:02:28,720
inboard array has been acting up and

73
00:02:33,270 --> 00:02:30,959
we've

74
00:02:34,869 --> 00:02:33,280
had a few uh what's called power on

75
00:02:38,390 --> 00:02:34,879
resets and this is where the system

76
00:02:41,830 --> 00:02:38,400
itself resets itself if it thinks it has

77
00:02:43,750 --> 00:02:41,840
some sort of minor anomaly

78
00:02:45,750 --> 00:02:43,760
but there hasn't been any anomaly so the

79
00:02:46,949 --> 00:02:45,760
system's gone through a reset every so

80
00:02:48,470 --> 00:02:46,959
often

81
00:02:51,030 --> 00:02:48,480
that was occurring

82
00:02:52,229 --> 00:02:51,040
semi-regularly for uh for several days

83
00:02:53,750 --> 00:02:52,239
and then as of sunday i don't think

84
00:02:55,270 --> 00:02:53,760
we've seen any since sunday so we're

85
00:02:58,630 --> 00:02:55,280
looking at that

86
00:03:00,790 --> 00:02:58,640
uh so um overall though we've had this

87
00:03:03,430 --> 00:03:00,800
is a kind of a low traffic period for us

88
00:03:06,790 --> 00:03:03,440

on iss and therefore we've done a really

89
00:03:10,309 --> 00:03:06,800
good job of focusing on research

90
00:03:12,550 --> 00:03:10,319
as as you've heard me say many times our

91
00:03:13,830 --> 00:03:12,560
our requirement is to get at least 35

92
00:03:15,990 --> 00:03:13,840
hours a week

93
00:03:17,830 --> 00:03:16,000
of research over the last several weeks

94
00:03:20,470 --> 00:03:17,840
we've been averaging something closer to

95
00:03:22,309 --> 00:03:20,480
about 40 to 45 hours a week

96
00:03:25,350 --> 00:03:22,319
so the team is doing a really good job

97
00:03:27,350 --> 00:03:25,360
of preparing for or conducting research

98
00:03:29,110 --> 00:03:27,360
on board iss

99
00:03:30,070 --> 00:03:29,120
and i think with these increments coming

100
00:03:31,830 --> 00:03:30,080
up

101
00:03:34,390 --> 00:03:31,840
you'll see us to continue to focus on

102
00:03:35,910 --> 00:03:34,400
that uh as we also at this point you

103
00:03:38,470 --> 00:03:35,920
know as we get towards the spring time

104
00:03:43,110 --> 00:03:38,480
frame we will change out the crews as we

105
00:03:45,190 --> 00:03:43,120
go from uh from 34 to 35 and 35 to 36

106
00:03:47,270 --> 00:03:45,200
so you'll see some some crew change out

107
00:03:49,670 --> 00:03:47,280
and also i think tony's going to touch

108
00:03:51,509 --> 00:03:49,680
on this a little bit we're considering

109
00:03:53,110 --> 00:03:51,519
um a uh

110
00:03:55,030 --> 00:03:53,120
the russians already have planned a

111
00:03:55,990 --> 00:03:55,040
couple of evas and we're considering a

112
00:03:57,990 --> 00:03:56,000
uh

113
00:04:00,710 --> 00:03:58,000

perhaps a set of evas in the middle

114
00:04:02,149 --> 00:04:00,720
summer time frame in order to take care

115
00:04:04,550 --> 00:04:02,159
of a backlog of things that we need to

116
00:04:07,190 --> 00:04:04,560
get done outside which would include

117
00:04:09,509 --> 00:04:07,200
replacing this this failed transceiver i

118
00:04:12,309 --> 00:04:09,519
talked about a little bit earlier

119
00:04:13,990 --> 00:04:12,319
so on board everything's going very well

120
00:04:15,589 --> 00:04:14,000
on the ground of course we're preparing

121
00:04:16,550 --> 00:04:15,599
for our next several flights we've got a

122
00:04:25,030 --> 00:04:16,560
progress

123
00:04:26,629 --> 00:04:25,040
11th of february

124
00:04:29,030 --> 00:04:26,639
from a u.s

125
00:04:31,430 --> 00:04:29,040
logistics standpoint we have

126
00:04:34,790 --> 00:04:31,440
the next spacex flight

127
00:04:37,110 --> 00:04:34,800
is the spacex 2 flight to iss and it's

128
00:04:39,030 --> 00:04:37,120
currently scheduled for march 1st

129
00:04:40,070 --> 00:04:39,040
and i don't see anything that would keep

130
00:04:42,710 --> 00:04:40,080
that from

131
00:04:45,590 --> 00:04:42,720
from happening at least not today

132
00:04:48,469 --> 00:04:45,600
uh of course we're uh the the objective

133
00:04:51,189 --> 00:04:48,479
for the first half of this year is to uh

134
00:04:53,430 --> 00:04:51,199
to get the demo flight off the orbital

135
00:04:56,390 --> 00:04:53,440
uh demo flight so we'd like to see the

136
00:04:58,790 --> 00:04:56,400
cygnus spacecraft at iss uh sometime in

137
00:05:00,710 --> 00:04:58,800
the summer time frame and so uh that's

138
00:05:02,790 --> 00:05:00,720

going very well in fact today they're

139
00:05:04,950 --> 00:05:02,800
doing the last step in the cold flow

140
00:05:07,270 --> 00:05:04,960
test uh out at the wallops launch

141
00:05:09,029 --> 00:05:07,280
facility uh this afternoon after lunch i

142
00:05:10,469 --> 00:05:09,039
think they'll get the they'll start the

143
00:05:13,510 --> 00:05:10,479
flowing of the

144
00:05:16,230 --> 00:05:13,520
of the propellant in order to

145
00:05:17,670 --> 00:05:16,240
test that whole system

146
00:05:18,790 --> 00:05:17,680
and then that'll be followed up

147
00:05:22,550 --> 00:05:18,800
immediately

148
00:05:23,510 --> 00:05:22,560
at the end of january by a hot fire test

149
00:05:25,590 --> 00:05:23,520
which is has

150
00:05:27,510 --> 00:05:25,600
been in the works for some time

151
00:05:29,510 --> 00:05:27,520
uh and then the plan is to have the test

152
00:05:32,150 --> 00:05:29,520
flight that we've talked about in in

153
00:05:32,950 --> 00:05:32,160
roughly the march early spring time

154
00:05:35,430 --> 00:05:32,960
frame

155
00:05:39,029 --> 00:05:35,440
uh with the uh the possible launch of

156
00:05:40,550 --> 00:05:39,039
the demo flight uh hopefully in the

157
00:05:43,189 --> 00:05:40,560
summer time frame

158
00:05:45,270 --> 00:05:43,199
so that's the plan for the orbital

159
00:05:47,110 --> 00:05:45,280
vehicle and

160
00:05:48,469 --> 00:05:47,120
many things have come together with the

161
00:05:49,990 --> 00:05:48,479
getting the pad ready and the vehicle

162
00:05:51,830 --> 00:05:50,000
ready to go fly

163
00:05:53,590 --> 00:05:51,840

they've overcome a number of hurdles and

164
00:05:55,590 --> 00:05:53,600
so i think the schedule's starting to

165
00:05:57,749 --> 00:05:55,600
stabilize on that system and so we're

166
00:06:00,390 --> 00:05:57,759
looking forward to it uh coming to iss

167
00:06:02,870 --> 00:06:00,400
as well so overall in the program we're

168
00:06:05,510 --> 00:06:02,880
we're doing very well and i'll hand it

169
00:06:07,189 --> 00:06:05,520
over to tony uh and to julie to tell you

170
00:06:08,550 --> 00:06:07,199
more about the specifics of what's

171
00:06:13,350 --> 00:06:08,560
coming up in these next couple of

172
00:06:16,390 --> 00:06:14,950
oh okay i thought you were going to say

173
00:06:18,309 --> 00:06:16,400
something josh let's get it all kicked

174
00:06:20,629 --> 00:06:18,319
up we'll say good morning

175
00:06:21,990 --> 00:06:20,639
to everyone like mike said uh my plan

176
00:06:23,029 --> 00:06:22,000
today is basically give you a quick

177
00:06:24,950 --> 00:06:23,039
summary

178
00:06:27,830 --> 00:06:24,960
of all the major events we'll be doing

179
00:06:29,110 --> 00:06:27,840
during both uh the increment 35 and 36

180
00:06:31,270 --> 00:06:29,120
time frame

181
00:06:32,550 --> 00:06:31,280
and uh based on our current schedules

182
00:06:35,270 --> 00:06:32,560
and like mike said they're they're

183
00:06:36,950 --> 00:06:35,280
working and negotiating uh uh very

184
00:06:40,469 --> 00:06:36,960
schedules and where we're gonna

185
00:06:43,029 --> 00:06:40,479
execute these things uh see as far as uh

186
00:06:44,950 --> 00:06:43,039
lead flight directors i will be the lead

187
00:06:47,189 --> 00:06:44,960
for increment 35

188
00:06:49,670 --> 00:06:47,199

and i'll be back up for 36 and gary

189
00:06:51,749 --> 00:06:49,680
horlocker one of my flight director

190
00:06:53,430 --> 00:06:51,759
compadres will be doing the lead for

191
00:06:55,589 --> 00:06:53,440
increment 36

192
00:06:59,430 --> 00:06:55,599
and i'll be back up for like and he will

193
00:07:01,589 --> 00:06:59,440
be back up for me on increment 35.

194
00:07:03,189 --> 00:07:01,599
to let's see paint a complete picture i

195
00:07:04,230 --> 00:07:03,199
wanted to talk about who's on board the

196
00:07:06,870 --> 00:07:04,240
station

197
00:07:08,950 --> 00:07:06,880
as of today and that way you can see

198
00:07:12,070 --> 00:07:08,960
here crew i'll go left from right it's

199
00:07:15,430 --> 00:07:12,080
oleg novitskiy of course kevin ford who

200
00:07:16,469 --> 00:07:15,440
is the cdr of increment 34.

