



To FGB



Satellite Cristoforo Colombo

Cept  
Space Science

Indica



1  
00:00:09,190 --> 00:00:07,110  
we're now close to the conclusion of the

2  
00:00:12,070 --> 00:00:09,200  
international space station's expedition

3  
00:00:14,310 --> 00:00:12,080  
43 which has been a very busy time for

4  
00:00:17,109 --> 00:00:14,320  
science for the six station crew members

5  
00:00:19,670 --> 00:00:17,119  
that leads directly into expedition 44

6  
00:00:22,070 --> 00:00:19,680  
which will conclude or continue the

7  
00:00:24,470 --> 00:00:22,080  
one-year mission and a lot of other

8  
00:00:27,670 --> 00:00:24,480  
research recently my colleague pat ryan

9  
00:00:29,669 --> 00:00:27,680  
had spoke with jorge sotomayer the lead

10  
00:00:32,709 --> 00:00:29,679  
increment scientist for both expeditions

11  
00:00:34,549 --> 00:00:32,719  
43 and 44 to get an update starting with

12  
00:00:37,430 --> 00:00:34,559  
the crew's work on a flame experiment

13  
00:00:39,830 --> 00:00:37,440

known as flux 2.

14

00:00:42,709 --> 00:00:39,840

basically flex 2 studies the combustion

15

00:00:45,029 --> 00:00:42,719

of tiny little droplets of fuel

16

00:00:46,549 --> 00:00:45,039

in microgravity and studied the

17

00:00:48,869 --> 00:00:46,559

generation of

18

00:00:50,229 --> 00:00:48,879

suit during those tests

19

00:00:51,830 --> 00:00:50,239

and

20

00:00:55,270 --> 00:00:51,840

flex 2

21

00:00:57,990 --> 00:00:55,280

studied different mixes of fuel and and

22

00:01:00,470 --> 00:00:58,000

also studied in addition to just one

23

00:01:03,510 --> 00:01:00,480

droplet of fuel it also studied multiple

24

00:01:06,230 --> 00:01:03,520

fuel droplets two specifically

25

00:01:07,830 --> 00:01:06,240

so it wanted to study the interaction of

26

00:01:10,830 --> 00:01:07,840

the flame uh

27

00:01:14,310 --> 00:01:10,840

with between the two droplets as they

28

00:01:17,510 --> 00:01:14,320

ignite and and actually we have a new

29

00:01:19,830 --> 00:01:17,520

experiment coming up flex 2j in

30

00:01:21,590 --> 00:01:19,840

collaboration with japan and in that

31

00:01:24,310 --> 00:01:21,600

experiment we're actually going to test

32

00:01:26,550 --> 00:01:24,320

multiple droplets of fuel igniting at

33

00:01:27,830 --> 00:01:26,560

the same time and study the interaction

34

00:01:29,910 --> 00:01:27,840

of the flame

35

00:01:32,469 --> 00:01:29,920

as it occurs and it's important to know

36

00:01:34,069 --> 00:01:32,479

how flames burn in space because it's

37

00:01:36,069 --> 00:01:34,079

different than it is on earth right it

38

00:01:39,030 --> 00:01:36,079

is yes yeah we have a

39

00:01:40,469 --> 00:01:39,040

spherical droplet of fuel so the

40

00:01:42,710 --> 00:01:40,479

properties combustion properties and the

41

00:01:45,270 --> 00:01:42,720

fluid dynamics are different then what

42

00:01:46,710 --> 00:01:45,280

occurs in microgravity then what occurs

43

00:01:49,510 --> 00:01:46,720

here on earth

44

00:01:51,030 --> 00:01:49,520

so with this information we can

45

00:01:52,069 --> 00:01:51,040

design

46

00:01:53,350 --> 00:01:52,079

advanced

47

00:01:57,749 --> 00:01:53,360

systems for

48

00:02:00,789 --> 00:01:57,759

well as study

49

00:02:01,910 --> 00:02:00,799

and design cleaner

50

00:02:03,030 --> 00:02:01,920

burning

51  
00:02:04,789 --> 00:02:03,040  
techniques

52  
00:02:06,469 --> 00:02:04,799  
for the ground interesting

53  
00:02:08,389 --> 00:02:06,479  
there's also science onboard the station

54  
00:02:10,949 --> 00:02:08,399  
that happens outside the pressurized

55  
00:02:13,350 --> 00:02:10,959  
modules uh the fact that the robotic

56  
00:02:15,589 --> 00:02:13,360  
refueling mission had operations

57  
00:02:18,150 --> 00:02:15,599  
recently tell us about what that is yes

