
VOICE OF
Robert Corban
Fluids & Combustion Facility Manager

1
00:00:04,710 --> 00:00:03,429
hey chris fukopian we're currently

2
00:00:06,789 --> 00:00:04,720
thinking about it but i do want to let

3
00:00:10,310 --> 00:00:06,799
you know that we do see ssc one so thank

4
00:00:13,350 --> 00:00:11,110
okay

5
00:00:14,910 --> 00:00:13,360
i just manually connected it to

6
00:00:18,630 --> 00:00:14,920
the

7
00:00:22,630 --> 00:00:18,640
um iss underscore msl underscore 2.4

8
00:00:25,750 --> 00:00:24,070
this is mission control houston in

9
00:00:27,269 --> 00:00:25,760
addition to this laptop work that

10
00:00:28,470 --> 00:00:27,279
cassidy is discussing with the team here

11
00:00:30,550 --> 00:00:28,480
on the ground now

12
00:00:32,470 --> 00:00:30,560
the main activity on his timeline today

13
00:00:34,709 --> 00:00:32,480

was some routine maintenance work on the

14
00:00:36,870 --> 00:00:34,719
combustions integrated rack that's a

15
00:00:38,790 --> 00:00:36,880
specialized experiment facility located

16
00:00:40,150 --> 00:00:38,800
in the destiny laboratory and it's

17
00:00:42,229 --> 00:00:40,160
actually part of the fluids and

18
00:00:44,549 --> 00:00:42,239
combustion facility which also houses

19
00:00:46,229 --> 00:00:44,559
the fluids integrated rack

20
00:00:48,389 --> 00:00:46,239
we have here on the phone with us today

21
00:00:50,950 --> 00:00:48,399
robert corbin the fluids and

22
00:00:52,869 --> 00:00:50,960
combustion facility manager from nasa's

23
00:00:55,830 --> 00:00:52,879
glenn research center thanks so much for

24
00:00:57,029 --> 00:00:55,840
joining us robert oh it's a pleasure

25
00:00:58,549 --> 00:00:57,039
well i was hoping you could tell us a

26
00:01:00,470 --> 00:00:58,559
little bit about these facilities and

27
00:01:01,590 --> 00:01:00,480
how what goes into designing a

28
00:01:04,869 --> 00:01:01,600
combustion

29
00:01:06,469 --> 00:01:04,879
um experiment facility to work in space

30
00:01:08,789 --> 00:01:06,479
and to work in space i expect that's a

31
00:01:10,630 --> 00:01:08,799
little a little tricky

32
00:01:13,750 --> 00:01:10,640
well the combustion integrated rack

33
00:01:16,230 --> 00:01:13,760
actually is maybe a second generation

34
00:01:17,510 --> 00:01:16,240
rack we used to fly on the space shuttle

35
00:01:21,109 --> 00:01:17,520
back in the

36
00:01:23,749 --> 00:01:21,119
in the 80s and cm1 and cm2 combustion

37
00:01:26,550 --> 00:01:23,759
module 1 combustion module 2

38
00:01:30,390 --> 00:01:26,560

and obviously of the major designs is to

39
00:01:32,550 --> 00:01:30,400
contain any fire that you're burning

40
00:01:35,350 --> 00:01:32,560
in some kind of controlled

41
00:01:37,350 --> 00:01:35,360
a chamber so the main feature of the

42
00:01:40,550 --> 00:01:37,360
combustion air graded rack is the

43
00:01:41,910 --> 00:01:40,560
combustion chamber

44
00:01:43,830 --> 00:01:41,920
okay and

45
00:01:45,670 --> 00:01:43,840
i guess the combustion chamber

46
00:01:47,910 --> 00:01:45,680
essentially has to in addition to

47
00:01:49,670 --> 00:01:47,920
holding the um experiment has to

48
00:01:50,870 --> 00:01:49,680