201
00:07:18,469 --> 00:07:16,479
we've got

202
00:07:20,629 --> 00:07:18,479
evgeny torrenkin

203
00:07:24,390 --> 00:07:20,639
roman romanenko

204
00:07:26,390 --> 00:07:24,400
got chris hadfield and tom marshborn

205
00:07:29,350 --> 00:07:26,400
so those are the crew on board let's see

206
00:07:31,589 --> 00:07:29,360
uh increment 35 start

207
00:07:34,629 --> 00:07:31,599
the increment 35 start officially begins

208
00:07:36,790 --> 00:07:34,639
with the departure of the 32s crew

209
00:07:38,629 --> 00:07:36,800
and that'll start off prior to departure

210
00:07:40,710 --> 00:07:38,639
of course we have the traditional

211
00:07:43,430 --> 00:07:40,720
official handover ceremony

212
00:07:46,550 --> 00:07:43,440
where kevin ford the anchorman 34 cdr

213
00:07:49,270 --> 00:07:46,560

will hand over command of the iss to

214
00:07:51,909 --> 00:07:49,280
chris hadfield expedition 35 commander

215
00:07:52,950 --> 00:07:51,919
of course this will be the first

216
00:07:55,110 --> 00:07:52,960
commander

217
00:07:57,189 --> 00:07:55,120
for a canadian to take over so i know

218
00:07:59,270 --> 00:07:57,199
the canadians are happy about that when

219
00:08:01,029 --> 00:07:59,280
that occurs it'll begin the increment

220
00:08:03,990 --> 00:08:01,039
35's tenure

221
00:08:06,710 --> 00:08:04,000
the schedule undock of the 32s

222
00:08:09,189 --> 00:08:06,720
crew is on march 15th

223
00:08:11,670 --> 00:08:09,199
of course kevin oleg and

224
00:08:13,110 --> 00:08:11,680
afghani will return to earth after 143

225
00:08:15,430 --> 00:08:13,120
days

226
00:08:16,869 --> 00:08:15,440
in space 141 of those on board the

227
00:08:19,189 --> 00:08:16,879
station

228
00:08:22,070 --> 00:08:19,199
the increment 35

229
00:08:24,869 --> 00:08:22,080
crew begin with uh and again here's rome

230
00:08:28,230 --> 00:08:24,879
roman and tom and chris

231
00:08:30,790 --> 00:08:28,240
they'll be uh starting their uh three we

232
00:08:31,830 --> 00:08:30,800
call it a half crew three-person

233
00:08:35,190 --> 00:08:31,840
increment

234
00:08:37,110 --> 00:08:35,200
for about 16 days and just uh

235
00:08:38,550 --> 00:08:37,120
for a side note today is their 30th day

236
00:08:41,190 --> 00:08:38,560
on space

237
00:08:43,350 --> 00:08:41,200
uh let's see of course i'm sure you guys

238
00:08:45,110 --> 00:08:43,360

already know about the increment 35 crew

239
00:08:47,110 --> 00:08:45,120
but just a quick summary uh chris

240
00:08:49,670 --> 00:08:47,120
hadfield this is he has uh three

241
00:08:52,070 --> 00:08:49,680
previous space flights uh tom marshburn

242
00:08:55,110 --> 00:08:52,080
had one previous and lamont had one

243
00:08:57,269 --> 00:08:55,120
previous uh space flight so they're uh

244
00:08:59,030 --> 00:08:57,279
they're experienced and uh they're

245
00:09:03,269 --> 00:08:59,040
working hard getting caught up on the

246
00:09:07,430 --> 00:09:05,590
let's see here as far as uh

247
00:09:09,509 --> 00:09:07,440
the 34 s

248
00:09:12,790 --> 00:09:09,519
crew arrival that'll that crew will

249
00:09:15,430 --> 00:09:12,800
complete the increment 35

250
00:09:16,630 --> 00:09:15,440
team compliment get us up to six

251
00:09:19,269 --> 00:09:16,640
crew members

252
00:09:22,070 --> 00:09:19,279
uh basically the increment 30

253
00:09:24,310 --> 00:09:22,080
4 s crew will arrive about 17 days after

254
00:09:26,550 --> 00:09:24,320
the 32 s departure

255
00:09:28,389 --> 00:09:26,560
that'd be on march 28th

256
00:09:30,150 --> 00:09:28,399
and uh right now they're scheduled for a

257
00:09:31,750 --> 00:09:30,160
march 30th

258
00:09:33,030 --> 00:09:31,760
docking and i know there's discussion

259
00:09:35,509 --> 00:09:33,040
about

260
00:09:37,509 --> 00:09:35,519
docking uh within four rebs and i think

261
00:09:39,030 --> 00:09:37,519
that has a couple of

262
00:09:40,470 --> 00:09:39,040
additional discussions that have to be

263
00:09:41,590 --> 00:09:40,480

made to determine if that's what we want

264
00:09:44,790 --> 00:09:41,600
to do

265
00:09:46,470 --> 00:09:44,800
but basically a 34s will dock on mrm2

266
00:09:50,070 --> 00:09:46,480
the of course

267
00:09:52,070 --> 00:09:50,080
the sm zenith docking port and that crew

268
00:09:54,710 --> 00:09:52,080
from left to right will include uh chris

269
00:09:56,150 --> 00:09:54,720
cassidy this will be uh chris's second

270
00:09:57,750 --> 00:09:56,160
space flight

271
00:09:59,509 --> 00:09:57,760
and

272
00:10:01,829 --> 00:09:59,519
what's unique is that he previously flew

273
00:10:03,190 --> 00:10:01,839
on sts-127 with tom

274
00:10:04,870 --> 00:10:03,200
so that was their

275
00:10:05,590 --> 00:10:04,880
first space flight together

276
00:10:06,550 --> 00:10:05,600
uh

277
00:10:07,829 --> 00:10:06,560
pablo

278
00:10:10,710 --> 00:10:07,839
vinogradov

279
00:10:13,590 --> 00:10:10,720
he'll be the uh he would be the soyuz

280
00:10:16,150 --> 00:10:13,600
34s commander and also will be the

281
00:10:19,030 --> 00:10:16,160
increment 36 commander and then

282
00:10:20,630 --> 00:10:19,040
alexander zirkin he'll be a flight

283
00:10:23,910 --> 00:10:20,640
engineer

284
00:10:25,750 --> 00:10:23,920
see if we get the next one increment 35

285
00:10:26,870 --> 00:10:25,760
six crew pitcher here's all the folks

286
00:10:28,949 --> 00:10:26,880
together

287
00:10:31,030 --> 00:10:28,959
and they'll be uh

288
00:10:34,389 --> 00:10:31,040

on board to uh bringing the compliment

289
00:10:37,910 --> 00:10:36,069
oh let's see mike talked about a bunch

290
00:10:39,829 --> 00:10:37,920
of visiting vehicle traffic but before i

291
00:10:42,870 --> 00:10:39,839
wanted to talk about that i thought it

292
00:10:45,110 --> 00:10:42,880
would just be simple to finish up the

293
00:10:47,190 --> 00:10:45,120
soyuz traffic and

294
00:10:49,430 --> 00:10:47,200
talk about when the 30 increment 35 will

295
00:10:50,550 --> 00:10:49,440
end and 36 will begin

296
00:10:52,630 --> 00:10:50,560
so uh

297
00:10:53,829 --> 00:10:52,640
we'll transition to increment 36 of

298
00:10:55,990 --> 00:10:53,839
course uh

299
00:10:57,910 --> 00:10:56,000
after the 33s crew

300
00:11:00,069 --> 00:10:57,920
departs and like i talked about before

301
00:11:01,590 --> 00:11:00,079
we'll do the uh traditional handover

302
00:11:03,670 --> 00:11:01,600
ceremony where

303
00:11:06,230 --> 00:11:03,680
chris who is the increment

304
00:11:08,790 --> 00:11:06,240
35 commander will hand over the station

305
00:11:10,230 --> 00:11:08,800
range to pavel

306
00:11:12,470 --> 00:11:10,240
see

307
00:11:15,030 --> 00:11:12,480
the schedule on docker the 33s soyuz

308
00:11:17,190 --> 00:11:15,040
from the iss is may 14th

309
00:11:18,870 --> 00:11:17,200
of course chris roman and tom

310
00:11:21,509 --> 00:11:18,880
coming down on the soyuz and returning

311
00:11:24,550 --> 00:11:21,519
to earth after 146 days on space which

312
00:11:26,310 --> 00:11:24,560
144 will be on the station

313
00:11:28,550 --> 00:11:26,320

see in that and at that point in time

314
00:11:30,069 --> 00:11:28,560
the increment 36 guys will be in their

315
00:11:31,670 --> 00:11:30,079
half compliment

316
00:11:33,990 --> 00:11:31,680
crew and

317
00:11:36,150 --> 00:11:34,000
of course there's their 36 pass at this

318
00:11:38,230 --> 00:11:36,160
time is when gary horlocker will be

319
00:11:41,350 --> 00:11:38,240
taking over as the lead flight director

320
00:11:46,310 --> 00:11:43,590
see 35s arrival well of course we only

321
00:11:47,670 --> 00:11:46,320
have three uh increment 36 crew members

322
00:11:50,790 --> 00:11:47,680
on board so we need to get the other

323
00:11:52,790 --> 00:11:50,800
three up there here you see uh 35 soyuz

324
00:11:54,710 --> 00:11:52,800
is scheduled to arrive on may 9th

325
00:11:57,910 --> 00:11:54,720
i'm sorry may 30th

326
00:11:59,590 --> 00:11:57,920
uh and we'll dock to the mrm fgb mrm1

327
00:12:01,350 --> 00:11:59,600
fgb nader

328
00:12:03,269 --> 00:12:01,360
of course in the crew left from right

329
00:12:06,949 --> 00:12:03,279
it'd be karen nyberg this is karen's

330
00:12:09,670 --> 00:12:06,959
second flight she flew on sts-134

331
00:12:11,269 --> 00:12:09,680
fyodor yurchikhin this will be his

332
00:12:12,629 --> 00:12:11,279
fourth space flight

333
00:12:15,430 --> 00:12:12,639
and then

334
00:12:18,470 --> 00:12:15,440
my paisan luca promitano this will be

335
00:12:21,509 --> 00:12:18,480
his uh first base plate

336
00:12:25,750 --> 00:12:21,519
and that'll bring the increment 36 crew

337
00:12:29,829 --> 00:12:27,590
let's talk about uh visiting vehicle

338
00:12:31,829 --> 00:12:29,839

traffic a little bit i know mike talked

339
00:12:33,350 --> 00:12:31,839
a little bit about the progress is

340
00:12:35,190 --> 00:12:33,360
coming up

341
00:12:37,110 --> 00:12:35,200
what i like to do is just go through

342
00:12:39,509 --> 00:12:37,120
through the whole increment 35 and 36

343
00:12:40,949 --> 00:12:39,519
we'll be having three undocks

344
00:12:43,269 --> 00:12:40,959
and of course two launches and two

345
00:12:45,350 --> 00:12:43,279
dockings you can see here the

346
00:12:47,269 --> 00:12:45,360
progress

347
00:12:48,710 --> 00:12:47,279
coming towards the station and you know

348
00:12:50,949 --> 00:12:48,720
all you guys know that this is a

349
00:12:53,030 --> 00:12:50,959
automated rendezvous

350
00:12:55,190 --> 00:12:53,040
that will dock to the station

351
00:12:57,350 --> 00:12:55,200
uh i'll just give the quick dates uh

352
00:12:58,230 --> 00:12:57,360
let's see we do have 49 p is already on

353
00:13:00,629 --> 00:12:58,240
board

354
00:13:01,910 --> 00:13:00,639
that's going to undock on april 15th is

355
00:13:03,350 --> 00:13:01,920
the plan

356
00:13:04,949 --> 00:13:03,360
and i think we're going to have each one

357
00:13:06,629 --> 00:13:04,959
of the where the locations of the

358
00:13:09,110 --> 00:13:06,639
different

359
00:13:13,110 --> 00:13:09,120
progresses or docking and such

360
00:13:15,750 --> 00:13:13,120
50p undock is going to be april 23rd we

361
00:13:18,949 --> 00:13:15,760
have a 51p launch it's going to be april

362
00:13:20,870 --> 00:13:18,959
24th and docking on april 26 to the

363
00:13:24,150 --> 00:13:20,880

docking compartment one

364
00:13:26,550 --> 00:13:24,160
51p will undock on july 23rd

365
00:13:29,269 --> 00:13:26,560
and then 52p launch uh

366
00:13:30,949 --> 00:13:29,279
will be july 24th docking and 26 and

367
00:13:31,990 --> 00:13:30,959
that'll be all the progress traffic

368
00:13:35,110 --> 00:13:32,000
during the

369
00:13:37,430 --> 00:13:35,120
increment 3536

370
00:13:39,350 --> 00:13:37,440
time

371
00:13:41,590 --> 00:13:39,360
i think a commercial crew mike talked a

372
00:13:43,910 --> 00:13:41,600
little bit about the schedules for that

373
00:13:45,910 --> 00:13:43,920
the dates that i presented are basically

374
00:13:48,389 --> 00:13:45,920
what's on the baseline that came out in

375
00:13:50,389 --> 00:13:48,399
november and like again

376
00:13:52,790 --> 00:13:50,399
mike said they're still discussing

377
00:13:54,470 --> 00:13:52,800
different uh launch dates and

378
00:13:57,189 --> 00:13:54,480
and on burst and such but i wanted to

379
00:13:59,269 --> 00:13:57,199
talk first about the spacex

380
00:14:01,350 --> 00:13:59,279
of course spacex will be their birth to

381
00:14:03,110 --> 00:14:01,360
note 2 when the increment

382
00:14:04,389 --> 00:14:03,120
35 starts

383
00:14:07,189 --> 00:14:04,399
so they'll be doing a lot of work with

384
00:14:11,430 --> 00:14:09,030
unbirth right now

385
00:14:13,269 --> 00:14:11,440
is uh scheduled for april 2nd

386
00:14:15,030 --> 00:14:13,279
i know we're still having discussions on

387
00:14:16,470 --> 00:14:15,040
if that's the day we're going to unbirth

388
00:14:18,870 --> 00:14:16,480

or not but that's currently on the

389
00:14:21,750 --> 00:14:18,880
manifest

390
00:14:24,710 --> 00:14:21,760
as far as the orbital commercial traffic

391
00:14:27,110 --> 00:14:24,720
mike already talked about trying to get

392
00:14:28,629 --> 00:14:27,120
the demo mission one main and voids of

393
00:14:30,870 --> 00:14:28,639
the cygnus

394
00:14:32,550 --> 00:14:30,880
up to the station currently

395
00:14:34,710 --> 00:14:32,560
and i know that it's going to change uh

396
00:14:35,910 --> 00:14:34,720
launch is april 5th with uh docking

397
00:14:38,069 --> 00:14:35,920
april 10th

398
00:14:39,829 --> 00:14:38,079
and basically it's a standard thing what

399
00:14:41,590 --> 00:14:39,839
we've been doing is with spacex where

400
00:14:45,750 --> 00:14:41,600
the crew will go ahead and

401
00:14:47,269 --> 00:14:45,760
grapple it and birth it to the node to

402
00:14:48,870 --> 00:14:47,279
nader port

403
00:14:50,870 --> 00:14:48,880
and right now on the schedule during the

404
00:14:52,069 --> 00:14:50,880
increment time frame we have do have

405
00:14:55,030 --> 00:14:52,079
orbital one

406
00:14:58,870 --> 00:14:55,040
for august 13th but i know based on when

407
00:15:01,269 --> 00:14:58,880
d1 launches uh will adjust that launch

408
00:15:02,389 --> 00:15:01,279
as required

409
00:15:05,350 --> 00:15:02,399
see uh

410
00:15:06,790 --> 00:15:05,360
atv4 that's uh scheduled to come up

411
00:15:09,269 --> 00:15:06,800
during our

412
00:15:10,949 --> 00:15:09,279
increment again another automated

413
00:15:12,470 --> 00:15:10,959

rendezvous and that will be docking to

414
00:15:14,710 --> 00:15:12,480
the uh

415
00:15:15,990 --> 00:15:14,720
after the sm

416
00:15:17,990 --> 00:15:16,000
see the launch right now is scheduled