58  
00:02:22,070 --> 00:02:18,160  
yeah the uh robotic refueling mission uh

59  
00:02:25,990 --> 00:02:22,080  
phase two or rrm as we call it um that

60  
00:02:29,350 --> 00:02:26,000  
mission studies uh how to uh repair

61  
00:02:31,430 --> 00:02:29,360  
satellites currently in orbit

62  
00:02:33,110 --> 00:02:31,440  
but that were not designed to be

63  
00:02:36,710 --> 00:02:33,120

repaired

64

00:02:39,589 --> 00:02:36,720

so all refueled so what rrm

65

00:02:43,110 --> 00:02:39,599

phase 2 consisted of was

66

00:02:45,030 --> 00:02:43,120

the crew set up task boards and tools

67

00:02:48,150 --> 00:02:45,040

in the gem airlock

68

00:02:50,869 --> 00:02:48,160

then the ssrms the robotic arm came over

69

00:02:54,150 --> 00:02:50,879

and picked those tools up and install

70

00:02:56,070 --> 00:02:54,160

them in the or on the rm facility

71

00:02:58,949 --> 00:02:56,080

external to the station right

72

00:03:02,949 --> 00:02:58,959

and the next phase is for the robotic

73

00:03:05,910 --> 00:03:02,959

arm to test those tools

74

00:03:08,949 --> 00:03:05,920

simulating uh that it's doing a repair

75

00:03:11,350 --> 00:03:08,959

on a failed uh satellite so the

76  
00:03:14,070 --> 00:03:11,360  
advantage of this is that we can extend

77  
00:03:16,309 --> 00:03:14,080  
the lives of the satellites on orbit

78  
00:03:19,589 --> 00:03:16,319  
that were not initially planned uh for

79  
00:03:21,670 --> 00:03:19,599  
replacement for a long duration and that

80  
00:03:23,270 --> 00:03:21,680  
will save cost to the

81  
00:03:25,509 --> 00:03:23,280  
companies on the ground as they don't

82  
00:03:27,750 --> 00:03:25,519  
have to relaunch the satellites yeah

83  
00:03:28,949 --> 00:03:27,760  
clearly have some some value

84  
00:03:31,350 --> 00:03:28,959  
another thing that got a lot of

85  
00:03:33,270 --> 00:03:31,360  
attention during expedition 43 was the

86  
00:03:34,789 --> 00:03:33,280  
first espresso machine

87  
00:03:36,710 --> 00:03:34,799  
on board the station

88  
00:03:38,550 --> 00:03:36,720

that's not just for fun right tell me

89

00:03:40,229 --> 00:03:38,560

about that demonstration yes yeah yeah

90

00:03:42,309 --> 00:03:40,239

that was a very interesting

91

00:03:45,430 --> 00:03:42,319

demonstration it's a an investigation

92

00:03:48,149 --> 00:03:45,440

from the italian space agency and

93

00:03:50,869 --> 00:03:48,159

basically it wanted to bring to the

94

00:03:51,830 --> 00:03:50,879

station the comforts of home from the

95

00:03:54,390 --> 00:03:51,840

ground

96

00:03:56,630 --> 00:03:54,400

and uh and actually coincidentally an

97

00:03:59,589 --> 00:03:56,640

italian astronaut samantha christopher

98

00:04:01,190 --> 00:03:59,599

already installed the iss

99

00:04:04,070 --> 00:04:01,200

espresso machine

100

00:04:06,789 --> 00:04:04,080

and tested it it was all very successful

101  
00:04:10,149 --> 00:04:06,799  
and so now what the intent is to

102  
00:04:12,149 --> 00:04:10,159  
it not only helps in terms of

103  
00:04:14,229 --> 00:04:12,159  
bringing other options

104  
00:04:16,310 --> 00:04:14,239  
for food uh consumption to the

105  
00:04:18,870 --> 00:04:16,320  
astronauts but also

106  
00:04:21,830 --> 00:04:18,880  
the psychological effect of bringing it

107  
00:04:24,150 --> 00:04:21,840  
closer to home yeah and i think this

108  
00:04:26,790 --> 00:04:24,160  
other thing was sort of a psychological

109  
00:04:29,110 --> 00:04:26,800  
thing too they were using cups that

110  
00:04:30,870 --> 00:04:29,120  
allowed them to actually drink

111  
00:04:33,030 --> 00:04:30,880  
more like they would on earth as opposed

112  
00:04:35,510 --> 00:04:33,040  
to a straw in a bag

113  
00:04:37,430 --> 00:04:35,520

yes capillary beverage yeah that's uh

114