protect the rest of the station from

49
00:01:52,870 --> 00:01:50,880
that experiment

50
00:01:54,870 --> 00:01:52,880
yeah it does and it also sets the

51
00:01:56,709 --> 00:01:54,880
environment for which the principal

52
00:01:57,830 --> 00:01:56,719
investigator you know wants to see

53
00:01:59,990 --> 00:01:57,840
during a

54
00:02:02,149 --> 00:02:00,000
series of data points

55
00:02:04,389 --> 00:02:02,159
so you know chris will be going in

56
00:02:06,870 --> 00:02:04,399
to the chamber today to pull out you

57
00:02:09,589 --> 00:02:06,880
know basically the experiment and

58
00:02:11,270 --> 00:02:09,599
he'll be replacing the fuel reservoir in

59
00:02:13,110 --> 00:02:11,280
there so that they can

60
00:02:14,470 --> 00:02:13,120
continue to do their experimentation

61
00:02:16,070 --> 00:02:14,480
this week

62
00:02:18,070 --> 00:02:16,080
and we're actually seeing some video of

63
00:02:19,910 --> 00:02:18,080

him doing that work from earlier this

64
00:02:20,869 --> 00:02:19,920
morning now this recorded video that

65
00:02:22,390 --> 00:02:20,879
shows him

66
00:02:24,390 --> 00:02:22,400
looking inside the

67
00:02:25,830 --> 00:02:24,400
combustion integrated rack and and

68
00:02:27,910 --> 00:02:25,840
getting ready to do some of those change

69
00:02:30,309 --> 00:02:27,920
outs

70
00:02:32,150 --> 00:02:30,319
so it it holds i guess you can change

71
00:02:34,949 --> 00:02:32,160
out the different types of fuel so that

72
00:02:37,350 --> 00:02:34,959
the uh the researchers can can see the

73
00:02:39,910 --> 00:02:37,360
effects of different um different types

74
00:02:42,470 --> 00:02:39,920
of materials as they're

75
00:02:44,869 --> 00:02:42,480
ignited in space yeah i mean this one is

76
00:02:46,229 --> 00:02:44,879
all focused on on droplets you know

77
00:02:48,949 --> 00:02:46,239
liquid type

78
00:02:51,110 --> 00:02:48,959
combustion you know phenomena

79
00:02:52,309 --> 00:02:51,120
so he's replacing one of the fuel

80
00:02:54,229 --> 00:02:52,319
reservoirs and they're looking at

81
00:02:56,710 --> 00:02:54,239
heptane

82
00:02:58,869 --> 00:02:56,720
the researchers have a series of

83
00:03:01,190 --> 00:02:58,879
different fuels they look at

84
00:03:03,270 --> 00:03:01,200
and they also change the environment

85
00:03:06,070 --> 00:03:03,280
inside the chamber to either enrich it

86
00:03:07,190 --> 00:03:06,080
in helium or enrich it in xenon or

87
00:03:09,589 --> 00:03:07,200
whatever that have different

88
00:03:12,470 --> 00:03:09,599

characteristics

89
00:03:14,070 --> 00:03:12,480
so that they can see how it extinguishes

90
00:03:15,509 --> 00:03:14,080
they kind of understand a lot more about

91
00:03:17,350 --> 00:03:15,519
the phenomena

92
00:03:19,430 --> 00:03:17,360
of combustion

93
00:03:21,430 --> 00:03:19,440
by doing that

94
00:03:23,750 --> 00:03:21,440
and i i think one of the reasons they're

95
00:03:25,270 --> 00:03:23,760
interested in that is because um fire

96
00:03:26,470 --> 00:03:25,280
behaves a little differently in space

97
00:03:29,589 --> 00:03:26,480
than it does here on the ground is that

98
00:03:31,430 --> 00:03:29,599