417
00:15:21,110 --> 00:15:18,000
for april 18th

418
00:15:23,269 --> 00:15:21,120
uh docking may 1st and then

419
00:15:26,949 --> 00:15:23,279
undocking will be after our increment

420
00:15:29,749 --> 00:15:26,959
but october 15th just to close that out

421
00:15:31,749 --> 00:15:29,759
as far as htv

422
00:15:34,710 --> 00:15:31,759
again

423
00:15:36,710 --> 00:15:34,720
the launch for htv is uh no earlier than

424
00:15:38,790 --> 00:15:36,720
july 15th

425
00:15:42,389 --> 00:15:38,800
and capturing birthing will be on july

426
00:15:45,350 --> 00:15:42,399
20th and unbird and release will be

427
00:15:49,990 --> 00:15:47,110
so mike talked about

428
00:15:52,389 --> 00:15:50,000
the evas right now the russians have

429
00:15:53,509 --> 00:15:52,399
four evas scheduled during the increment

430
00:15:55,829 --> 00:15:53,519
time frame

431
00:15:58,069 --> 00:15:55,839
the first one uh

432
00:16:00,470 --> 00:15:58,079
spacewalk number 32 it'll be

433
00:16:02,389 --> 00:16:00,480
roman and pavel doing that one

434
00:16:06,310 --> 00:16:02,399
and then they have

435
00:16:09,509 --> 00:16:06,320
33 34 and 35 june 26 august 15th and

436
00:16:12,069 --> 00:16:09,519
august 21st and fyodor and alexander

437
00:16:15,509 --> 00:16:12,079
will be doing those three evas

438
00:16:17,030 --> 00:16:15,519

as far as u.s evas like mike discussed

439
00:16:19,189 --> 00:16:17,040
right now three va's are under

440
00:16:21,590 --> 00:16:19,199
evaluation

441
00:16:22,550 --> 00:16:21,600
consideration for the june july time

442
00:16:24,550 --> 00:16:22,560
frame

443
00:16:25,829 --> 00:16:24,560
like mike had talked about last year we

444
00:16:28,069 --> 00:16:25,839
had some uh

445
00:16:31,430 --> 00:16:28,079
evas we had contingency evas that we had

446
00:16:33,829 --> 00:16:31,440
to go out and perform for the mbsu and

447
00:16:36,470 --> 00:16:33,839
try to determine uh leak troubleshooting

448
00:16:38,710 --> 00:16:36,480
on the the 2b solar array so a lot of

449
00:16:40,310 --> 00:16:38,720
tasks got removed from the list

450
00:16:42,470 --> 00:16:40,320
and

451
00:16:43,749 --> 00:16:42,480
for this summer looks like the best

452
00:16:45,509 --> 00:16:43,759
time to probably

453
00:16:46,949 --> 00:16:45,519
complete those tasks get caught up to

454
00:16:47,910 --> 00:16:46,959
date and of course they're still looking

455
00:16:49,749 --> 00:16:47,920
at

456
00:16:52,629 --> 00:16:49,759
sergeant sarge's and see if we want to

457
00:16:54,949 --> 00:16:52,639
re-lube those and also the ams

458
00:16:56,470 --> 00:16:54,959
possibly putting a mli cover on that due

459
00:16:58,389 --> 00:16:56,480
to some of the thermal concerns that

460
00:17:00,949 --> 00:16:58,399
they've been seeing

461
00:17:03,110 --> 00:17:00,959
uh let's see and for those evas i didn't

462
00:17:05,350 --> 00:17:03,120
mention that it would be chris cassidy

463
00:17:08,069 --> 00:17:05,360

and luca performing those

464
00:17:09,429 --> 00:17:08,079
as far as uh the inclement increment 36

465
00:17:11,189 --> 00:17:09,439
completion

466
00:17:13,669 --> 00:17:11,199
increment 36 comes to an end with a

467
00:17:16,069 --> 00:17:13,679
departure of the 34s crew

468
00:17:17,429 --> 00:17:16,079
and their departure

469
00:17:19,590 --> 00:17:17,439
is scheduled for

470
00:17:21,429 --> 00:17:19,600
september 11th and prior to that of

471
00:17:24,069 --> 00:17:21,439
course uh pablo will be handing over the

472
00:17:26,710 --> 00:17:24,079
command of the iss to fyodor beginning

473
00:17:29,510 --> 00:17:26,720
the increment 37's tenure

474
00:17:31,350 --> 00:17:29,520
and let's see as far as 34s crew they'll

475
00:17:32,789 --> 00:17:31,360
be coming home on september 11th right

476
00:17:33,669 --> 00:17:32,799
now is a schedule like i talked and

477
00:17:37,510 --> 00:17:33,679
they'll be

478
00:17:39,350 --> 00:17:37,520
up in space for 167 days 165 of those uh

479
00:17:40,630 --> 00:17:39,360
onboard the station

480
00:17:43,270 --> 00:17:40,640
let's see and that's all i have for you

481
00:17:45,110 --> 00:17:43,280
is a quick summary of the major events

482
00:17:46,470 --> 00:17:45,120
so i'll hand it over to julie to talk

483
00:17:47,909 --> 00:17:46,480
about all the

484
00:17:49,350 --> 00:17:47,919
neat science stuff we'll be doing on the

485
00:17:51,190 --> 00:17:49,360
station

486
00:17:53,110 --> 00:17:51,200
well thanks tony you know all those

487
00:17:54,789 --> 00:17:53,120
operational activities that that tony

488
00:17:56,870 --> 00:17:54,799

just talked about are really for a

489
00:17:58,950 --> 00:17:56,880
reason and that reason is to carry out

490
00:18:00,950 --> 00:17:58,960
the robust research program that we have

491
00:18:03,830 --> 00:18:00,960
going on on the space station so for

492
00:18:05,590 --> 00:18:03,840
expedition 3536 i'm just going to give

493
00:18:07,350 --> 00:18:05,600
you some brief highlights of a few

494
00:18:09,990 --> 00:18:07,360
select investigations

495
00:18:12,630 --> 00:18:10,000
overall we have just in kibo columbus

496
00:18:14,710 --> 00:18:12,640
and destiny we'll have over 137

497
00:18:17,590 --> 00:18:14,720
investigations active

498
00:18:20,710 --> 00:18:17,600
during expedition 35 and 36

499
00:18:23,750 --> 00:18:20,720
80 of those are led by u.s funded or u.s

500
00:18:26,150 --> 00:18:23,760
supported investigators about 25 percent

501
00:18:27,990 --> 00:18:26,160
of our investigations are sponsored

502
00:18:30,710 --> 00:18:28,000
under the declaration of iss as a

503
00:18:32,870 --> 00:18:30,720
national laboratory this started back in

504
00:18:34,549 --> 00:18:32,880
2005 when we were dead we were declared

505
00:18:36,870 --> 00:18:34,559
a national laboratory by congress and

506
00:18:39,190 --> 00:18:36,880
that represents our users that are from

507
00:18:40,710 --> 00:18:39,200
other government agencies uh commercial

508
00:18:42,710 --> 00:18:40,720
companies the private sector and

509
00:18:44,630 --> 00:18:42,720
non-profit organizations so they're not

510
00:18:45,750 --> 00:18:44,640
funded by nasa

511
00:18:47,830 --> 00:18:45,760
we're also

512
00:18:49,190 --> 00:18:47,840
serving the needs of over 400

513
00:18:50,630 --> 00:18:49,200

investigators

514
00:18:52,710 --> 00:18:50,640
from around the world and those

515
00:18:54,950 --> 00:18:52,720
investigators represent 28 different

516
00:18:56,710 --> 00:18:54,960
countries and

517
00:18:58,470 --> 00:18:56,720
you saw in the in the graphic that was

518
00:19:00,870 --> 00:18:58,480
up those colors represented the

519
00:19:02,950 --> 00:19:00,880
different disciplines and so we have uh

520
00:19:05,270 --> 00:19:02,960
biology and biotechnology earth and

521
00:19:07,350 --> 00:19:05,280
space sciences education and cultural

522
00:19:10,470 --> 00:19:07,360
activities human research focused on

523
00:19:12,230 --> 00:19:10,480
human physiology and future exploration

524
00:19:14,230 --> 00:19:12,240
physical sciences and technology

525
00:19:16,150 --> 00:19:14,240
development and demonstration

526
00:19:17,750 --> 00:19:16,160
so with that number of investigations

527
00:19:19,909 --> 00:19:17,760
obviously i can't give you a very

528
00:19:22,230 --> 00:19:19,919
detailed rundown of most of them what i

529
00:19:24,470 --> 00:19:22,240
did was select five investigations

530
00:19:26,070 --> 00:19:24,480
covering that breadth of disciplines

531
00:19:27,750 --> 00:19:26,080
linked to some of our past research

532
00:19:30,070 --> 00:19:27,760
results and

533
00:19:32,549 --> 00:19:30,080
that are kind of new in this starting up

534
00:19:34,310 --> 00:19:32,559
in expedition 35. so the first i want to

535
00:19:36,310 --> 00:19:34,320
talk about is from the biology area and

536
00:19:37,909 --> 00:19:36,320
it's called microbiome

537
00:19:40,070 --> 00:19:37,919
some recent discoveries over the last

538
00:19:42,870 --> 00:19:40,080

few years in the microbial sciences have

539
00:19:44,870 --> 00:19:42,880
shown us that bacteria account for

540
00:19:47,830 --> 00:19:44,880
basically 10 times more cells in our

541
00:19:49,750 --> 00:19:47,840
body than our ver our own cells so we're

542
00:19:52,150 --> 00:19:49,760
outnumbered 10 to 1 everywhere we go by

543
00:19:54,630 --> 00:19:52,160
the bacteria that we carry with us and

544
00:19:56,390 --> 00:19:54,640
we know that in space flight bacteria

545
00:19:58,310 --> 00:19:56,400
grow quite differently we also know that

546
00:20:00,470 --> 00:19:58,320
the human immune system is affected

547
00:20:02,710 --> 00:20:00,480
significantly and so what we'll be doing

548
00:20:04,950 --> 00:20:02,720
in this project is collecting samples

549
00:20:07,270 --> 00:20:04,960
from iss crew members before during and

550
00:20:09,909 --> 00:20:07,280
after their missions to the iss and also

551
00:20:11,669 --> 00:20:09,919
looking at the environment of the iss

552
00:20:13,270 --> 00:20:11,679
and the diet and other aspects other

553
00:20:15,350 --> 00:20:13,280
ways that humans

554
00:20:17,270 --> 00:20:15,360
have bacteria come into their systems

555
00:20:18,789 --> 00:20:17,280
and we'll be looking at their stress

556
00:20:19,750 --> 00:20:18,799
levels and their immune system function

557
00:20:21,270 --> 00:20:19,760
as well

558
00:20:23,430 --> 00:20:21,280
it's important from an exploration

559
00:20:25,350 --> 00:20:23,440
perspective because this research will

560
00:20:27,750 --> 00:20:25,360
help us predict how long-term space

561
00:20:29,430 --> 00:20:27,760
travel which is basically humans and the

562
00:20:30,870 --> 00:20:29,440
microbes that go with us

563
00:20:33,190 --> 00:20:30,880

is going to affect those communities

564
00:20:34,630 --> 00:20:33,200
those ecological communities but also

565
00:20:36,390 --> 00:20:34,640
it's really important because it's

566
00:20:37,830 --> 00:20:36,400
addressing a

567
00:20:39,909 --> 00:20:37,840
top recommendation of the national

568
00:20:41,669 --> 00:20:39,919
academies of sciences last year when

569
00:20:44,390 --> 00:20:41,679
they suggested that iss needed to be

570
00:20:45,830 --> 00:20:44,400
developed as a microbial observatory to

571
00:20:47,190 --> 00:20:45,840
address some of these new findings that

572
00:20:48,390 --> 00:20:47,200
have been made across the scientific

573
00:20:49,990 --> 00:20:48,400
community and so this is one of the

574
00:20:51,909 --> 00:20:50,000
first studies that really starts

575
00:20:53,430 --> 00:20:51,919
addressing that recommendation and

576
00:20:55,270 --> 00:20:53,440
that's important because of the benefits

577
00:20:57,350 --> 00:20:55,280
back here on earth if we can understand

578
00:20:59,510 --> 00:20:57,360
how microbial communities work and take

579
00:21:01,350 --> 00:20:59,520
advantage of the iss as a relatively

580
00:21:03,350 --> 00:21:01,360
isolated environment there's a lot of

581
00:21:05,990 --> 00:21:03,360
basic science and then improvements in

582
00:21:08,710 --> 00:21:06,000
health on earth that we can make

583
00:21:10,870 --> 00:21:08,720
moving to human physiology we have a new

584
00:21:13,350 --> 00:21:10,880
investigation starting in expedition 35

585
00:21:14,789 --> 00:21:13,360
called ocular health and this is an

586
00:21:17,110 --> 00:21:14,799
important investigation because it

587
00:21:19,510 --> 00:21:17,120
builds off a discovery made through our

588
00:21:21,029 --> 00:21:19,520

space medicine about two years ago it

589
00:21:23,270 --> 00:21:21,039
will be the first experiment to

590
00:21:25,590 --> 00:21:23,280
characterize the risk of what we're now

591
00:21:27,909 --> 00:21:25,600
calling microgravity induced visual

592
00:21:29,590 --> 00:21:27,919
impairment and intracranial pressure

593
00:21:31,669 --> 00:21:29,600
essentially what we've discovered is

594
00:21:34,070 --> 00:21:31,679
that astronauts some astronauts on orbit

595
00:21:36,230 --> 00:21:34,080
not all of them but they have real

596
00:21:39,590 --> 00:21:36,240
changes in fluid shifts in their bodies

597
00:21:41,190 --> 00:21:39,600
and uh that that leads them to uh both

598
00:21:42,710 --> 00:21:41,200
have changes in their vision and also

599
00:21:44,870 --> 00:21:42,720
changes in the pressure in their central

600
00:21:45,990 --> 00:21:44,880
nervous system about 20 percent of the

601
00:21:47,270 --> 00:21:46,000
astronauts that have flown to the

602
00:21:49,430 --> 00:21:47,280
international space station have

603
00:21:51,029 --> 00:21:49,440
reported these kinds of vision changes

604
00:21:52,870 --> 00:21:51,039
so what we're going to be doing is

605
00:21:54,230 --> 00:21:52,880
taking detailed scientific measurements

606
00:21:55,270 --> 00:21:54,240
here you see

607
00:21:56,789 --> 00:21:55,280
sunny

608
00:21:58,070 --> 00:21:56,799
having some tomography measurements

609
00:21:59,669 --> 00:21:58,080
taken of her eye you may have had

610
00:22:01,510 --> 00:21:59,679
something like this in a doctor's office

611
00:22:03,750 --> 00:22:01,520
where you have some anesthetizing eye

612
00:22:05,750 --> 00:22:03,760
drops and then they use that direct

613
00:22:07,430 --> 00:22:05,760

contact to tap and actually measure the

614
00:22:08,230 --> 00:22:07,440
pressure of the fluid that's inside the

615
00:22:11,270 --> 00:22:08,240
eye

616
00:22:13,110 --> 00:22:11,280
you also saw some video of ultrasounds

617
00:22:14,789 --> 00:22:13,120
and and here's another instrument being

618
00:22:17,190 --> 00:22:14,799
used to characterize the eye so we'll be

619
00:22:18,870 --> 00:22:17,200
taking systematic measurements to really