00:04:38,710 --> 00:04:37,440

that investigation studies

115

00:04:41,830 --> 00:04:38,720

how to

116

00:04:42,790 --> 00:04:41,840

use fluid dynamics on the design of a

117

00:04:45,430 --> 00:04:42,800

cup

118

00:04:47,350 --> 00:04:45,440

so that the liquid doesn't spill

119

00:04:49,350 --> 00:04:47,360

it's still an open cup but the liquid

120

00:04:50,710 --> 00:04:49,360

doesn't spill again using all the

121

00:04:53,430 --> 00:04:50,720

physics and

122

00:04:54,870 --> 00:04:53,440

fluid dynamics that go with it now

123

00:04:56,870 --> 00:04:54,880

interestingly enough

124

00:04:59,110 --> 00:04:56,880

this technology from

125

00:05:02,550 --> 00:04:59,120

capillary beverage is not only being

126

00:05:05,189 --> 00:05:02,560

used to design these cups but also

127

00:05:08,790 --> 00:05:05,199

it will be used to design uh advanced

128

00:05:10,710 --> 00:05:08,800

fluid systems for spacecraft so it's all

129

00:05:13,270 --> 00:05:10,720

it seems very simple but the physics

130

00:05:16,310 --> 00:05:13,280

involved are very complex and have a

131

00:05:18,230 --> 00:05:16,320

multiple uh application and a way to

132

00:05:20,150 --> 00:05:18,240

control the movement of liquids where

133

00:05:22,230 --> 00:05:20,160

there's no gravity like yes pulling

134

00:05:24,390 --> 00:05:22,240

fluids to the bottom of a fuel tank

135

00:05:25,749 --> 00:05:24,400

right right yes that's a that's a

136

00:05:27,430 --> 00:05:25,759

problem that

137

00:05:28,230 --> 00:05:27,440

we're working on

138

00:05:28,950 --> 00:05:28,240

uh

139

00:05:31,350 --> 00:05:28,960

the

140

00:05:32,710 --> 00:05:31,360

expedition 43 crews uh working on a

141

00:05:35,430 --> 00:05:32,720

couple of big experiments in the

142

00:05:37,749 --> 00:05:35,440

one-year mission uh coming up uh tell me

143

00:05:39,270 --> 00:05:37,759

about this fluid shifts experiment and

144

00:05:41,430 --> 00:05:39,280

what scott kelly's going to be doing

145

00:05:42,710 --> 00:05:41,440

inside a russian

146

00:05:44,070 --> 00:05:42,720

piece of hardware

147

00:05:45,110 --> 00:05:44,080

yes yeah that's a very interesting

148

00:05:46,950 --> 00:05:45,120

experiment

149

00:05:49,430 --> 00:05:46,960

and fluid shifts

150

00:05:54,150 --> 00:05:49,440

basically what the scientists want to

151  
00:05:57,430 --> 00:05:54,160  
study is the effect of long-term uh

152  
00:05:59,590 --> 00:05:57,440  
exposure to microgravity and because the

153  
00:06:02,230 --> 00:05:59,600  
fluids shift from the lower part of the

154  
00:06:04,390 --> 00:06:02,240  
body to the upper part of the body and

155  
00:06:06,469 --> 00:06:04,400  
that creates increased

156  
00:06:08,469 --> 00:06:06,479  
pressure in the brain which at the same

157  
00:06:10,230 --> 00:06:08,479  
time then it increases the pressure on

158  
00:06:12,950 --> 00:06:10,240  
the eye on the back of the eye and that

159  
00:06:15,510 --> 00:06:12,960  
changes the vision of the astronauts so

160  
00:06:16,629 --> 00:06:15,520  
the objective is to study how that

161  
00:06:17,670 --> 00:06:16,639  
happens

162  
00:06:19,590 --> 00:06:17,680  
and

163  
00:06:21,909 --> 00:06:19,600

possibly identify

164

00:06:25,110 --> 00:06:21,919

countermeasures for that with that

165

00:06:26,870 --> 00:06:25,120

situation by testing

166

00:06:30,309 --> 00:06:26,880

the ocular structure

167

00:06:31,670 --> 00:06:30,319

intracranial pressure

168

00:06:32,830 --> 00:06:31,680

both

169

00:06:35,830 --> 00:06:32,840

outside of the

170

00:06:37,830 --> 00:06:35,840

chibis suit as well as inside the chibis

171

00:06:39,430 --> 00:06:37,840

suit what the chibis

172

00:06:42,629 --> 00:06:39,440

suit does it's a

173

00:06:45,270 --> 00:06:42,639

lower body negative pressure so it will

174

