
PAO

1
00:00:01,060 --> 00:00:04,000
>> Well, good afternoon or good
morning I guess for us here

2
00:00:04,000 --> 00:00:07,510
in Houston and I guess for
you folks up in New York.

3
00:00:07,510 --> 00:00:08,500
It's afternoon.

4
00:00:08,500 --> 00:00:10,300
Welcome to Mission
Control Houston.

5
00:00:10,300 --> 00:00:10,770
You're looking

6
00:00:10,770 --> 00:00:13,650
at the International Space
Station Flight Control Room,

7
00:00:13,650 --> 00:00:17,880
and we are very pleased to have
with us here Jason Barbour.

8
00:00:17,880 --> 00:00:21,840
He is an aerospace engineer.

9
00:00:21,840 --> 00:00:23,890
So he's very, very smart.

10
00:00:23,890 --> 00:00:28,170
He works right in front here
on one of the other consoles.

11
00:00:28,170 --> 00:00:32,590
He supports the environmental
control and life support system

12
00:00:32,590 --> 00:00:35,710
on the Station, monitors
all of that activity as part

13
00:00:35,710 --> 00:00:39,310
of the environmental and thermal
operating system of the Station.

14
00:00:39,310 --> 00:00:41,920
So Jason's agreed to join us

15
00:00:41,920 --> 00:00:44,450
and help answer some
questions for you guys.

16
00:00:44,450 --> 00:00:48,210
So we're really happy
to have you guys here.

17
00:00:48,210 --> 00:00:49,580
>> Jason Barbour: Good morning.

18
00:00:49,580 --> 00:00:53,230
It's good to talk to
people from my home state.

19
00:00:53,230 --> 00:00:53,650
>> Welcome.

20
00:00:53,650 --> 00:00:54,560
>> Naomi: OK, welcome.

21
00:00:54,560 --> 00:00:57,740
Welcome. We understand
you're a New Yorker.

22
00:00:57,740 --> 00:01:02,950
I went to school in

Binghamton on Route 81 -

23
00:01:02,950 --> 00:01:03,080
>> Jason Barbour: OK -

24
00:01:03,080 --> 00:01:03,150
>> Naomi: So [inaudible].

25
00:01:03,150 --> 00:01:06,590
And we have a couple of
students with questions.

26
00:01:06,590 --> 00:01:09,840
We learned this year,
because of our work,

27
00:01:09,840 --> 00:01:14,220
that two of the family
members worked with NASA.

28
00:01:14,220 --> 00:01:17,290
The things you learn when
you work with new people.

29
00:01:17,290 --> 00:01:19,350
So we have, we'll have one

30
00:01:19,350 --> 00:01:21,560
of the students tell
you what grandpa did,

31
00:01:21,560 --> 00:01:23,830
and we have lovely questions.

32
00:01:23,830 --> 00:01:27,180
Tell us when you'd like
us to ask our questions.

33
00:01:27,180 --> 00:01:27,820

>> We're ready.

34
00:01:27,820 --> 00:01:28,540
>> Jason Barbour: Go for it.

35
00:01:28,540 --> 00:01:30,920
>> We're really happy
to have you guys here.

36
00:01:30,920 --> 00:01:32,150
We're going to try.

37
00:01:32,150 --> 00:01:33,360
>> Naomi: [Inaudible] Julia.

38
00:01:33,360 --> 00:01:34,680
>> Julia: My name is Julia.

39
00:01:34,680 --> 00:01:40,010
My question is mostly
about the Gemini missions

40
00:01:40,010 --> 00:01:43,830
because my grandpa [inaudible]
was a real time programmer

41
00:01:43,830 --> 00:01:50,180
for IBM that reported to
NASA from 1962 to 1966.

42
00:01:50,180 --> 00:01:52,640
So I was wondering what
kind of information you got

43
00:01:52,640 --> 00:01:55,680
from the spacecraft's radar
during the Gemini missions.