620
00:22:20,070 --> 00:22:18,880
try and understand this process for the

621
00:22:22,310 --> 00:22:20,080
first time

622
00:22:23,990 --> 00:22:22,320
this is an example of why we really need

623
00:22:26,149 --> 00:22:24,000
long-duration human space flight with

624
00:22:28,310 --> 00:22:26,159
multiple crew members to understand all

625
00:22:30,230 --> 00:22:28,320
the different effects on the human body

626
00:22:32,390 --> 00:22:30,240
but it's also interesting that that this

627
00:22:34,470 --> 00:22:32,400
is a process that was not predicted from

628
00:22:36,070 --> 00:22:34,480
what we know about human health on earth

629
00:22:38,070 --> 00:22:36,080
and we even have some results now that

630
00:22:39,590 --> 00:22:38,080
have come out that suggest that what

631
00:22:41,350 --> 00:22:39,600
we're seeing in astronauts in orbit

632
00:22:43,110 --> 00:22:41,360
could link to ways of understanding

633
00:22:45,190 --> 00:22:43,120
cardiovascular disease high blood

634
00:22:46,390 --> 00:22:45,200
pressure and other aspects in

635
00:22:47,909 --> 00:22:46,400
in people on earth that might not be

636
00:22:50,070 --> 00:22:47,919
quite as healthy as our astronauts are

637
00:22:52,149 --> 00:22:50,080
in orbit

638
00:22:53,750 --> 00:22:52,159

and so so we're really excited to have

639
00:22:56,549 --> 00:22:53,760
this important study kicking off it will

640
00:22:57,990 --> 00:22:56,559
take place over about two years

641
00:22:59,270 --> 00:22:58,000
next i want to shift from human

642
00:23:01,510 --> 00:22:59,280
physiology

643
00:23:03,510 --> 00:23:01,520
focused on exploration to technology

644
00:23:05,430 --> 00:23:03,520
demonstration focused on exploration and

645
00:23:08,070 --> 00:23:05,440
really just yesterday on iss we started

646
00:23:10,149 --> 00:23:08,080
a study called ubnt or ultrasonic

647
00:23:12,950 --> 00:23:10,159
background noise test

648
00:23:14,549 --> 00:23:12,960
this test is to observe the high

649
00:23:15,990 --> 00:23:14,559
frequency noise levels that are

650
00:23:18,789 --> 00:23:16,000
background on the international space

651
00:23:20,549 --> 00:23:18,799
station and develop an understanding of

652
00:23:23,190 --> 00:23:20,559
what those noise levels are so that we

653
00:23:25,350 --> 00:23:23,200
can then develop a tool to

654
00:23:26,950 --> 00:23:25,360
automatically detect leaks you can think

655
00:23:29,270 --> 00:23:26,960
of a leak as having some kind of a

656
00:23:30,870 --> 00:23:29,280
hissing noise and these ultrasonic

657
00:23:33,270 --> 00:23:30,880
detectors and you see a training video

658
00:23:34,390 --> 00:23:33,280
here of someone putting the epoxy on one

659
00:23:36,710 --> 00:23:34,400
of these detectors and actually

660
00:23:39,430 --> 00:23:36,720
attaching it onto

661
00:23:41,430 --> 00:23:39,440
the space behind a rack and basically

662
00:23:43,510 --> 00:23:41,440
what will what the acoustic engineers

663
00:23:45,430 --> 00:23:43,520

will be doing is developing a profile of

664
00:23:47,430 --> 00:23:45,440
what normal noises are like

665
00:23:49,430 --> 00:23:47,440
inside the iss and then they'll be able

666
00:23:51,510 --> 00:23:49,440
to start developing algorithms to detect

667
00:23:52,789 --> 00:23:51,520
abnormal noises including the kind of

668
00:23:54,950 --> 00:23:52,799
noises you might get if there's air

669
00:23:56,630 --> 00:23:54,960
leaking through the pressure wall and so

670
00:23:58,789 --> 00:23:56,640
this will be an important advance in the

671
00:24:00,070 --> 00:23:58,799
way that we approach spacecraft safety

672
00:24:02,950 --> 00:24:00,080
and leak detection for future

673
00:24:05,110 --> 00:24:02,960
exploration missions

674
00:24:07,190 --> 00:24:05,120
next i'll shift from technology

675
00:24:09,909 --> 00:24:07,200
demonstration to some a more fundamental

676
00:24:12,149 --> 00:24:09,919
physical process and that is combustion

677
00:24:15,110 --> 00:24:12,159
last year we had a really neat discovery

678
00:24:17,029 --> 00:24:15,120
in our combustion rack and

679
00:24:18,310 --> 00:24:17,039
based on one of the the combustion

680
00:24:20,710 --> 00:24:18,320
experiments we were doing where we were

681
00:24:22,230 --> 00:24:20,720
burning uh very simple fuels

682
00:24:23,830 --> 00:24:22,240
in this case heptane

683
00:24:26,149 --> 00:24:23,840
heptane drops and this was from an

684
00:24:28,390 --> 00:24:26,159
experiment called flex it was the first

685
00:24:30,950 --> 00:24:28,400
time that scientists had observed a low

686
00:24:32,630 --> 00:24:30,960
temperature soot free cool flame now

687
00:24:34,470 --> 00:24:32,640
cool flame sounds kind of strange a

688
00:24:36,549 --> 00:24:34,480

normal flame is about 1400 degrees

689
00:24:39,110 --> 00:24:36,559
celsius and a cool flame is about 600

690
00:24:41,190 --> 00:24:39,120
degrees celsius we have a video to show

691
00:24:42,390 --> 00:24:41,200
you uh from the inside of the combustion

692
00:24:44,390 --> 00:24:42,400
rack that shows you what this

693
00:24:46,230 --> 00:24:44,400
observation is so you see the droplet

694
00:24:48,310 --> 00:24:46,240
the droplets ignited and you see the

695
00:24:50,390 --> 00:24:48,320
burning go on then you'll see an

696
00:24:52,470 --> 00:24:50,400
extinction where it gets dark

697
00:24:54,390 --> 00:24:52,480
it goes out but the flame the burning

698
00:24:55,750 --> 00:24:54,400
actually continues and then in the end

699
00:24:58,390 --> 00:24:55,760
you can see that through a

700
00:24:59,750 --> 00:24:58,400
chemiluminescent afterglow that comes

701
00:25:01,350 --> 00:24:59,760
back afterwards and so that's how

702
00:25:02,549 --> 00:25:01,360
scientists know that the flame continued

703
00:25:04,390 --> 00:25:02,559
to burn

704
00:25:06,310 --> 00:25:04,400
uh so this is has really important

705
00:25:08,390 --> 00:25:06,320
applications on earth because this is

706
00:25:10,310 --> 00:25:08,400
something you just can't study any other

707
00:25:11,750 --> 00:25:10,320
way this kind of droplets staying in one

708
00:25:14,070 --> 00:25:11,760
place and being controllable and

709
00:25:15,909 --> 00:25:14,080
measurable without having convection

710
00:25:17,590 --> 00:25:15,919
drawing a flame upward in the point that

711
00:25:19,750 --> 00:25:17,600
we normally see say when we're burning a

712
00:25:21,269 --> 00:25:19,760
candle on earth this is a fundamental

713
00:25:22,630 --> 00:25:21,279

property of combustion you can only

714
00:25:24,710 --> 00:25:22,640
study in space

715
00:25:26,710 --> 00:25:24,720
and this gives us some insights in some

716
00:25:28,470 --> 00:25:26,720
ways to improve internal combustion

717
00:25:30,390 --> 00:25:28,480
engines because this kind of cool flame

718
00:25:31,909 --> 00:25:30,400
property if you can control it better on

719
00:25:33,510 --> 00:25:31,919
earth would help you to control

720
00:25:36,149 --> 00:25:33,520
combustion in a way that could make

721
00:25:38,230 --> 00:25:36,159
engines more fuel efficient

722
00:25:40,950 --> 00:25:38,240
the experiment that we'll be starting in

723
00:25:43,190 --> 00:25:40,960
expedition 35 is a follow-on to the flex

724
00:25:44,870 --> 00:25:43,200
investigation data i just showed you

725
00:25:47,269 --> 00:25:44,880
it's called the italian combustion

726
00:25:49,669 --> 00:25:47,279
experiment for green air or ice ga for

727
00:25:52,470 --> 00:25:49,679
short and here you can see a picture

728
00:25:54,310 --> 00:25:52,480
in front of the combustion rack is a gas

729
00:25:55,830 --> 00:25:54,320
bottle is being put in and it's a

730
00:25:57,830 --> 00:25:55,840
collaboration with the italian space

731
00:26:01,110 --> 00:25:57,840
agency instead of burning things like

732
00:26:03,430 --> 00:26:01,120
heptane decane or or octane we'll be

733
00:26:05,750 --> 00:26:03,440
looking at second and third generation

734
00:26:06,950 --> 00:26:05,760
biofuels second generation biofuels are

735
00:26:09,590 --> 00:26:06,960
instead of being made from corn or

736
00:26:11,269 --> 00:26:09,600
soybeans they're made from any kind of

737
00:26:12,310 --> 00:26:11,279
excess biomass so they're not competing

738
00:26:14,230 --> 00:26:12,320

with food

739
00:26:15,750 --> 00:26:14,240
production and third generation biofuels

740
00:26:18,230 --> 00:26:15,760
are the ones that are made from algae so

741
00:26:19,430 --> 00:26:18,240
we'll be testing combustion in the in

742
00:26:21,590 --> 00:26:19,440
the combustion rack using these

743
00:26:23,990 --> 00:26:21,600
different biofuels and this is obviously

744
00:26:25,750 --> 00:26:24,000
very applied at getting insights that

745
00:26:28,870 --> 00:26:25,760
will help us to improve the efficiency

746
00:26:30,470 --> 00:26:28,880
of combustion with biofuels

747
00:26:33,190 --> 00:26:30,480
finally i'd like to shift to the earth

748
00:26:34,630 --> 00:26:33,200
sciences and talk about

749
00:26:37,029 --> 00:26:34,640
an important or science remote sensing

750
00:26:38,789 --> 00:26:37,039
instrument on iss the hico or

751
00:26:40,789 --> 00:26:38,799
hyperspectral imager for the coastal

752
00:26:42,710 --> 00:26:40,799
ocean you can see a picture of that here

753
00:26:44,230 --> 00:26:42,720
out on the mounted externally on the

754
00:26:46,789 --> 00:26:44,240
kibo laboratory

755
00:26:48,549 --> 00:26:46,799
hyperspectral data is essentially

756
00:26:50,950 --> 00:26:48,559
hundreds of spectral bands instead of

757
00:26:53,350 --> 00:26:50,960
just a few like landsat has and so this

758
00:26:55,669 --> 00:26:53,360
gives you a lot more information about

759
00:26:57,110 --> 00:26:55,679
what you're what's being observed and

760
00:26:58,149 --> 00:26:57,120
measured on the earth below the

761
00:27:02,230 --> 00:26:58,159
instrument

762
00:27:04,789 --> 00:27:02,240
transitioned from being just a naval

763
00:27:07,190 --> 00:27:04,799

research operated payload for the naval

764
00:27:09,269 --> 00:27:07,200
research laboratory to being a facility

765
00:27:11,990 --> 00:27:09,279
on the international space station and

766
00:27:13,990 --> 00:27:12,000
this opens it up to a wide array of

767
00:27:15,909 --> 00:27:14,000
users both national lab users from other

768
00:27:18,149 --> 00:27:15,919
government agencies and the private

769
00:27:20,470 --> 00:27:18,159
sector especially users that are focused

770
00:27:22,950 --> 00:27:20,480
on agribusiness and oil exploration

771
00:27:25,350 --> 00:27:22,960
and it also opens the instrument up to

772
00:27:26,470 --> 00:27:25,360
more access to our nasa users that are

773
00:27:27,750 --> 00:27:26,480
funded by the science mission

774
00:27:29,909 --> 00:27:27,760
directorate

775
00:27:31,909 --> 00:27:29,919
in studies of the earth system

776
00:27:34,389 --> 00:27:31,919
so we're excited about that transition

777
00:27:35,909 --> 00:27:34,399
and i wanted to close by showing you uh

778
00:27:37,350 --> 00:27:35,919
one example of what the environmental

779
00:27:39,990 --> 00:27:37,360
protection agency has done with

780
00:27:41,990 --> 00:27:40,000
hyperspectral data they had a pathfinder

781
00:27:43,430 --> 00:27:42,000
innovation project exploratory grant

782
00:27:45,350 --> 00:27:43,440
from their office of research and

783
00:27:46,950 --> 00:27:45,360
development at epa and this is one of

784
00:27:48,789 --> 00:27:46,960
the results of those this is pensacola

785
00:27:51,110 --> 00:27:48,799
bay florida and if you see the little

786
00:27:52,710 --> 00:27:51,120
red parts of that image they took data

787
00:27:54,870 --> 00:27:52,720
from hico and they processed it and

788
00:27:57,269 --> 00:27:54,880

those little red areas represent where

789
00:27:59,750 --> 00:27:57,279
there's significant nitrogen coming into

790
00:28:02,149 --> 00:27:59,760
the bay and causing blooms of algae and

791
00:28:03,909 --> 00:28:02,159
so they use this by combining their

792
00:28:05,350 --> 00:28:03,919
in-water measurements with the remote

793
00:28:07,269 --> 00:28:05,360
sensing measurements they've used it to

794
00:28:09,510 --> 00:28:07,279
develop a predictive system that they

795
00:28:11,750 --> 00:28:09,520
can use for monitoring the water quality

796
00:28:14,310 --> 00:28:11,760
in pensacola bay they're now working to

797
00:28:16,149 --> 00:28:14,320
expand this to more bays around the gulf

798
00:28:18,870 --> 00:28:16,159
coast region and even to look at other

799
00:28:19,669 --> 00:28:18,880
epa regions and see if they can extend

800
00:28:21,110 --> 00:28:19,679
this

801
00:28:21,909 --> 00:28:21,120
and

802
00:28:26,230 --> 00:28:21,919
both

803
00:28:28,230 --> 00:28:26,240
at epa as well as their office of

804
00:28:30,789 --> 00:28:28,240
research is continuing to support

805
00:28:34,389 --> 00:28:30,799
expanded use so this is the kind of use

806
00:28:36,549 --> 00:28:34,399
of hico as a as a national laboratory

807
00:28:38,149 --> 00:28:36,559
facility that really benefits our life

808
00:28:40,070 --> 00:28:38,159
here on earth and

809
00:28:42,149 --> 00:28:40,080
will also be extended to additional

810
00:28:43,590 --> 00:28:42,159
users because of hico becoming an iss

811
00:28:46,070 --> 00:28:43,600
facility

812
00:28:48,149 --> 00:28:46,080
so that summary really just touches the

813
00:28:50,549 --> 00:28:48,159

surface i urge you to look at the press

814
00:28:52,870 --> 00:28:50,559
kit and on nasa.gov to see all of those

815
00:28:55,190 --> 00:28:52,880
hundreds of investigations going on

816
00:28:56,830 --> 00:28:55,200
and we look forward to a really dynamic