right uh it does yes um first of all you

99
00:03:34,390 --> 00:03:31,440
know if you see like a candle you'll see

100
00:03:36,229 --> 00:03:34,400
like a you know convective flow around

101
00:03:37,990 --> 00:03:36,239
it and you'll see the point you know as

102
00:03:40,229 --> 00:03:38,000
it you know gravity

103
00:03:42,869 --> 00:03:40,239
obviously heat rises things like that in

104
00:03:44,710 --> 00:03:42,879
space you'll see a nice blue

105
00:03:47,270 --> 00:03:44,720
burning flame ball

106
00:03:49,030 --> 00:03:47,280
and yet it also burns much longer

107
00:03:50,869 --> 00:03:49,040
and what they're really concentrating on

108
00:03:52,710 --> 00:03:50,879
is what you know one one whether or not

109
00:03:53,670 --> 00:03:52,720
we can even ignite it in that particular

110
00:03:56,630 --> 00:03:53,680
environment

111
00:03:58,309 --> 00:03:56,640
and then two once we do

112
00:04:01,110 --> 00:03:58,319
they want to look at how it extinguishes

113
00:04:02,869 --> 00:04:01,120

in two different uh phenomena

114
00:04:04,630 --> 00:04:02,879
one of the things they're starting to

115
00:04:05,990 --> 00:04:04,640
see as well is what they call a cool

116
00:04:08,229 --> 00:04:06,000
flames

117
00:04:11,190 --> 00:04:08,239
phenomena where they um

118
00:04:13,589 --> 00:04:11,200
the flame is visibly out but it still

119
00:04:15,190 --> 00:04:13,599
has a very rapid evaporation and it's

120
00:04:16,390 --> 00:04:15,200
called cool flame so it's actually a

121
00:04:20,150 --> 00:04:16,400
flame

122
00:04:24,150 --> 00:04:22,150
yeah i remember reading about that i

123
00:04:25,749 --> 00:04:24,160
think it was a bit of an unexpected

124
00:04:27,990 --> 00:04:25,759
finding is that right

125
00:04:29,510 --> 00:04:28,000
uh well yeah they've seen it a little

126
00:04:31,909 --> 00:04:29,520
bit before i think in some of the

127
00:04:34,230 --> 00:04:31,919
shuttle experiments but now they're

128
00:04:37,670 --> 00:04:34,240
concentrating more and more on that

129
00:04:39,110 --> 00:04:37,680
um that area is is sort of new and

130
00:04:41,909 --> 00:04:39,120
trying to understand a lot more about

131
00:04:43,510 --> 00:04:41,919
what's happening there so that they can

132
00:04:45,909 --> 00:04:43,520
understand better you know some of the

133
00:04:48,070 --> 00:04:45,919
confusion phenomena on the ground such

134
00:04:49,670 --> 00:04:48,080
as knocking and you know diesel engines

135
00:04:51,909 --> 00:04:49,680
and things like that

136
00:04:53,670 --> 00:04:51,919
um so that they can make you know more

137
00:04:56,710 --> 00:04:53,680
efficient engines more combustion you

138
00:04:58,390 --> 00:04:56,720

know fishing combustion processes

139
00:05:00,469 --> 00:04:58,400
this uh wreck has been on the space

140
00:05:02,870 --> 00:05:00,479
station for a few years now i think and

141
00:05:06,390 --> 00:05:02,880
um do you feel like we've been getting

142
00:05:10,550 --> 00:05:06,400
good um good data out of it yeah see we

143
00:05:11,830 --> 00:05:10,560
launched in i believe was 2 000 and

144
00:05:15,350 --> 00:05:11,840
um

145
00:05:17,270 --> 00:05:15,360
and so yeah he was on sts 126.