44
00:01:55,680 --> 00:02:00,720

>> Naomi: That helped you
with these current missions.

45
00:02:00,720 --> 00:02:01,790
>> Jason Barbour: Right.

46
00:02:01,790 --> 00:02:03,590
I'll answer that as best I can,

47
00:02:03,590 --> 00:02:08,330
but the main thing was
how the vehicle worked

48
00:02:08,330 --> 00:02:11,380
in space orbiting the planet.

49
00:02:11,380 --> 00:02:14,750
How the life support equipment
was interfacing with the crew,

50
00:02:14,750 --> 00:02:20,040
and taking that and expanding
it to making it moon.

51
00:02:20,040 --> 00:02:20,750
I'm sorry, yeah.

52
00:02:20,750 --> 00:02:23,910
Mars. Making it all the
way to the moon and back,

53
00:02:23,910 --> 00:02:25,900
and basically making sure all

54
00:02:25,900 --> 00:02:28,710
of that hardware worked
the way it was supposed

55
00:02:28,710 --> 00:02:30,750

to for long durations.

56
00:02:30,750 --> 00:02:31,910
The other thing it figured

57
00:02:31,910 --> 00:02:36,620
out was doing inner tube
maneuvers while the vehicle was

58
00:02:36,620 --> 00:02:39,640
in space and being able
to align the vehicle

59
00:02:39,640 --> 00:02:44,140
to leave Earth's atmosphere
and go to the moon itself.

60
00:02:44,140 --> 00:02:47,380
So it was testing all of
the, those capabilities.

61
00:02:47,380 --> 00:02:52,370
So that way we could land on
the moon in Apollo like we did.

62
00:02:52,370 --> 00:02:55,240
>> So I guess that
Julia can be a legacy

63
00:02:55,240 --> 00:02:58,170
and maybe one day work right
here where grandpa did.

64
00:02:58,170 --> 00:03:00,810
That'll be pretty exciting.

65
00:03:00,810 --> 00:03:01,770
>> Jason Barbour: And
that's not unheard of.

66
00:03:01,770 --> 00:03:04,040
We've actually in the
flight director office,

67
00:03:04,040 --> 00:03:06,420
we've had father-son
flight directors before.

68
00:03:06,420 --> 00:03:09,790
So it's not unheard
of for families

69
00:03:09,790 --> 00:03:13,510
to follow each other into NASA.

70
00:03:13,510 --> 00:03:13,690
>> [Inaudible].

71
00:03:13,690 --> 00:03:17,870
>> In fact, we encourage it.

72
00:03:17,870 --> 00:03:18,530
>> Naomi: Who's my [inaudible]?

73
00:03:18,530 --> 00:03:19,680
Ryan.

74
00:03:19,680 --> 00:03:20,120
>> Ryan: Hello.

75
00:03:20,120 --> 00:03:25,590
My name is Ryan, and my
question is what do members

76
00:03:25,590 --> 00:03:28,820
of Mission Control do
to [inaudible] at launch

77

00:03:28,820 --> 00:03:31,900
and the most recent
one with Expedition 36.

78
00:03:31,900 --> 00:03:32,270
Thank you.

79
00:03:32,270 --> 00:03:35,170
>> You may have to repeat that.

80
00:03:35,170 --> 00:03:35,860
Can you get a -

81
00:03:35,860 --> 00:03:38,050
>> Naomi: Well, what
does you do to prepare,

82
00:03:38,050 --> 00:03:42,020
what did Mission Control have to
do to prepare for this launch,

83
00:03:42,020 --> 00:03:45,710
this most recent mission
when it was going up?

84
00:03:45,710 --> 00:03:47,930
What was your role in it?

85
00:03:47,930 --> 00:03:51,150
>> Jason Barbour: My
particular role in that.