817
00:28:58,630 --> 00:28:56,840
and active research

818
00:29:00,310 --> 00:28:58,640
expedition thanks

819
00:29:01,830 --> 00:29:00,320
okay thank you julie let's take some

820
00:29:05,269 --> 00:29:01,840
questions now from the media we'll start

821
00:29:08,149 --> 00:29:05,279
here in houston mark caro

822
00:29:11,029 --> 00:29:08,159
thank you mark caro from the

823
00:29:13,269 --> 00:29:11,039
aviation week in space technology and

824
00:29:15,590 --> 00:29:13,279
i think my question is is for mike

825
00:29:17,669 --> 00:29:15,600
suffradini but

826
00:29:19,909 --> 00:29:17,679
directors as needed

827
00:29:22,070 --> 00:29:19,919
i believe you mentioned that march 28

828
00:29:23,750 --> 00:29:22,080
the launch of the soyuz might be the

829
00:29:25,350 --> 00:29:23,760
first

830
00:29:26,950 --> 00:29:25,360
four orbit

831
00:29:29,590 --> 00:29:26,960
rendezvous

832
00:29:31,510 --> 00:29:29,600
flight of a soyuz crew to the iss and

833
00:29:33,669 --> 00:29:31,520
you said you're assessing

834
00:29:35,909 --> 00:29:33,679
some issues yet that will be considered

835
00:29:37,990 --> 00:29:35,919
before a final decision i wonder if you

836
00:29:38,950 --> 00:29:38,000
could elaborate a little bit

837
00:29:46,950 --> 00:29:38,960
and

838
00:29:49,750 --> 00:29:46,960

you would look to regularly do

839
00:29:51,269 --> 00:29:49,760
for orbit with soyuz or that you would

840
00:29:53,750 --> 00:29:51,279
have a mix i just kind of want to see

841
00:29:55,669 --> 00:29:53,760
where this was going in your mind

842
00:29:57,510 --> 00:29:55,679
very good uh

843
00:29:59,669 --> 00:29:57,520
so those two are related and so that's

844
00:30:01,750 --> 00:29:59,679
the answer to your first question is you

845
00:30:04,630 --> 00:30:01,760
got to talk about the benefits and the

846
00:30:07,510 --> 00:30:04,640
and the downsides in order to decide uh

847
00:30:10,630 --> 00:30:07,520
if you'd like to do this long term or or

848
00:30:12,549 --> 00:30:10,640
at all so there's two factors one is the

849
00:30:13,669 --> 00:30:12,559
the crew factors of a four orbit

850
00:30:15,350 --> 00:30:13,679
rendezvous

851
00:30:17,510 --> 00:30:15,360
um and then of course the other is the

852
00:30:19,350 --> 00:30:17,520
ground operations impact associated with

853
00:30:25,190 --> 00:30:19,360
the four orbit rendezvous

854
00:30:27,669 --> 00:30:25,200
advantage that you have a very short

855
00:30:29,430 --> 00:30:27,679
period of time from launch to uh

856
00:30:30,950 --> 00:30:29,440
to docking

857
00:30:32,310 --> 00:30:30,960
that's good from

858
00:30:34,230 --> 00:30:32,320
you know if you had to get to iss

859
00:30:35,990 --> 00:30:34,240
quickly you know how to do it

860
00:30:37,830 --> 00:30:36,000
it reduces the amount of time the crew

861
00:30:40,549 --> 00:30:37,840
has to spend in a small environment

862
00:30:41,990 --> 00:30:40,559
before they get to iss

863
00:30:43,750 --> 00:30:42,000

and

864
00:30:45,750 --> 00:30:43,760
in addition to that the neat thing about

865
00:30:47,990 --> 00:30:45,760
the way the soyuz

866
00:30:49,750 --> 00:30:48,000
trajectory goes is it's very easy to

867
00:30:50,789 --> 00:30:49,760
transition from a four orbit to a

868
00:30:52,149 --> 00:30:50,799
two-day

869
00:30:54,070 --> 00:30:52,159
rendezvous

870
00:30:55,430 --> 00:30:54,080
if you have any any issues and i'll talk

871
00:30:57,669 --> 00:30:55,440
a little bit about one of the issues

872
00:30:59,669 --> 00:30:57,679
associated that in a minute

873
00:31:03,430 --> 00:30:59,679
um and so that's a

874
00:31:05,190 --> 00:31:03,440
that's certainly an attractive

875
00:31:07,350 --> 00:31:05,200
set of reasons the other the other

876
00:31:09,509 --> 00:31:07,360
attractive thing about that is

877
00:31:11,750 --> 00:31:09,519
is there's a certain size of the ground

878
00:31:13,190 --> 00:31:11,760
ops team to control a free-flying

879
00:31:15,750 --> 00:31:13,200
spacecraft

880
00:31:17,590 --> 00:31:15,760
that once it's docked to iss and power

881
00:31:19,830 --> 00:31:17,600
down you can go to a very very small

882
00:31:21,990 --> 00:31:19,840
team so there's a cost savings with

883
00:31:24,310 --> 00:31:22,000
regard to flying those spacecraft uh

884
00:31:25,269 --> 00:31:24,320
where you can trim down the flight ops

885
00:31:30,230 --> 00:31:25,279
team

886
00:31:32,389 --> 00:31:30,240
that has to last for two plus days to

887
00:31:33,990 --> 00:31:32,399
one that could you know last to about a

888
00:31:36,310 --> 00:31:34,000

day or so

889
00:31:39,509 --> 00:31:36,320
so those are the advantages the downside

890
00:31:41,110 --> 00:31:39,519
is one is in and this first one is crew

891
00:31:42,630 --> 00:31:41,120
related it's not really a downside it's

892
00:31:44,870 --> 00:31:42,640
just working out the details and that's

893
00:31:46,549 --> 00:31:44,880
a little bit about what tony was talking

894
00:31:48,630 --> 00:31:46,559
to that we have to kind of sort out

895
00:31:50,470 --> 00:31:48,640
amongst ourselves and that is there's

896
00:31:52,950 --> 00:31:50,480
just there's just things you have to

897
00:31:55,110 --> 00:31:52,960
consider with the crew you can't expect

898
00:31:57,430 --> 00:31:55,120
a crew to stay buckled up in those and

899
00:31:59,350 --> 00:31:57,440
you've seen the the seat liners they sit

900
00:32:00,389 --> 00:31:59,360
in you can't expect them to stay like

901
00:32:02,230 --> 00:32:00,399
that for the

902
00:32:03,509 --> 00:32:02,240
for the eight hours or so that they're

903
00:32:06,310 --> 00:32:03,519
flying around

904
00:32:08,149 --> 00:32:06,320
uh in space trying to get to iss and so

905
00:32:09,750 --> 00:32:08,159
from the launch to from the time they

906
00:32:11,430 --> 00:32:09,760
get in the capsule to the time they get

907
00:32:14,070 --> 00:32:11,440
into iss actually it's probably close to

908
00:32:15,590 --> 00:32:14,080
about 10 hours so they can't sit there

909
00:32:17,190 --> 00:32:15,600
all strapped in so we're working we're

910
00:32:19,190 --> 00:32:17,200
really just working the details can you

911
00:32:21,830 --> 00:32:19,200
get the crew out can they

912
00:32:24,549 --> 00:32:21,840
go stretch can they use the facilities

913
00:32:25,909 --> 00:32:24,559

if necessary um and then of course they

914
00:32:27,430 --> 00:32:25,919
have to be appropriately strapped in by

915
00:32:30,070 --> 00:32:27,440
the time they get close to for

916
00:32:31,990 --> 00:32:30,080
rendezvous and prox ops and docking so

917
00:32:33,590 --> 00:32:32,000
we're just working those details and

918
00:32:34,310 --> 00:32:33,600
we'll certainly be able to sort those

919
00:32:37,909 --> 00:32:34,320
out

920
00:32:40,310 --> 00:32:37,919
the bigger question lies uh in terms of

921
00:32:42,950 --> 00:32:40,320
operational impacts

922
00:32:46,310 --> 00:32:42,960
a four orbit rendezvous means that you

923
00:32:49,509 --> 00:32:46,320
have to know precisely where iss is

924
00:32:50,870 --> 00:32:49,519
uh within pretty tight tolerances uh at

925
00:32:53,350 --> 00:32:50,880
launch time

926
00:32:55,350 --> 00:32:53,360
um and and it's because you don't really

927
00:32:57,190 --> 00:32:55,360
have time for the soyuz to make up the

928
00:32:59,990 --> 00:32:57,200
phase angle differences

929
00:33:02,470 --> 00:33:00,000
that are inherent in a system like iss

930
00:33:04,230 --> 00:33:02,480
you can do no burns on iss in any given

931
00:33:05,990 --> 00:33:04,240
orbit and just because of the size and

932
00:33:08,630 --> 00:33:06,000
the nature of the iss and the

933
00:33:10,230 --> 00:33:08,640
environment flies in the drag alone can

934
00:33:13,029 --> 00:33:10,240
vary enough because the environment

935
00:33:15,430 --> 00:33:13,039
varies enough that you can the iss won't

936
00:33:16,710 --> 00:33:15,440
be where you expect it to be and and

937
00:33:19,110 --> 00:33:16,720
because you're talking about such tight

938
00:33:21,029 --> 00:33:19,120

tolerances that's significant

939
00:33:23,990 --> 00:33:21,039
so operationally it doesn't sound too

940
00:33:25,750 --> 00:33:24,000
bad to you consider that today if i do a

941
00:33:27,750 --> 00:33:25,760
debris avoidance maneuver i have to

942
00:33:29,509 --> 00:33:27,760
consider whether that impacts a flight

943
00:33:31,750 --> 00:33:29,519
in march

944
00:33:33,509 --> 00:33:31,760
and so you can see from an op standpoint

945
00:33:35,110 --> 00:33:33,519
it becomes much much more difficult now

946
00:33:36,470 --> 00:33:35,120
every time we do a maneuver every time

947
00:33:38,710 --> 00:33:36,480
we have to do a debris avoidance

948
00:33:41,269 --> 00:33:38,720
maneuver every time i do a reboost

949
00:33:43,350 --> 00:33:41,279
not only do i worry about phasing before

950
00:33:44,549 --> 00:33:43,360
i phased into a

951
00:33:45,669 --> 00:33:44,559
a certain

952
00:33:49,669 --> 00:33:45,679
angle

953
00:33:51,509 --> 00:33:49,679
make up the rest and progress can make

954
00:33:52,950 --> 00:33:51,519
up now it's much much tighter and so i'm

955
00:33:54,310 --> 00:33:52,960
worrying about that three or four months

956
00:33:56,710 --> 00:33:54,320
in advance i'm worried about whether or

957
00:33:58,470 --> 00:33:56,720
not i want to screw up my location

958
00:34:01,029 --> 00:33:58,480
for the launch of that vehicle and so

959
00:34:03,110 --> 00:34:01,039
that's turning out to be a enormous

960
00:34:04,630 --> 00:34:03,120
amount of work for the ops team

961
00:34:06,070 --> 00:34:04,640
so that's part of what we have to work

962
00:34:08,550 --> 00:34:06,080
with our russian colleagues to talk

963
00:34:11,349 --> 00:34:08,560

about the gain from the from the savings

964
00:34:13,190 --> 00:34:11,359
of time and getting to iss quicker does

965
00:34:16,389 --> 00:34:13,200
that offset the impacts that we're going

966
00:34:17,990 --> 00:34:16,399
to have just flying the iss day-to-day

967
00:34:20,389 --> 00:34:18,000
and so that's the future discussion that

968
00:34:22,310 --> 00:34:20,399
we have to have about term we we have

969
00:34:24,069 --> 00:34:22,320
agreed fundamentally that we would like

970
00:34:25,109 --> 00:34:24,079
to go ahead and do this at least once or

971
00:34:27,030 --> 00:34:25,119
twice to show that we have the

972
00:34:29,109 --> 00:34:27,040
capability in case we need to get to iss

973
00:34:31,349 --> 00:34:29,119
quick for any reason

974
00:34:35,349 --> 00:34:31,359
but the decision to fly like this long

975
00:34:38,550 --> 00:34:35,359
term is still out there to be determined

976
00:34:40,310 --> 00:34:38,560
okay anything else here in houston

977
00:34:42,869 --> 00:34:40,320
all right let's go to the phone lines uh

978
00:34:46,230 --> 00:34:42,879
marcia dunn with the associated press

979
00:34:48,470 --> 00:34:46,240
yes hello can you hear me uh a little

980
00:34:50,310 --> 00:34:48,480
choppy but yeah go ahead uh this

981
00:34:52,710 --> 00:34:50,320
question is probably from mike mike i'm

982
00:34:54,230 --> 00:34:52,720
just wondering um there was some issues

983
00:34:56,869 --> 00:34:54,240
with the freezer when the blood and

984
00:34:59,910 --> 00:34:56,879
urine samples came down on the spacex

985
00:35:01,510 --> 00:34:59,920
drag in the last time i'm wondering um

986
00:35:03,349 --> 00:35:01,520
can you give us an update on how the

987
00:35:04,950 --> 00:35:03,359
samples turned out to be were they

988
00:35:07,910 --> 00:35:04,960

usable and

989
00:35:09,829 --> 00:35:07,920
will there be another freezer aboard the

990
00:35:10,870 --> 00:35:09,839
next wreck and going up to bring down

991
00:35:13,990 --> 00:35:10,880
samples

992
00:35:16,790 --> 00:35:14,000
oh that's that's a great question marcia

993
00:35:18,790 --> 00:35:16,800
first of all the freezer itself was not

994
00:35:20,710 --> 00:35:18,800
the issue it was the power going to the

995
00:35:22,790 --> 00:35:20,720
freezer that was lost

996
00:35:25,430 --> 00:35:22,800
we have analyzed there was only a couple

997
00:35:27,990 --> 00:35:25,440
of samples that needed the minus

998
00:35:29,430 --> 00:35:28,000
80 degree temps and that was by design

999
00:35:31,109 --> 00:35:29,440
by the way because we knew there was a

1000
00:35:33,190 --> 00:35:31,119
risk that we could lose power to the

1001
00:35:34,390 --> 00:35:33,200
freezer on these first couple of spacex

1002
00:35:37,030 --> 00:35:34,400
flights

1003
00:35:38,550 --> 00:35:37,040
and i'll get to that in a moment

1004
00:35:40,790 --> 00:35:38,560
and

1005
00:35:43,349 --> 00:35:40,800
based on detail analysis we it turns out

1006
00:35:44,950 --> 00:35:43,359
we never did go below their lower limit

1007
00:35:46,470 --> 00:35:44,960
there has been a first look at the

1008
00:35:47,990 --> 00:35:46,480
samples and they don't see any

1009
00:35:49,190 --> 00:35:48,000
degradation

1010
00:35:50,870 --> 00:35:49,200
and of course they'll keep looking at

1011
00:35:52,150 --> 00:35:50,880
them but our final analysis says we

1012
00:35:54,870 --> 00:35:52,160
actually never went below what their

1013
00:35:57,190 --> 00:35:54,880

lower temp limit was or their upper temp

1014
00:35:59,829 --> 00:35:57,200
limit excuse me was

1015
00:36:02,150 --> 00:35:59,839
so from that respect it's okay our

1016
00:36:04,470 --> 00:36:02,160
we've been working with spacex

1017
00:36:07,589 --> 00:36:04,480
um about these particular power

1018
00:36:09,910 --> 00:36:07,599
components uh that uh provide power to

1019
00:36:12,630 --> 00:36:09,920
the freezers they're they're in a lower

1020
00:36:14,550 --> 00:36:12,640