146
00:05:19,430 --> 00:05:17,280
and so uh yeah we've been getting a lot

147
00:05:20,790 --> 00:05:19,440
of good data um

148
00:05:22,310 --> 00:05:20,800
you know there's a kind of the

149
00:05:24,310 --> 00:05:22,320
difference with the combustion

150
00:05:25,749 --> 00:05:24,320
experiments as they're developing a huge

151
00:05:27,749 --> 00:05:25,759
matrix so

152
00:05:29,350 --> 00:05:27,759
um you know like this particular set of

153
00:05:31,510 --> 00:05:29,360
experiments they're doing something like

154
00:05:33,510 --> 00:05:31,520
120 different you know

155
00:05:35,270 --> 00:05:33,520
data points just to understand better

156
00:05:36,390 --> 00:05:35,280
what they're seeing and what they're

157
00:05:37,990 --> 00:05:36,400
experiencing in the different

158
00:05:40,310 --> 00:05:38,000
atmospheres

159
00:05:42,070 --> 00:05:40,320
so it takes a long time and so some of

160
00:05:45,110 --> 00:05:42,080
these experiments aren't just a one-time

161
00:05:46,390 --> 00:05:45,120
deal it goes over years and so yeah

162
00:05:48,550 --> 00:05:46,400
we've been getting a lot of good data

163
00:05:51,189 --> 00:05:48,560

coming back

164
00:05:52,790 --> 00:05:51,199
great well um so the combustion

165
00:05:55,510 --> 00:05:52,800
integrated rack is combined with the

166
00:05:57,909 --> 00:05:55,520
fluids integrated rack into one facility

167
00:05:59,590 --> 00:05:57,919
what is that just for convenience and

168
00:06:00,950 --> 00:05:59,600
space or is there a reason to have those

169
00:06:03,189 --> 00:06:00,960
two together

170
00:06:05,430 --> 00:06:03,199
uh no actually the combustion integrated

171
00:06:07,110 --> 00:06:05,440
rack which chris is working on today

172
00:06:08,950 --> 00:06:07,120
you know obviously it's in u.s lab and

173
00:06:10,710 --> 00:06:08,960
then right to the right of it is the

174
00:06:12,070 --> 00:06:10,720
fluids integrated rack

175
00:06:13,270 --> 00:06:12,080
sometimes you'll see it on the camera

176
00:06:15,510 --> 00:06:13,280
it'll have a

177
00:06:17,670 --> 00:06:15,520
kind of a grid looking net in front of

178
00:06:20,070 --> 00:06:17,680
it because it's what they call an eris

179
00:06:21,990 --> 00:06:20,080
type rack which means it floats

180
00:06:24,950 --> 00:06:22,000
or can float

181
00:06:26,150 --> 00:06:24,960
off of some kind of an active isolation

182
00:06:28,070 --> 00:06:26,160
system

183
00:06:29,510 --> 00:06:28,080
so that's right to the

184
00:06:31,350 --> 00:06:29,520
right of the sur

185
00:06:33,270 --> 00:06:31,360
if you're looking at it

186
00:06:34,870 --> 00:06:33,280
but the fur and the third they have a

187
00:06:37,270 --> 00:06:34,880
lot of common hardware between them in

188
00:06:39,510 --> 00:06:37,280

terms of the way that it deals with its

189
00:06:40,629 --> 00:06:39,520
interfaces with the avionics to the

190
00:06:43,590 --> 00:06:40,639
station

191
00:06:45,270 --> 00:06:43,600
as well as its power distribution but

192
00:06:46,950 --> 00:06:45,280
and they also both have what we would

193
00:06:49,189 --> 00:06:46,960
kind of call a

194
00:06:50,790 --> 00:06:49,199
optics bench within those

195
00:06:52,469 --> 00:06:50,800
racks that kind of slides out when the

196
00:06:53,670 --> 00:06:52,479
crew needs to get access to the back of

197
00:06:55,749 --> 00:06:53,680
the rack

198
00:06:57,430 --> 00:06:55,759
so that's where some of the common areas

199
00:06:59,110 --> 00:06:57,440
are and then after that there's a lot of

200
00:07:00,309 --> 00:06:59,120
big differences

201
00:07:02,950 --> 00:07:00,319
the fur

202
00:07:04,710 --> 00:07:02,960
is a very large open volume

203
00:07:07,189 --> 00:07:04,720
and in it right now is the light

204
00:07:08,390 --> 00:07:07,199
microscopy module which is a microscope

205
00:07:11,110 --> 00:07:08,400
that

206
00:07:12,950 --> 00:07:11,120
is fully automated to do a lot of the

207
00:07:14,550 --> 00:07:12,960
science that we need to do in a very

208
00:07:15,430 --> 00:07:14,560
microscopic

209
00:07:17,510 --> 00:07:15,440
um

210
00:07:19,110 --> 00:07:17,520
you know research kind of area

211
00:07:22,550 --> 00:07:19,120
and so there is some big differences

212
00:07:27,749 --> 00:07:25,510
okay and um you just mentioned that the

213
00:07:30,070 --> 00:07:27,759

the microscope that is in the fluids

214
00:07:32,070 --> 00:07:30,080
rack at the moment is fully automated i

215
00:07:33,510 --> 00:07:32,080
think that's you know generally the case

216
00:07:34,790 --> 00:07:33,520
for these experiments that the crew

217
00:07:36,710 --> 00:07:34,800