86
00:03:51,150 --> 00:03:54,440
Well, my console's role
was to basically determine

87
00:03:54,440 --> 00:03:56,300
that we had all the consumables
that we needed to be able

88
00:03:56,300 --> 00:03:59,130
to support the crew
while they're on orbit,

89
00:03:59,130 --> 00:04:04,700
and by that that we have plenty
of water, plenty of food.

90
00:04:04,700 --> 00:04:07,450
We have the necessary
equipment to be able

91
00:04:07,450 --> 00:04:11,650
to process their
bathroom facilities

92
00:04:11,650 --> 00:04:15,500
into drinking water the next day
and basically making sure all

93
00:04:15,500 --> 00:04:17,770
that is ready for
them to get there.

94
00:04:17,770 --> 00:04:20,300
>> Patricia: Naomi,
this is Patricia.

95
00:04:20,300 --> 00:04:23,440
If the students could come
closer to the microphone,

96
00:04:23,440 --> 00:04:25,620
that way we could hear them
better, that would be great.

97
00:04:27,490 --> 00:04:26,020
Thank you.

98

00:04:27,490 --> 00:04:29,720
Number three.

99
00:04:30,780 --> 00:04:30,290
>> Number two.

100
00:04:30,780 --> 00:04:32,660
I'm sorry.

101
00:04:32,660 --> 00:04:36,300
Come up, and number
three, line up behind you.

102
00:04:36,300 --> 00:04:37,380
Go ahead.

103
00:04:37,380 --> 00:04:37,610
>> Rachel: Hi.

104
00:04:37,610 --> 00:04:38,120
I'm Rachel.

105
00:04:38,120 --> 00:04:42,150
My question is how and
where are new members

106
00:04:42,150 --> 00:04:43,740
of the Mission Control taught.

107
00:04:43,740 --> 00:04:49,540
>> You may have to help
us with that Naomi.

108
00:04:49,540 --> 00:04:51,420
>> Naomi: You have
to, say that again.

109
00:04:51,420 --> 00:04:52,940
>> Rachel: How and

where new members

110
00:04:52,940 --> 00:04:54,800
of Mission Control taught?

111
00:04:54,800 --> 00:04:56,270
>> Naomi: Where are you trained?

112
00:04:56,270 --> 00:04:59,090
Where is the best way
to training in order

113
00:04:59,090 --> 00:05:02,530
to become assigned
to Mission Control?

114
00:05:02,530 --> 00:05:03,300
>> Jason Barbour: Ah, OK.

115
00:05:03,300 --> 00:05:08,080
The, I'll just give a
general overview of my path.

116
00:05:08,080 --> 00:05:11,350
First thing is get your
four-year engineering degree,

117
00:05:11,350 --> 00:05:13,990
and that can be aerospace,
mechanical,

118
00:05:13,990 --> 00:05:20,790
or any one of that type, and
then you, once you get there,

119
00:05:20,790 --> 00:05:24,470
done with that, you get
hired by NASA, and you'll go

120

00:05:24,470 --> 00:05:25,800
through a series of training.

121
00:05:25,800 --> 00:05:28,620
My training took me about
two and a half years

122
00:05:28,620 --> 00:05:32,140
to get the current cert I had to
do the, to work on life support.

123
00:05:32,140 --> 00:05:36,630
And basically NASA teaches you
to become a flight controller,

124
00:05:36,630 --> 00:05:41,110
and that's through a series
of simulations, book reading,

125
00:05:41,110 --> 00:05:46,710
testing to take on the job
that I have, and then there's,

126
00:05:46,710 --> 00:05:51,770
after that, once I do a year
or so of working console,

127
00:05:51,770 --> 00:05:55,190
that's when I get assigned
to be a mission lead

128
00:05:55,190 --> 00:05:58,060
for various missions like,
for me it was shuttle missions

129
00:05:58,060 --> 00:06:01,110
and incrementally it's with
the crew that's on orbit now

130
00:06:01,110 --> 00:06:05,410

and various other
system leads that pop

131
00:06:05,410 --> 00:06:08,870
up for different hardware
[inaudible] launch.