portion of the dragon that sees water at

1021
00:36:16,390 --> 00:36:14,560
splashdown

1022
00:36:17,670 --> 00:36:16,400
and they knew before that flight that

1023
00:36:19,589 --> 00:36:17,680
this this

1024
00:36:21,190 --> 00:36:19,599
the way the box is sealed well it just

1025
00:36:23,910 --> 00:36:21,200
was not sealed up

1026
00:36:26,310 --> 00:36:23,920
good enough to prevent water intrusion

1027
00:36:27,750 --> 00:36:26,320
so we had this discussion uh they did

1028
00:36:30,150 --> 00:36:27,760
they did some extra things around the

1029
00:36:32,790 --> 00:36:30,160
boxes but they were already installed

1030
00:36:34,550 --> 00:36:32,800
and and so we knew uh that it was

1031
00:36:37,109 --> 00:36:34,560
possible we'd get water in there at a

1032
00:36:39,109 --> 00:36:37,119
level that would um

1033
00:36:41,109 --> 00:36:39,119
submerge these boxes that could then

1034
00:36:43,670 --> 00:36:41,119
ingest the water and then ultimately

1035
00:36:45,270 --> 00:36:43,680
fail there was one contributing factor

1036
00:36:47,030 --> 00:36:45,280
that we did fix

1037
00:36:48,630 --> 00:36:47,040
from the demo flight to the first flight

1038
00:36:50,470 --> 00:36:48,640

and that was

1039
00:36:52,310 --> 00:36:50,480
that the chutes hung on a little bit

1040
00:36:53,990 --> 00:36:52,320
longer to the spacecraft and drug it a

1041
00:36:56,470 --> 00:36:54,000
little bit which tended to bring more

1042
00:36:58,630 --> 00:36:56,480
water into this lower area faster they

1043
00:37:00,790 --> 00:36:58,640
did they did make a software change and

1044
00:37:02,870 --> 00:37:00,800
and have the shoots released quicker

1045
00:37:04,150 --> 00:37:02,880
um and so that did help i think that

1046
00:37:05,589 --> 00:37:04,160
bought us a little more time but

1047
00:37:08,470 --> 00:37:05,599
essentially the

1048
00:37:10,230 --> 00:37:08,480
the fix that was necessary was to do a

1049
00:37:12,390 --> 00:37:10,240
better job of sealing up the boxes and

1050
00:37:16,150 --> 00:37:12,400
they had a redesign

1051
00:37:19,750 --> 00:37:16,160
in in their plan for a space x3

1052
00:37:21,510 --> 00:37:19,760
we've worked with spacex since then

1053
00:37:22,870 --> 00:37:21,520
to talk to them about

1054
00:37:24,310 --> 00:37:22,880
see if there's anything they could do

1055
00:37:26,550 --> 00:37:24,320
they've been very aggressive with this

1056
00:37:29,030 --> 00:37:26,560
issue they've actually went

1057
00:37:30,950 --> 00:37:29,040
and pulled the boxes for spacex ii

1058
00:37:33,190 --> 00:37:30,960
they've come up with the design fix to

1059
00:37:35,030 --> 00:37:33,200
seal up the boxes not the ultimate

1060
00:37:36,870 --> 00:37:35,040
design that they're going to do in for

1061
00:37:38,550 --> 00:37:36,880
spacex 3 where they're they're actually

1062
00:37:40,630 --> 00:37:38,560
changing the box but where they come in

1063
00:37:42,390 --> 00:37:40,640

with the sealing material

1064
00:37:44,310 --> 00:37:42,400
they test it on a box

1065
00:37:45,750 --> 00:37:44,320
in in a water tank

1066
00:37:47,670 --> 00:37:45,760
and convince themselves that they've

1067
00:37:50,470 --> 00:37:47,680
sealed them up very good

1068
00:37:53,030 --> 00:37:50,480
and so this next flight we have higher

1069
00:37:54,310 --> 00:37:53,040
confidence that we won't lose power as

1070
00:37:55,430 --> 00:37:54,320
early

1071
00:37:57,990 --> 00:37:55,440
and so that

1072
00:38:00,230 --> 00:37:58,000
again we probably because it's not the

1073
00:38:01,750 --> 00:38:00,240
ultimate design fix we'll still probably

1074
00:38:03,270 --> 00:38:01,760
manage

1075
00:38:06,150 --> 00:38:03,280
and try to have

1076
00:38:08,310 --> 00:38:06,160
more of the minus 20 degree

1077
00:38:10,069 --> 00:38:08,320
items in there because the freezer

1078
00:38:12,390 --> 00:38:10,079
doesn't warm up that fast even you lose

1079
00:38:14,150 --> 00:38:12,400
power it touchdown

1080
00:38:15,670 --> 00:38:14,160
but but ultimately we have the

1081
00:38:17,030 --> 00:38:15,680
confidence we need to bring home some of

1082
00:38:19,030 --> 00:38:17,040
the samples that we just have to get

1083
00:38:20,230 --> 00:38:19,040
home that need the minus 80 degree temps

1084
00:38:21,829 --> 00:38:20,240
and so

1085
00:38:24,390 --> 00:38:21,839
i would tell you that we're we're a

1086
00:38:26,069 --> 00:38:24,400
little closer to nominal on spacex ii

1087
00:38:27,190 --> 00:38:26,079
and and of course the design that fix

1088
00:38:29,349 --> 00:38:27,200

that we've all agreed to will be

1089
00:38:31,670 --> 00:38:29,359
implemented on space x3 so

1090
00:38:33,670 --> 00:38:31,680
i think we've gotten ourselves past that

1091
00:38:35,990 --> 00:38:33,680
thank you and i had one other question

1092
00:38:37,109 --> 00:38:36,000
if i might for you again mike

1093
00:38:38,870 --> 00:38:37,119
we're coming

1094
00:38:41,109 --> 00:38:38,880
quick upon the 10th anniversary of the

1095
00:38:43,829 --> 00:38:41,119
columbia accident and i was hoping you

1096
00:38:45,109 --> 00:38:43,839
could spend a few minutes

1097
00:38:46,390 --> 00:38:45,119
just

1098
00:38:48,470 --> 00:38:46,400
talking about

1099
00:38:50,150 --> 00:38:48,480
lessons learned and how those lessons

1100
00:38:52,790 --> 00:38:50,160
are still alive in the space station

1101
00:38:55,990 --> 00:38:52,800
program today to make it safer better if

1102
00:38:59,510 --> 00:38:57,670
of course we all know

1103
00:39:00,950 --> 00:38:59,520
what the report said about the columbia

1104
00:39:03,349 --> 00:39:00,960
accident there was a lot of things to

1105
00:39:05,910 --> 00:39:03,359
focus on and i would tell you that the

1106
00:39:09,109 --> 00:39:05,920
primary thing

1107
00:39:11,589 --> 00:39:09,119
that we that we took away from

1108
00:39:13,430 --> 00:39:11,599
from the clubby accident was not to

1109
00:39:16,710 --> 00:39:13,440
assume

1110
00:39:18,790 --> 00:39:16,720
things that seem easy for the uh average

1111
00:39:20,390 --> 00:39:18,800
engineer to assume so

1112
00:39:22,390 --> 00:39:20,400
and what i mean by that was this whole

1113
00:39:25,190 --> 00:39:22,400

discussion about the foam

1114
00:39:27,430 --> 00:39:25,200
and and how light foam is that you know

1115
00:39:30,550 --> 00:39:27,440
and then you it's it's hard for you to

1116
00:39:33,030 --> 00:39:30,560
imagine foam flying fast enough to cause

1117
00:39:34,390 --> 00:39:33,040
any real damage and intuitively it

1118
00:39:38,230 --> 00:39:34,400
sounds

1119
00:39:40,310 --> 00:39:38,240
say yeah it's just foam it'll probably

1120
00:39:42,150 --> 00:39:40,320
be okay

1121
00:39:43,670 --> 00:39:42,160
and and the bottom line is we just

1122
00:39:46,150 --> 00:39:43,680
didn't do

1123
00:39:49,270 --> 00:39:46,160
uh the right amount of analysis to

1124
00:39:50,630 --> 00:39:49,280
decide that we understood the true

1125
00:39:52,950 --> 00:39:50,640
impact of that

1126
00:39:55,910 --> 00:39:52,960
um and so to me if you boil everything

1127
00:39:58,230 --> 00:39:55,920
up that came from the that particular

1128
00:40:01,349 --> 00:39:58,240
accident i would tell you that was it uh

1129
00:40:03,829 --> 00:40:01,359
there was a there was a intuitive

1130
00:40:05,589 --> 00:40:03,839
thought that we understood that risk

1131
00:40:07,910 --> 00:40:05,599
without the appropriate amount analysis

1132
00:40:09,990 --> 00:40:07,920
to back up that intuitive thought and

1133
00:40:11,990 --> 00:40:10,000
that is today one of the strongest

1134
00:40:13,589 --> 00:40:12,000
things we work on

1135
00:40:15,829 --> 00:40:13,599
in the space business in general and

1136
00:40:18,390 --> 00:40:15,839
certainly in the iss program it is is

1137
00:40:20,390 --> 00:40:18,400
alive and well

1138
00:40:21,910 --> 00:40:20,400

that we do not we do not make those

1139
00:40:23,349 --> 00:40:21,920
assumptions now

1140
00:40:24,950 --> 00:40:23,359
you could say well

1141
00:40:26,309 --> 00:40:24,960
you don't really have the final answer

1142
00:40:28,710 --> 00:40:26,319
on anything

1143
00:40:31,589 --> 00:40:28,720
and so what you have to make sure is

1144
00:40:33,589 --> 00:40:31,599
that all the appropriate individuals

1145
00:40:36,069 --> 00:40:33,599
understand the environments that you're

1146
00:40:38,390 --> 00:40:36,079
living in so if you do make assumptions

1147
00:40:39,430 --> 00:40:38,400
and you tend to try not to make too many

1148
00:40:40,870 --> 00:40:39,440
the only people allow to make

1149
00:40:43,030 --> 00:40:40,880
assumptions are the people that are

1150
00:40:45,270 --> 00:40:43,040
truly experts in their field so if they

1151
00:40:47,109 --> 00:40:45,280
tell you that based on their experience

1152
00:40:48,950 --> 00:40:47,119
this will be okay then you can feel

1153
00:40:52,309 --> 00:40:48,960
better about that as long as you

1154
00:40:54,710 --> 00:40:52,319
understand the integrated uh use of that

1155
00:40:55,990 --> 00:40:54,720
object or whatever the the system is

1156
00:40:57,109 --> 00:40:56,000
you're you're talking about as long as

1157
00:40:59,190 --> 00:40:57,119
you understand the integrated

1158
00:41:01,109 --> 00:40:59,200
environment then there are occasions

1159
00:41:02,230 --> 00:41:01,119
when you can can let experts make

1160
00:41:04,550 --> 00:41:02,240
assumptions

1161
00:41:07,670 --> 00:41:04,560
uh and explain them to you but largely

1162
00:41:10,069 --> 00:41:07,680
that is not a practice we uh

1163
00:41:12,790 --> 00:41:10,079

we use very often in almost all cases

1164
00:41:14,550 --> 00:41:12,800
for any critical systems we are doing

1165
00:41:16,390 --> 00:41:14,560
a detailed analysis to understand not

1166
00:41:18,950 --> 00:41:16,400
only what we know about that specific

1167
00:41:20,950 --> 00:41:18,960
system but how it's used how it operates

1168
00:41:23,829 --> 00:41:20,960
in the integrated environment

1169
00:41:25,829 --> 00:41:23,839
which of course is one of the big

1170
00:41:27,829 --> 00:41:25,839
big things that we didn't do in the in

1171
00:41:30,069 --> 00:41:27,839
that particular part

1172
00:41:31,829 --> 00:41:30,079
of the uh of the foam impacting the wing

1173
00:41:33,750 --> 00:41:31,839
leading edge of the of the shuttle and

1174
00:41:35,589 --> 00:41:33,760
understand the slip stream that that the

1175
00:41:37,349 --> 00:41:35,599
phone was flying in and the ultimate

1176
00:41:39,990 --> 00:41:37,359
damage it could cause

1177
00:41:42,710 --> 00:41:40,000
uh so i would tell you that uh that it's

1178
00:41:45,349 --> 00:41:42,720
alive and well we did the as we as a

1179
00:41:46,710 --> 00:41:45,359
result of the cave report we did there

1180
00:41:48,550 --> 00:41:46,720
were a lot of very specific

1181
00:41:50,230 --> 00:41:48,560
recommendations and the iss program we

1182
00:41:51,510 --> 00:41:50,240
took every one of those recommendations

1183
00:41:54,870 --> 00:41:51,520
and

1184
00:41:56,550 --> 00:41:54,880
related it to how we do iss because in

1185
00:41:58,550 --> 00:41:56,560
some cases they weren't direct relatable

1186
00:41:59,990 --> 00:41:58,560
but you could understand the concept and

1187
00:42:01,670 --> 00:42:00,000
then we did our own fix to that we

1188
00:42:04,630 --> 00:42:01,680

actually wrote a report that showed how

1189
00:42:05,910 --> 00:42:04,640
we we met the cape findings as well so

1190
00:42:08,150 --> 00:42:05,920
so we're

1191
00:42:09,670 --> 00:42:08,160
we're we're still very uh sensitive to

1192
00:42:12,069 --> 00:42:09,680
that and the lesson we learned from that

1193
00:42:15,030 --> 00:42:12,079
i think we'll stay with the agency

1194
00:42:15,040 --> 00:42:22,630
okay uh jim lesher with npr washington

1195
00:42:22,640 --> 00:42:25,270
jim are you there

1196
00:42:30,790 --> 00:42:27,109
okay now let's go to stephen clark with

1197
00:42:36,309 --> 00:42:34,470
it's my question for uh for mike um uh

1198
00:42:39,109 --> 00:42:36,319
can you give us another investigation

1199
00:42:41,589 --> 00:42:39,119
into the engine failure um during the uh

1200
00:42:43,990 --> 00:42:41,599
october spacex one launch and

1201
00:42:46,230 --> 00:42:44,000
is uh has that in closings or is that

1202
00:42:47,990 --> 00:42:46,240
still an open issue

1203
00:42:49,990 --> 00:42:48,000
that needs to be closed before march 1st

1204
00:42:52,870 --> 00:42:50,000
thanks

1205
00:42:54,950 --> 00:42:52,880
uh the spacex engine anomaly uh well

1206
00:42:57,190 --> 00:42:54,960
first of all it's not completely closed

1207
00:42:59,190 --> 00:42:57,200
uh there's still some work to wrap up

1208
00:43:00,790 --> 00:42:59,200
and do the final closure

1209
00:43:02,309 --> 00:43:00,800
and we'll get into the details at the

1210
00:43:04,309 --> 00:43:02,319
right time we'll do that with our our

1211
00:43:05,270 --> 00:43:04,319
spacex colleagues actually own that

1212
00:43:07,829 --> 00:43:05,280
system

1213
00:43:10,230 --> 00:43:07,839

and there's some sensitivities in in in

1214
00:43:12,230 --> 00:43:10,240
all of this that we try to avoid

1215
00:43:14,710 --> 00:43:12,240
but i can tell you that a very thorough

1216
00:43:16,630 --> 00:43:14,720
review was uh conducted there was an

1217
00:43:18,870 --> 00:43:16,640
enormous amount of data

1218
00:43:21,829 --> 00:43:18,880
uh provided um

1219
00:43:24,390 --> 00:43:21,839
that the nasa engine guys and structures

1220
00:43:26,710 --> 00:43:24,400
guys uh and system guy propulsion system

1221
00:43:28,470 --> 00:43:26,720
guys all participated

1222
00:43:29,910 --> 00:43:28,480
with the spacex team to review the