00:06:47,270 --> 00:06:45,280

simulate or avoid having those fluids

175

00:06:49,510 --> 00:06:47,280

shifting from the lower body to the

176

00:06:51,909 --> 00:06:49,520

upper portion of the body it kind of

177

00:06:54,150 --> 00:06:51,919

draws fluids back down into the legs

178

00:06:56,309 --> 00:06:54,160

correct correct so we want to take the

179

00:06:58,550 --> 00:06:56,319

measurements with and without the

180

00:07:00,469 --> 00:06:58,560

chibi's suit and see if it makes a

181

00:07:03,909 --> 00:07:00,479

difference is there a thought that that

182

00:07:06,150 --> 00:07:03,919

might be a a way to fight the fluid

183

00:07:07,749 --> 00:07:06,160

shift that we can can do it with crew

184

00:07:10,390 --> 00:07:07,759

members throughout the mission perhaps

185

00:07:13,589 --> 00:07:10,400

correct correct and potentially avoid

186

00:07:14,950 --> 00:07:13,599

temporary or permanent uh changes to the

187

00:07:17,029 --> 00:07:14,960

eye structure

188

00:07:18,710 --> 00:07:17,039

uh scott kelly and mikhail kornienko

189

00:07:20,790 --> 00:07:18,720

have also been working on a thing called

190

00:07:23,189 --> 00:07:20,800

fine motor skills that's part of their

191

00:07:24,629 --> 00:07:23,199

their one year plan too what's what do

192

00:07:27,110 --> 00:07:24,639

they do for that

193

00:07:30,710 --> 00:07:27,120

yeah that one actually as you know

194

00:07:32,629 --> 00:07:30,720

nowadays uh we rely on technology uh and

195

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

not only technology but uh

196

00:07:36,070 --> 00:07:34,000

ipads and

197

00:07:37,110 --> 00:07:36,080

tablets and touch screen

198

00:07:39,510 --> 00:07:37,120

activities

199

00:07:40,950 --> 00:07:39,520

so in this particular investigation the

200

00:07:43,189 --> 00:07:40,960

crew members will

201  
00:07:44,629 --> 00:07:43,199  
do several tests throughout their

202  
00:07:47,350 --> 00:07:44,639  
mission

203  
00:07:49,110 --> 00:07:47,360  
to identify and all of the tests are

204  
00:07:52,790 --> 00:07:49,120  
going to be done on a touch screen

205  
00:07:55,990 --> 00:07:52,800  
tablet to identify how their reaction

206  
00:07:56,869 --> 00:07:56,000  
and the fine motor skills evolved as

207  
00:07:59,189 --> 00:07:56,879  
they

208  
00:08:01,270 --> 00:07:59,199  
stay on orbit and espec particularly

209  
00:08:03,430 --> 00:08:01,280  
during a one-year mission so there they

210  
00:08:05,350 --> 00:08:03,440  
were tested before flight

211  
00:08:08,150 --> 00:08:05,360  
then during flight to measure and

212  
00:08:10,550 --> 00:08:08,160  
identify the adaptation process and then

213  
00:08:14,070 --> 00:08:10,560

after they come back to the ground to

214

00:08:15,830 --> 00:08:14,080

identify how they uh re-adapt to the

215

00:08:17,909 --> 00:08:15,840

earth's gravity

216

00:08:20,230 --> 00:08:17,919

and that's important because crew

217

00:08:22,469 --> 00:08:20,240

members need to still have those fine

218

00:08:23,749 --> 00:08:22,479

motor skills to do their jobs yes yeah

219

00:08:24,950 --> 00:08:23,759

especially

220

00:08:29,350 --> 00:08:24,960

on orbit

221

00:08:31,830 --> 00:08:29,360

have to work with very sensitive

222

00:08:33,829 --> 00:08:31,840

hardware do repairs and very sensitive

223

00:08:37,110 --> 00:08:33,839

hardware so it is very important that

224

00:08:38,630 --> 00:08:37,120

they maintain the fine motor skills

225

00:08:40,469 --> 00:08:38,640

throughout their mission

226

00:08:43,110 --> 00:08:40,479

be interesting to watch that is into

227

00:08:44,790 --> 00:08:43,120

expedition 44 and beyond and uh we'll

228

00:08:46,470 --> 00:08:44,800

have an opportunity to to check in with

229

00:08:49,829 --> 00:08:46,480

you again then find out how it's going