132
00:06:10,280 --> 00:06:13,630
So that's the general
path to the training.

133
00:06:13,630 --> 00:06:16,580
>> And that's essentially
the path that a lot

134
00:06:16,580 --> 00:06:19,800
of the people you see
in this room take.

135
00:06:19,800 --> 00:06:22,680
As Jason said, there's different
engineering backgrounds,

136
00:06:22,680 --> 00:06:27,740
and depending on what position
you're sitting at in this room,

137
00:06:27,740 --> 00:06:31,030
you oversee a specific area of
that Space Station to make sure

138
00:06:31,030 --> 00:06:35,000
that it's safe and operating
for the crew that's on board.

139
00:06:35,000 --> 00:06:36,410
>> Jason Barbour: Correct.

140
00:06:36,410 --> 00:06:37,580
>> Naomi: OK.

141
00:06:37,580 --> 00:06:37,910
>> Ally: Hi.

142
00:06:37,910 --> 00:06:43,690
My name is Ally, and my
question is what have been some

143
00:06:43,690 --> 00:06:47,830
of the most important
measures you normally take

144
00:06:47,830 --> 00:06:49,540
to ensure safety?

145
00:06:49,540 --> 00:06:51,030
Is there anything
[inaudible] you are doing

146
00:06:51,030 --> 00:06:53,710
to improve safety
awareness on the ISS?

147
00:06:53,710 --> 00:06:54,890
>> Jason Barbour: Well,
three of the items

148
00:06:54,890 --> 00:07:00,150
that my console is specifically
involved in is emergencies.

149
00:07:00,150 --> 00:07:02,880
So any one of those emergencies
can be a rapid depress,

150
00:07:02,880 --> 00:07:05,420
a hole in the shell
of the vehicle,

151

00:07:05,420 --> 00:07:08,090
a fire on board the
vehicle, or some sort

152
00:07:08,090 --> 00:07:10,730
of toxic fluid gets
spilled on ISS,

153
00:07:10,730 --> 00:07:14,880
and my console is constantly
revamping procedures

154
00:07:14,880 --> 00:07:16,410
and making improvements.

155
00:07:16,410 --> 00:07:19,190
So that way if any of those
emergencies were to occur,

156
00:07:19,190 --> 00:07:22,210
we could respond as needed.

157
00:07:22,210 --> 00:07:24,240
>> Naomi: Thank you.

158
00:07:24,240 --> 00:07:25,410
>> Good question.

159
00:07:25,410 --> 00:07:29,740
>> Pamela: My name's Pamela,
and my question is what type

160
00:07:29,740 --> 00:07:32,560
of technology is
most commonly used

161
00:07:32,560 --> 00:07:37,820
that we would understand
for Mission Control.

162
00:07:37,820 --> 00:07:39,630
>> Jason Barbour: Well,
probably computers.

163
00:07:39,630 --> 00:07:42,850
Everything that we do
is all on computers.

164
00:07:42,850 --> 00:07:43,910
All of our [inaudible] we get

165
00:07:43,910 --> 00:07:49,390
from the vehicles we
view on computers.

166
00:07:49,390 --> 00:07:51,940
And all that is processed
on the ground and then sent

167
00:07:51,940 --> 00:07:54,710
to our particular consoles
where our computers are at,

168
00:07:54,710 --> 00:07:58,240
and we can view all the
telemetry that we have.

169
00:07:58,240 --> 00:08:01,520
>> Yeah. There's, my producer,

170
00:08:01,520 --> 00:08:05,170
Karen's showing Jason's console
right there so you guys can see.

171
00:08:05,170 --> 00:08:09,500
That's where he normally
sits if he's on duty.