1223
00:43:31,030 --> 00:43:29,920
anomaly

1224
00:43:34,710 --> 00:43:31,040
as

1225
00:43:36,470 --> 00:43:34,720
failure like this on a system you don't

1226
00:43:39,270 --> 00:43:36,480
get back

1227
00:43:41,670 --> 00:43:39,280
it was hard to find a specific smoking

1228
00:43:44,470 --> 00:43:41,680
gun to point to

1229
00:43:47,510 --> 00:43:44,480
but a number of of uh things

1230
00:43:49,990 --> 00:43:47,520
were believed to be contributors

1231
00:43:51,270 --> 00:43:50,000
that have been been looked at and and

1232
00:43:53,670 --> 00:43:51,280
the engines actually have been

1233
00:43:56,710 --> 00:43:53,680
re-examined

1234
00:43:58,710 --> 00:43:56,720
nde examinations to confirm

1235
00:44:00,150 --> 00:43:58,720
the health of the engines that are about

1236
00:44:02,150 --> 00:44:00,160
to fly

1237
00:44:03,910 --> 00:44:02,160
in addition to that a contributing

1238
00:44:05,430 --> 00:44:03,920

factor

1239
00:44:07,190 --> 00:44:05,440
was perhaps

1240
00:44:08,950 --> 00:44:07,200
the amount of testing that this engine

1241
00:44:10,390 --> 00:44:08,960
and engine two on that same vehicle saw

1242
00:44:11,829 --> 00:44:10,400
before it flew

1243
00:44:13,829 --> 00:44:11,839
although it was

1244
00:44:15,030 --> 00:44:13,839
certified and all the testing it went

1245
00:44:17,430 --> 00:44:15,040
through

1246
00:44:18,710 --> 00:44:17,440
none of those tests violated any of the

1247
00:44:20,390 --> 00:44:18,720
design

1248
00:44:22,230 --> 00:44:20,400
criteria of the engine

1249
00:44:23,829 --> 00:44:22,240
it's possible that the amount of testing

1250
00:44:26,150 --> 00:44:23,839
that they were exposed to might have

1251
00:44:29,109 --> 00:44:26,160
been a contributing factor

1252
00:44:31,430 --> 00:44:29,119
and these engines flying on is flying on

1253
00:44:33,190 --> 00:44:31,440
this next flight are all

1254
00:44:34,870 --> 00:44:33,200
new engines that have been acceptance

1255
00:44:36,870 --> 00:44:34,880
tested but really have not participated

1256
00:44:39,109 --> 00:44:36,880
in other test programs

1257
00:44:40,870 --> 00:44:39,119
so the combination of the additional nde

1258
00:44:42,390 --> 00:44:40,880
of the well i should say of the failure

1259
00:44:43,670 --> 00:44:42,400
investigation

1260
00:44:46,150 --> 00:44:43,680
what legs of the fall tree were

1261
00:44:48,550 --> 00:44:46,160
remaining the nde extra nde that's been

1262
00:44:50,309 --> 00:44:48,560
done to these engines

1263
00:44:51,430 --> 00:44:50,319

and the fact that these engines are all

1264
00:44:53,990 --> 00:44:51,440
uh

1265
00:44:55,589 --> 00:44:54,000
from a from a fl from a test time

1266
00:44:58,150 --> 00:44:55,599
standpoint have very

1267
00:45:00,150 --> 00:44:58,160
uh low test time on them additional test

1268
00:45:02,069 --> 00:45:00,160
time other than what is necessary to

1269
00:45:02,950 --> 00:45:02,079
certify the engine for flight

1270
00:45:05,430 --> 00:45:02,960
um

1271
00:45:07,270 --> 00:45:05,440
will will help us conclude that the

1272
00:45:10,069 --> 00:45:07,280
engines we have on on this particular

1273
00:45:12,309 --> 00:45:10,079
spacex flight are are good to go again

1274
00:45:13,750 --> 00:45:12,319
we haven't officially determined that um

1275
00:45:16,470 --> 00:45:13,760
the nde

1276
00:45:18,470 --> 00:45:16,480
uh work is uh is concluded but the

1277
00:45:19,910 --> 00:45:18,480
review of the data

1278
00:45:22,309 --> 00:45:19,920
is not

1279
00:45:24,470 --> 00:45:22,319
so that work has to to to wrap up and

1280
00:45:26,150 --> 00:45:24,480
then there'll be a more formal uh report

1281
00:45:29,510 --> 00:45:26,160
at the end

1282
00:45:31,430 --> 00:45:29,520
okay how about bill harwood with cbs

1283
00:45:32,950 --> 00:45:31,440
oh yeah hey uh hi it's bill hart with

1284
00:45:35,190 --> 00:45:32,960
cbs news a couple of quick ones for

1285
00:45:36,630 --> 00:45:35,200
stuff mr suffredani um is there any

1286
00:45:38,069 --> 00:45:36,640
reason you can't tell us what they think

1287
00:45:39,109 --> 00:45:38,079
is the cause of the engine anomaly i

1288
00:45:41,750 --> 00:45:39,119

mean one of the things that's different

1289
00:45:43,190 --> 00:45:41,760
about this commercial program is

1290
00:45:44,790 --> 00:45:43,200
you know the lack of insight people on

1291
00:45:45,990 --> 00:45:44,800
the outside have in term terms of what's

1292
00:45:48,069 --> 00:45:46,000
going on i mean you're telling me that

1293
00:45:50,069 --> 00:45:48,079
you guys know what's going on but i'm

1294
00:45:51,910 --> 00:45:50,079
just curious if you're contractually

1295
00:45:53,270 --> 00:45:51,920
prevented from telling us

1296
00:45:54,870 --> 00:45:53,280
and second question i wonder if you go

1297
00:45:56,390 --> 00:45:54,880
over a little bit about

1298
00:45:57,670 --> 00:45:56,400
bigelow and

1299
00:45:59,030 --> 00:45:57,680
you know how that thing's going to work

1300
00:46:00,550 --> 00:45:59,040
you know how often the hatch will be

1301
00:46:01,910 --> 00:46:00,560
open for example things you hope to

1302
00:46:03,510 --> 00:46:01,920
learn that sort of thing just kind of a

1303
00:46:06,150 --> 00:46:03,520
general overview of

1304
00:46:08,150 --> 00:46:06,160
the bigelow operation thanks

1305
00:46:09,030 --> 00:46:08,160
certainly i'll be glad to uh first of

1306
00:46:11,589 --> 00:46:09,040
all

1307
00:46:13,349 --> 00:46:11,599
this is kind of a new world for

1308
00:46:15,910 --> 00:46:13,359
for all of us

1309
00:46:18,230 --> 00:46:15,920
you know the spacex vehicle

1310
00:46:20,309 --> 00:46:18,240
is the propriety of

1311
00:46:22,150 --> 00:46:20,319
of the spacex corporation and so

1312
00:46:25,270 --> 00:46:22,160
therefore there are

1313
00:46:27,670 --> 00:46:25,280

the and the engines as you well know um

1314
00:46:29,349 --> 00:46:27,680
are very sensitive items they're

1315
00:46:30,710 --> 00:46:29,359
sensitive export control items and

1316
00:46:33,109 --> 00:46:30,720
they're certainly

1317
00:46:35,750 --> 00:46:33,119
sensitive proprietary

1318
00:46:38,309 --> 00:46:35,760
systems and so

1319
00:46:40,870 --> 00:46:38,319
so in that respect the reason why nasa

1320
00:46:43,750 --> 00:46:40,880
gets a large amount of data is we've

1321
00:46:46,309 --> 00:46:43,760
agreed not to disclose this data

1322
00:46:47,510 --> 00:46:46,319
ultimately i think the

1323
00:46:50,790 --> 00:46:47,520
the

1324
00:46:53,030 --> 00:46:50,800
anomaly

1325
00:46:55,349 --> 00:46:53,040
as we've talked about before is is

1326
00:46:57,670 --> 00:46:55,359
probably has to do with a

1327
00:47:00,309 --> 00:46:57,680
breach of the

1328
00:47:01,109 --> 00:47:00,319
chamber the pressure chamber

1329
00:47:10,069 --> 00:47:01,119
and

1330
00:47:11,670 --> 00:47:10,079
the potential contributing factors are

1331
00:47:13,349 --> 00:47:11,680
they are not a concern for these engines

1332
00:47:14,309 --> 00:47:13,359
that are about to fly

1333
00:47:16,550 --> 00:47:14,319
and

1334
00:47:19,589 --> 00:47:16,560
if i got into much more specifics than

1335
00:47:21,270 --> 00:47:19,599
that then i'm i'd be treading perhaps on

1336
00:47:23,030 --> 00:47:21,280
a proprietary information and so in

1337
00:47:25,030 --> 00:47:23,040
order to to

1338
00:47:28,150 --> 00:47:25,040

make sure i don't talk about anything

1339
00:47:30,069 --> 00:47:28,160
that we shouldn't disclose at this point

1340
00:47:32,069 --> 00:47:30,079
i can tell you that

1341
00:47:33,750 --> 00:47:32,079
from a nasa

1342
00:47:36,309 --> 00:47:33,760
and u.s government standpoint we have

1343
00:47:37,829 --> 00:47:36,319
been deeply involved and are completely

1344
00:47:39,750 --> 00:47:37,839
satisfied that the right amount of work

1345
00:47:41,510 --> 00:47:39,760
has been done on these systems

1346
00:47:44,710 --> 00:47:41,520
as far as communicating up and out we

1347
00:47:46,870 --> 00:47:44,720
will rely on spacex to ultimately

1348
00:47:48,790 --> 00:47:46,880
talk at some of the some of the level of

1349
00:47:51,589 --> 00:47:48,800
detail so it's just kind of a

1350
00:47:55,109 --> 00:47:51,599
a balancing act we do to make sure we

1351
00:47:57,829 --> 00:47:55,119
are sensitive to the the corporate

1352
00:48:00,470 --> 00:47:57,839
needs while at the same time getting the

1353
00:48:02,549 --> 00:48:00,480
right amount of information out there

1354
00:48:04,790 --> 00:48:02,559
both within nasa and as much as we can

1355
00:48:07,670 --> 00:48:04,800
out to the general public

1356
00:48:09,589 --> 00:48:07,680
the bigelow module

1357
00:48:10,630 --> 00:48:09,599
is really a i'll call it a structural

1358
00:48:13,750 --> 00:48:10,640
test

1359
00:48:16,950 --> 00:48:13,760
module for the iss

1360
00:48:19,030 --> 00:48:16,960
it will be attached to the iss on the af

1361
00:48:21,750 --> 00:48:19,040
port of node three

1362
00:48:23,990 --> 00:48:21,760
uh it will be inflated

1363
00:48:25,750 --> 00:48:24,000

and then really the objective then is to

1364
00:48:27,190 --> 00:48:25,760
test

1365
00:48:29,510 --> 00:48:27,200
that

1366
00:48:32,470 --> 00:48:29,520
kind of module technology inflatable

1367
00:48:35,750 --> 00:48:32,480
technology long duration

1368
00:48:38,230 --> 00:48:35,760
in space uh really structurally speaking

1369
00:48:39,910 --> 00:48:38,240
um it's a it's a big player we'll we'll

1370
00:48:41,430 --> 00:48:39,920
do a little bit of understanding the

1371
00:48:43,190 --> 00:48:41,440
flow within it

1372
00:48:43,910 --> 00:48:43,200
um

1373
00:48:50,309 --> 00:48:43,920
but

1374
00:48:53,349 --> 00:48:50,319
module or part of a technology

1375
00:48:55,990 --> 00:48:53,359
demonstration on board iss

1376
00:48:58,150 --> 00:48:56,000
as such in order to keep the

1377
00:49:00,069 --> 00:48:58,160
integration costs down

1378
00:49:01,190 --> 00:49:00,079
we don't intend to make it a habitable

1379
00:49:03,829 --> 00:49:01,200
module

1380
00:49:05,990 --> 00:49:03,839
for iss it certainly could be used

1381
00:49:08,309 --> 00:49:06,000
for stowage if we so chose and and

1382
00:49:10,390 --> 00:49:08,319
that'll perhaps be a discussion for for

1383
00:49:11,829 --> 00:49:10,400
the future but the operational concepts

1384
00:49:13,910 --> 00:49:11,839
as soon as the crew will not be in and

1385
00:49:16,309 --> 00:49:13,920
out of there a lot uh they need to get

1386
00:49:18,470 --> 00:49:16,319
in there to configure it

1387
00:49:20,790 --> 00:49:18,480
but for the most part they won't go in

1388
00:49:23,109 --> 00:49:20,800

there as a matter of course

1389
00:49:25,829 --> 00:49:23,119
and and that allowed us to reduce some

1390
00:49:27,750 --> 00:49:25,839
of the normal things you put in a module

1391
00:49:30,309 --> 00:49:27,760
to make sure it's safe for the crew so

1392
00:49:32,710 --> 00:49:30,319
because of the need to keep the cost

1393
00:49:34,790 --> 00:49:32,720
down because really this is a

1394
00:49:37,430 --> 00:49:34,800
technology demonstration

1395
00:49:39,829 --> 00:49:37,440
capability we've

1396
00:49:41,829 --> 00:49:39,839
we've done that by assuming that the

1397
00:49:43,750 --> 00:49:41,839
crew won't be in and out of there on a

1398
00:49:45,349 --> 00:49:43,760
regular basis hopefully that kind of

1399
00:49:47,030 --> 00:49:45,359
answered your question

1400
00:49:48,950 --> 00:49:47,040
yeah it does thanks a lot

1401
00:49:55,589 --> 00:49:48,960
okay let's go to dana with abc news

1402
00:49:59,270 --> 00:49:57,190
okay let's go to james dean florida

1403
00:50:01,270 --> 00:49:59,280
today

1404
00:50:03,589 --> 00:50:01,280
thanks uh mr suffredini could you just

1405
00:50:06,069 --> 00:50:03,599
provide a quick primer on the the ku

1406
00:50:07,750 --> 00:50:06,079
system and and why it's so important and

1407
00:50:08,549 --> 00:50:07,760
and i guess what the impact would be if

1408
00:50:12,950 --> 00:50:08,559
you

1409
00:50:14,710 --> 00:50:12,960
backup as well and and then also i was

1410
00:50:18,230 --> 00:50:14,720
just curious why i think you you've said

1411
00:50:20,230 --> 00:50:18,240
that you are considering three evas um

1412
00:50:22,549 --> 00:50:20,240
is that um

1413
00:50:24,950 --> 00:50:22,559

that just seemed like quite a lot for um

1414
00:50:29,030 --> 00:50:24,960
what you only identified i think one

1415
00:50:30,790 --> 00:50:29,040
sort of major uh

1416
00:50:32,470 --> 00:50:30,800
problem that needs repair and i just was

1417
00:50:34,309 --> 00:50:32,480
wondering what what the rest of the

1418
00:50:36,950 --> 00:50:34,319
content might be

1419
00:50:40,150 --> 00:50:36,960
uh certainly um

1420
00:50:41,510 --> 00:50:40,160
i'll do your last question first

1421
00:50:50,549 --> 00:50:41,520
the

1422
00:50:52,390 --> 00:50:50,559
amount of research time on board

1423
00:50:54,790 --> 00:50:52,400
as you as you know

1424
00:50:56,950 --> 00:50:54,800
eva time uh

1425
00:50:59,190 --> 00:50:56,960
we we estimate about 100 hours to

1426
00:51:00,390 --> 00:50:59,200
prepare for and conduct

1427
00:51:01,990 --> 00:51:00,400
an eba

1428
00:51:04,230 --> 00:51:02,000
all of that would come out of time

1429
00:51:06,630 --> 00:51:04,240
available for research

1430
00:51:08,470 --> 00:51:06,640
and anomalies don't schedule themselves

1431
00:51:10,630 --> 00:51:08,480
up according to when is best for the

1432
00:51:11,990 --> 00:51:10,640
research guys to go outside and fix them

1433
00:51:13,589 --> 00:51:12,000
and so

1434
00:51:15,910 --> 00:51:13,599
we have to try to figure out a way to

1435
00:51:18,150 --> 00:51:15,920
manage our lives around that

1436