doesn't have to

218
00:07:39,510 --> 00:07:36,720
do a whole lot of work with them other

219
00:07:41,510 --> 00:07:39,520
than get them started is that uh both of

220
00:07:44,629 --> 00:07:41,520
them yeah very similar um when these

221
00:07:46,869 --> 00:07:44,639
were designed the concept was that

222
00:07:48,790 --> 00:07:46,879
we pretty much thought crew

223
00:07:52,070 --> 00:07:48,800
the crew's time was going to be very

224
00:07:54,309 --> 00:07:52,080
precious and it's sort of still the case

225
00:07:57,510 --> 00:07:54,319
um so we did a lot of things where we

226
00:07:59,749 --> 00:07:57,520
wanted the crew to interact with our

227
00:08:01,430 --> 00:07:59,759
different pieces of hardware um to set

228
00:08:02,469 --> 00:08:01,440
up the experiments and but then they

229
00:08:05,029 --> 00:08:02,479
could

230
00:08:06,869 --> 00:08:05,039
close the doors and kind of walk away

231
00:08:09,270 --> 00:08:06,879
sometimes for days and sometimes for

232
00:08:10,830 --> 00:08:09,280
weeks and we can do experiments

233
00:08:13,670 --> 00:08:10,840
and then they would have to come back

234
00:08:15,350 --> 00:08:13,680
and and then just like he's doing today

235
00:08:17,430 --> 00:08:15,360
change out the fuel or

236
00:08:18,790 --> 00:08:17,440
change out an igniter that may burn out

237
00:08:20,550 --> 00:08:18,800
or whatever but

238
00:08:21,510 --> 00:08:20,560

but most of it we were not having a

239
00:08:24,150 --> 00:08:21,520
cruise

240
00:08:27,029 --> 00:08:24,160
hands-on doing the experiments um

241
00:08:27,909 --> 00:08:27,039
you know like the msg which is also next

242
00:08:30,790 --> 00:08:27,919
to the

243
00:08:32,630 --> 00:08:30,800
sur the crew has a lot of on hands um

244
00:08:33,670 --> 00:08:32,640
experiment work which obviously like

245
00:08:34,550 --> 00:08:33,680
doing

246
00:08:37,589 --> 00:08:34,560
but

247
00:08:40,070 --> 00:08:37,599
because of the nature of of

248
00:08:41,589 --> 00:08:40,080
the flames in the combustion rack and

249
00:08:43,589 --> 00:08:41,599
the microscopic

250
00:08:45,110 --> 00:08:43,599
nature of the work we had to do in the

251
00:08:46,710 --> 00:08:45,120
fur we had to automate a lot of that

252
00:08:47,910 --> 00:08:46,720
stuff

253
00:08:49,829 --> 00:08:47,920
okay

254
00:08:51,590 --> 00:08:49,839
well um anything else that we should be

255
00:08:52,790 --> 00:08:51,600
looking forward to with with either

256
00:08:54,550 --> 00:08:52,800
these

257
00:08:56,389 --> 00:08:54,560
facilities any experiments coming up

258
00:08:58,710 --> 00:08:56,399
that will be especially interesting

259
00:09:00,150 --> 00:08:58,720
uh well the lmm the like microscopy

260
00:09:02,150 --> 00:09:00,160
module um

261
00:09:03,829 --> 00:09:02,160
they're going to go in and we had to we

262
00:09:06,070 --> 00:09:03,839
had a little bit of an issue a couple

263
00:09:07,910 --> 00:09:06,080

weeks ago the crew is going to go in and

264
00:09:10,470 --> 00:09:07,920
take care of that and we'll be back up

265
00:09:13,670 --> 00:09:10,480
and running in a in a couple weeks

266
00:09:15,110 --> 00:09:13,680
again they'll be back looking at colloid

267
00:09:17,110 --> 00:09:15,120
type research

268
00:09:19,110 --> 00:09:17,120
to better understand

269
00:09:21,829 --> 00:09:19,120
the phenomena basically of particles

270
00:09:24,230 --> 00:09:21,839
interacting and making structures in

271
00:09:26,070 --> 00:09:24,240
space when you have no gravity

272
00:09:27,509 --> 00:09:26,080
and the combustion um

273
00:09:29,190 --> 00:09:27,519
he's also going to be doing something we

274
00:09:31,509 --> 00:09:29,200
haven't done since we launched which is

275
00:09:33,750 --> 00:09:31,519
not that complicated but

276
00:09:34,870 --> 00:09:33,760
the today chris will also be changing

277
00:09:39,030 --> 00:09:34,880
out the

278
00:09:40,790 --> 00:09:39,040
seals actually on the combustion chamber

279
00:09:42,870 --> 00:09:40,800
those do need to be replaced

280
00:09:45,269 --> 00:09:42,880
periodically just to maintain you know

281
00:09:46,710 --> 00:09:45,279
that we get a vacuum in there and we can

282
00:09:48,790 --> 00:09:46,720
keep everything that needs to stay in

283
00:09:50,630 --> 00:09:48,800
there in the chamber so he'll be doing

284
00:09:51,670 --> 00:09:50,640
that as well today

285
00:09:53,110 --> 00:09:51,680
okay

286
00:09:54,630 --> 00:09:53,120
well we'll watch out for that as well

287
00:09:57,829 --> 00:09:54,640
thank you so much for talking with us we

288
00:10:01,750 --> 00:09:59,590

thank you this is robert corbin the