172
00:08:09,500 --> 00:08:13,820

Of course, he's doing, helping
me today to talk to you guys,

173
00:08:13,820 --> 00:08:18,950
but that is a live view just
about, what, 15 or 20 feet away,

174
00:08:18,950 --> 00:08:22,060
and the backside
of that console,

175
00:08:22,060 --> 00:08:24,990
which you don't see is all
of their computer screens

176
00:08:24,990 --> 00:08:28,710
that stream the data that
Jason's talking to you about.

177
00:08:28,710 --> 00:08:33,820
So they can maintain a real good
watch over all of the things

178
00:08:33,820 --> 00:08:36,250
that are going on with their
systems aboard the International

179
00:08:36,250 --> 00:08:37,680
Space Station.

180
00:08:37,680 --> 00:08:38,730
>> Jason Barbour: In fact,
if you look behind us,

181
00:08:38,730 --> 00:08:40,730
we have computers right
here that are similar

182
00:08:40,730 --> 00:08:41,970
to what all the other

consoles have.

183
00:08:41,970 --> 00:08:45,170
So that way you can get
an idea of what it is

184
00:08:45,170 --> 00:08:46,320
that we're looking at.

185
00:08:46,320 --> 00:08:46,810
>> Right.

186
00:08:46,810 --> 00:08:48,600
>> Jason Barbour: Most consoles
have about five monitors

187
00:08:48,600 --> 00:08:51,670
that we're using to
look at our data.

188
00:08:53,100 --> 00:08:54,510
>> Naomi: Thank you.

189
00:08:54,510 --> 00:08:54,910
>> Ariel: Hello.

190
00:08:54,910 --> 00:08:58,440
My name is Ariel, and
this is my question.

191
00:08:58,440 --> 00:09:01,020
What have you learned about
the spider's web in space?

192
00:09:01,020 --> 00:09:03,420
How is it different on Earth?

193
00:09:03,420 --> 00:09:05,670
>> Naomi: These interesting

creatures that you have

194
00:09:05,670 --> 00:09:08,510
and what you've learned
from them.

195
00:09:08,510 --> 00:09:09,880
Thank you.

196
00:09:09,880 --> 00:09:11,740
>> Jason Barbour: I'll
answer that the best I can.

197
00:09:11,740 --> 00:09:12,860
>> That's a toughie.

198
00:09:12,860 --> 00:09:18,330
>> Jason Barbour: And I'm
going to answer it just based

199
00:09:18,330 --> 00:09:20,410
on my views from the video
that we got downlinked.

200
00:09:20,410 --> 00:09:25,070
It looked like the spider webs
were more perfectly formed.

201
00:09:25,070 --> 00:09:28,230
So where they didn't have
gravity pulling them down.

202
00:09:28,230 --> 00:09:31,800
It looked like a
more pure shape.

203
00:09:31,800 --> 00:09:36,580
As far as the exact details
of what we learned from that,

204
00:09:36,580 --> 00:09:38,650
I can get more information
for you and pass it

205
00:09:38,650 --> 00:09:39,950
on to you guys if you'd like.

206
00:09:39,950 --> 00:09:43,010
As off the top of my
head, I don't know.

207
00:09:43,010 --> 00:09:49,370
>> Naomi: So did
they come back alive?

208
00:09:49,370 --> 00:09:52,450
>> Yeah. I think that
some of them did,

209
00:09:52,450 --> 00:09:56,330
for the most part that they did.

210
00:09:57,460 --> 00:09:59,270
We have one method right now.

211
00:09:59,270 --> 00:10:01,370
You know, we had the space
shuttle program that brought,

212
00:10:01,370 --> 00:10:04,530
was able to bring cargo
down from the station,

213
00:10:04,530 --> 00:10:07,100
and now we have other partners

214
00:10:07,100 --> 00:10:09,510
that are providing
cargo capability,

215
00:10:09,510 --> 00:10:11,580
one of which can provide
a return capability.