00:51:19,829 --> 00:51:18,160
one way to do that is you pick the best

1437
00:51:21,670 --> 00:51:19,839
time in the increment when you know

1438
00:51:24,230 --> 00:51:21,680

based on traffic and other things going

1439
00:51:25,910 --> 00:51:24,240
on when you could fit this

1440
00:51:27,990 --> 00:51:25,920
activity in and then

1441
00:51:30,549 --> 00:51:28,000
when you think about the work necessary

1442
00:51:31,990 --> 00:51:30,559
to prepare for part prepare for an eva

1443
00:51:34,150 --> 00:51:32,000
part of that work is to configure the

1444
00:51:36,150 --> 00:51:34,160
airlock get the suits out

1445
00:51:37,430 --> 00:51:36,160
check out the suits fit the suits to the

1446
00:51:40,150 --> 00:51:37,440
crew

1447
00:51:42,390 --> 00:51:40,160
once you've done all that you've you've

1448
00:51:43,750 --> 00:51:42,400
that's work you'd like to not repeat so

1449
00:51:45,030 --> 00:51:43,760
if you know all the work you're going to

1450
00:51:47,270 --> 00:51:45,040
go do

1451
00:51:48,630 --> 00:51:47,280
what you try to do is um

1452
00:51:50,309 --> 00:51:48,640
is to

1453
00:51:51,670 --> 00:51:50,319
get as many aviation as you can before

1454
00:51:53,510 --> 00:51:51,680
you have to go

1455
00:51:54,549 --> 00:51:53,520
recheck the suits or

1456
00:52:00,870 --> 00:51:54,559
or

1457
00:52:01,750 --> 00:52:00,880
go to eva if it's been quite a bit of

1458
00:52:03,589 --> 00:52:01,760
time

1459
00:52:04,549 --> 00:52:03,599
so there's an efficiency to trying to go

1460
00:52:07,270 --> 00:52:04,559
outside

1461
00:52:08,870 --> 00:52:07,280
a few times in a row you can't do a

1462
00:52:11,030 --> 00:52:08,880
whole bunch the the crew would be

1463
00:52:12,390 --> 00:52:11,040

exhausted and ultimately you got to get

1464
00:52:13,670 --> 00:52:12,400
back to

1465
00:52:16,470 --> 00:52:13,680
doing the research but if you know you

1466
00:52:18,950 --> 00:52:16,480
got enough tasks to keep you busy

1467
00:52:20,230 --> 00:52:18,960
then then you try to get as much of

1468
00:52:22,549 --> 00:52:20,240
those done if you know you got them

1469
00:52:25,910 --> 00:52:22,559
coming so we have a list of things that

1470
00:52:29,910 --> 00:52:25,920
need to be done uh on the iss

1471
00:52:31,589 --> 00:52:29,920
um some that are are time critical

1472
00:52:33,349 --> 00:52:31,599
and some that aren't but they're this

1473
00:52:34,150 --> 00:52:33,359
they just have to happen

1474
00:52:38,230 --> 00:52:34,160
uh

1475
00:52:40,230 --> 00:52:38,240
sarge joints we're finding now that is

1476
00:52:43,030 --> 00:52:40,240
probably gonna we're gonna need to lube

1477
00:52:45,109 --> 00:52:43,040
them probably within the next year or so

1478
00:52:46,390 --> 00:52:45,119
uh and so uh that's on the list of

1479
00:52:49,270 --> 00:52:46,400
things to do now

1480
00:52:50,870 --> 00:52:49,280
this ku transceiver problem is something

1481
00:52:52,710 --> 00:52:50,880
we'll have to go do we have to finish

1482
00:52:55,030 --> 00:52:52,720
running the cables

1483
00:52:57,109 --> 00:52:55,040
from the u.s segment to the interface to

1484
00:52:59,109 --> 00:52:57,119
the russian segment these are the power

1485
00:53:01,109 --> 00:52:59,119
and data cables

1486
00:53:03,910 --> 00:53:01,119
for the mlm so we have to complete that

1487
00:53:05,829 --> 00:53:03,920
task we have a pma2 cover that we need

1488
00:53:08,470 --> 00:53:05,839

to put on

1489
00:53:10,309 --> 00:53:08,480
and we have an ams uh has a new blanket

1490
00:53:12,309 --> 00:53:10,319
we're trying to install

1491
00:53:14,069 --> 00:53:12,319
to reduce some of the thermal

1492
00:53:15,750 --> 00:53:14,079
issues that it sees that we have to

1493
00:53:18,069 --> 00:53:15,760
protect for today

1494
00:53:19,750 --> 00:53:18,079
and i'm sure i'm forgetting some so as

1495
00:53:21,589 --> 00:53:19,760
you you just hear that list you can

1496
00:53:23,589 --> 00:53:21,599
figure out that all of these have to be

1497
00:53:25,510 --> 00:53:23,599
done at some point and so you try to

1498
00:53:27,829 --> 00:53:25,520
figure the best if you don't have to run

1499
00:53:29,430 --> 00:53:27,839
outside tomorrow to fix a critical

1500
00:53:31,589 --> 00:53:29,440
system then you try to pick a time when

1501
00:53:33,030 --> 00:53:31,599
you can do it knowing that by the time

1502
00:53:34,630 --> 00:53:33,040
you get there there may be something

1503
00:53:36,150 --> 00:53:34,640
else that's more important than some of

1504
00:53:37,190 --> 00:53:36,160
these other items and you'll stick it on

1505
00:53:39,829 --> 00:53:37,200
the list

1506
00:53:41,829 --> 00:53:39,839
and that goes to the next thing which is

1507
00:53:42,870 --> 00:53:41,839
when we used to do shuttle flights crews

1508
00:53:45,430 --> 00:53:42,880
trained

1509
00:53:47,670 --> 00:53:45,440
it was something to seven to ten to one

1510
00:53:49,589 --> 00:53:47,680
for each task you're gonna do

1511
00:53:51,510 --> 00:53:49,599
outside we don't do that in the iss

1512
00:53:53,829 --> 00:53:51,520
program by the time the guys finish

1513
00:53:55,910 --> 00:53:53,839

training and get to orbit and actually

1514
00:53:57,510 --> 00:53:55,920
go outside for the eva several months

1515
00:53:59,109 --> 00:53:57,520
have usually passed

1516
00:54:02,069 --> 00:53:59,119
and during that time other things can

1517
00:54:03,270 --> 00:54:02,079
happen and so we will we train the crew

1518
00:54:05,030 --> 00:54:03,280
on the ground for what we think they're

1519
00:54:07,190 --> 00:54:05,040
going to have we train them generically

1520
00:54:09,349 --> 00:54:07,200
to to do

1521
00:54:11,190 --> 00:54:09,359
kind of normal maintenance out outside

1522
00:54:13,190 --> 00:54:11,200
but what that means is you have to plan

1523
00:54:15,030 --> 00:54:13,200
more time for an eva for any one task

1524
00:54:17,030 --> 00:54:15,040
than we used to in the shuttle program

1525
00:54:18,470 --> 00:54:17,040
so those two things combined not knowing

1526
00:54:20,390 --> 00:54:18,480
exactly what you're doing not training

1527
00:54:22,870 --> 00:54:20,400
at the same level it says it takes a

1528
00:54:24,309 --> 00:54:22,880
little longer to go out to do the just

1529
00:54:26,309 --> 00:54:24,319
whatever the task is takes a little

1530
00:54:28,069 --> 00:54:26,319
longer and so if you've got a lot of

1531
00:54:29,670 --> 00:54:28,079
tests to do you should probably assume

1532
00:54:30,790 --> 00:54:29,680
that it'll take more than one eba and

1533
00:54:32,870 --> 00:54:30,800
then of course there's the things you

1534
00:54:35,270 --> 00:54:32,880
run into once you go outside

1535
00:54:38,150 --> 00:54:35,280
so that's uh that's how we schedule it

1536
00:54:40,069 --> 00:54:38,160
scheduled up the ku problem we have of

1537
00:54:42,549 --> 00:54:40,079
course it's already done it's redundant

1538
00:54:43,670 --> 00:54:42,559

ku system is considered crit 3 but over

1539
00:54:45,990 --> 00:54:43,680
the years

1540
00:54:47,910 --> 00:54:46,000
we've become to rely on it heavily and

1541
00:54:48,870 --> 00:54:47,920
so it used to not be a redundant system

1542
00:54:50,309 --> 00:54:48,880
we

1543
00:54:51,589 --> 00:54:50,319
towards the end of the shuttle program

1544
00:54:53,589 --> 00:54:51,599
one of the things one of the mods we

1545
00:54:54,950 --> 00:54:53,599
made to station was add a redundant ku

1546
00:54:56,390 --> 00:54:54,960
system

1547
00:54:58,549 --> 00:54:56,400
and so fortunately we've done that and

1548
00:55:00,470 --> 00:54:58,559
we're not losing any data

1549
00:55:02,390 --> 00:55:00,480
but all the video you see a lot of the

1550
00:55:04,150 --> 00:55:02,400
data that comes down comes through the

1551
00:55:06,230 --> 00:55:04,160
ku system we've

1552
00:55:07,750 --> 00:55:06,240
we have a very very limited uplink

1553
00:55:09,990 --> 00:55:07,760
capability in fact it wasn't in the

1554
00:55:11,829 --> 00:55:10,000
original design to do uplink but we

1555
00:55:14,150 --> 00:55:11,839
figured out how to do that

1556
00:55:16,870 --> 00:55:14,160
so that we can use it not only not only

1557
00:55:19,030 --> 00:55:16,880
for getting research

1558
00:55:21,510 --> 00:55:19,040
things up but actually primarily for the

1559
00:55:23,349 --> 00:55:21,520
operations team to use it to get images

1560
00:55:25,030 --> 00:55:23,359
up and video up for the crew it's it's

1561
00:55:26,309 --> 00:55:25,040
really much more helpful a picture is

1562
00:55:28,390 --> 00:55:26,319
worth a thousand words when you're

1563
00:55:29,910 --> 00:55:28,400

trying to do things on orbit

1564
00:55:32,870 --> 00:55:29,920
and so this has become something we've

1565
00:55:34,549 --> 00:55:32,880
relied on uh the the new com system that

1566
00:55:36,069 --> 00:55:34,559
you'll hear us talk about that we're

1567
00:55:37,109 --> 00:55:36,079
about to install here in the next few

1568
00:55:40,230 --> 00:55:37,119
months we

1569
00:55:42,309 --> 00:55:40,240
refer to it as the as the icu

1570
00:55:44,710 --> 00:55:42,319
will actually double the downlink

1571
00:55:46,150 --> 00:55:44,720
capability and provide 25

1572
00:55:48,069 --> 00:55:46,160
megabits up

1573
00:55:50,230 --> 00:55:48,079
so we can even utilize the ku system

1574
00:55:51,990 --> 00:55:50,240
where it also is adding a couple of

1575
00:55:53,510 --> 00:55:52,000
comm loops for the crew

1576
00:55:56,230 --> 00:55:53,520
so we can have more discussions in

1577
00:55:58,549 --> 00:55:56,240
different modules so so we're becoming a

1578
00:56:00,470 --> 00:55:58,559
very reliant on the ku system even

1579
00:56:01,750 --> 00:56:00,480
though it's a crit 3 system and so

1580
00:56:04,549 --> 00:56:01,760
making sure we have this redundant

1581
00:56:07,190 --> 00:56:04,559
capability is is becoming important to

1582
00:56:09,270 --> 00:56:07,200
us we can live without it for sure

1583
00:56:11,349 --> 00:56:09,280
but it would be a big impact if we lost

1584
00:56:19,109 --> 00:56:11,359
it

1585
00:56:20,950 --> 00:56:19,119
simply put is is this then like the main

1586
00:56:23,109 --> 00:56:20,960
your main communications link between

1587
00:56:25,510 --> 00:56:23,119
the ground and the station

1588
00:56:27,670 --> 00:56:25,520

well i would say uh crit three is just

1589
00:56:30,309 --> 00:56:27,680
the lower the the highest criticality in

1590
00:56:32,150 --> 00:56:30,319
iss is one and it's it's for vehicle and

1591
00:56:34,630 --> 00:56:32,160
crew safety is and if that's required

1592
00:56:36,789 --> 00:56:34,640
then those systems are crit one systems

1593
00:56:38,870 --> 00:56:36,799
the eclipse systems the s-band

1594
00:56:40,950 --> 00:56:38,880
communication system that is our primary

1595
00:56:42,950 --> 00:56:40,960
command and control capability the iss

1596
00:56:46,069 --> 00:56:42,960
is considered crit one and has all the

1597
00:56:48,549 --> 00:56:46,079
redundancies necessary uh for crit one a

1598
00:56:50,549 --> 00:56:48,559
system crit three is just the lowest

1599
00:56:51,910 --> 00:56:50,559
criticality it's it's not something you

1600
00:56:54,069 --> 00:56:51,920
have to have

1601
00:56:55,990 --> 00:56:54,079
um and what's happened is we've become

1602
00:56:57,910 --> 00:56:56,000
so reliant on it and we like its

1603
00:56:59,829 --> 00:56:57,920
capability so much and it saves us so

1604
00:57:01,430 --> 00:56:59,839
much time

1605
00:57:03,349 --> 00:57:01,440
that we've

1606
00:57:05,270 --> 00:57:03,359
we want to get it

1607
00:57:07,750 --> 00:57:05,280
redundant so that we don't have to live

1608
00:57:09,430 --> 00:57:07,760
without it but the primary means for

1609
00:57:11,430 --> 00:57:09,440
command and control of the international

1610
00:57:13,589 --> 00:57:11,440
space station is through the s-band

1611
00:57:15,109 --> 00:57:13,599
communication system which is uh the

1612
00:57:19,589 --> 00:57:15,119
highest criticality and has all the

1613
00:57:22,230 --> 00:57:20,549

okay

1614
00:57:27,990 --> 00:57:22,240
let's see if tamara dietrich is there

1615
00:57:31,910 --> 00:57:30,309
damn are you there

1616
00:57:34,870 --> 00:57:31,920
okay well that's going to wrap it up for

1617
00:57:36,630 --> 00:57:34,880
us coming up at 1 pm central time 2 pm

1618
00:57:38,950 --> 00:57:36,640
eastern time here on nasa television we

1619
00:57:40,470 --> 00:57:38,960
will have the expedition 35

1620
00:57:43,030 --> 00:57:40,480
crew news conference with the entire

1621
00:57:44,470 --> 00:57:43,040
crew pablo vinogradov alexander misurkin

1622
00:57:45,750 --> 00:57:44,480
and chris cassidy will be here taking

1623
00:57:46,549 --> 00:57:45,760
questions from the media and talking

1624
00:57:48,069 --> 00:57:46,559
about

1625
00:57:51,109 --> 00:57:48,079
what's ahead for them so again that's at

1626
00:57:52,390 --> 00:57:51,119
1 pm central time 2 pm eastern time and

1627
00:57:54,470 --> 00:57:52,400
of course if you would like to learn

1628
00:57:57,990 --> 00:57:54,480
more about what's ahead for expedition

1629
00:58:02,870 --> 00:57:58,000
35 and 36 just log on to nasa.gov

1630
00:58:06,069 --> 00:58:04,630
station and if you'd like to take a look

1631
00:58:07,430 --> 00:58:06,079
at everything julie talked about in

1632
00:58:09,030 --> 00:58:07,440
these experiments just look on the left

1633
00:58:11,109 --> 00:58:09,040
hand side of the page you'll see

1634
00:58:12,630 --> 00:58:11,119
research and technology and just click

1635
00:58:13,910 --> 00:58:12,640
on experiments and you can read all

1636
00:58:15,430 --> 00:58:13,920
about them so we'll see you back here at