216
00:10:11,580 --> 00:10:19,610
So, yes, when we do have insect
or animal type experiments

217
00:10:19,610 --> 00:10:22,050
on the Station, they
do, they are able

218
00:10:22,050 --> 00:10:23,120
to be brought back home.

219
00:10:23,120 --> 00:10:26,210
>> Christine: My
name is Christine,

220
00:10:26,210 --> 00:10:31,020
and my question is how many
flight controllers have become

221
00:10:31,020 --> 00:10:33,710
flight directors?

222
00:10:33,710 --> 00:10:37,700
>> I tried to get an answer
to that question, and -

223
00:10:37,700 --> 00:10:39,860
>> Jason Barbour: Most flight
directors are flight controllers

224
00:10:39,860 --> 00:10:41,750
from one discipline or another.

225
00:10:41,750 --> 00:10:43,530

Generally, that's the
path you take if you want

226
00:10:43,530 --> 00:10:45,900
to be a flight director is you
become a flight controller.

227
00:10:45,900 --> 00:10:47,400
There's a few exceptions
here and there,

228
00:10:47,400 --> 00:10:49,500
but I'd say probably 95 percent

229
00:10:49,500 --> 00:10:51,660
of the flight directors
were flight controllers,

230
00:10:51,660 --> 00:10:53,910
>> Yeah. I think almost every
one of them worked their way

231
00:10:53,910 --> 00:10:57,160
through just like
Jason's doing, you know,

232
00:10:57,160 --> 00:11:00,700
training to be a specialist
in one specific area.

233
00:11:00,700 --> 00:11:03,490
The flight director,
obviously, is the person

234
00:11:03,490 --> 00:11:06,700
that oversees everything
that goes on on that shift.

235
00:11:06,700 --> 00:11:10,670
As you know, a flight director

is in this room 24 hours a day

236
00:11:10,670 --> 00:11:12,430
around the clock
on three shifts,

237
00:11:12,430 --> 00:11:17,710
and so we have flight directors
that have to know everything

238
00:11:17,710 --> 00:11:19,720
about all of the
systems on the Station,

239
00:11:19,720 --> 00:11:22,520
but they do rely heavily
on Jason and the rest

240
00:11:22,520 --> 00:11:23,720
of the flight controllers

241
00:11:23,720 --> 00:11:28,400
to provide the very
quickly information to him

242
00:11:28,400 --> 00:11:30,940
to help make decisions,
especially in the case

243
00:11:30,940 --> 00:11:32,480
where there may be a problem -

244
00:11:32,480 --> 00:11:32,740
>> Jason Barbour: Yes -

245
00:11:32,740 --> 00:11:34,010
>> That you have to work.

246
00:11:34,010 --> 00:11:38,540

So flight director is a
critical position in the room,

247
00:11:38,540 --> 00:11:42,780
and as Jason said, almost
all of them have come

248
00:11:42,780 --> 00:11:46,830
from the background that
Jason has in flight control.

249
00:11:46,830 --> 00:11:49,010
Good question.

250
00:11:49,010 --> 00:11:50,500
>> Emily: My name is Emily,

251
00:11:50,500 --> 00:11:53,970
and my question is what other
experiments with animals,

252
00:11:53,970 --> 00:11:56,930
insects, or other creatures
do you have planned?

253
00:11:56,930 --> 00:12:00,940
Fish, more spiders, more
spider experiments, more bees,

254
00:12:00,940 --> 00:12:03,820
and what are some of the
changes that have occurred

255
00:12:03,820 --> 00:12:08,180
to them when they return?

256
00:12:08,180 --> 00:12:08,920
>> Jason Barbour: I'm not sure.

257

00:12:08,920 --> 00:12:12,540
I can find out for
you if you'd like.

258
00:12:12,540 --> 00:12:15,590
And actually I'm going
to have to do that.

259
00:12:15,590 --> 00:12:17,240
I'm going to have
to find out for you.

260
00:12:17,240 --> 00:12:17,920
I'm sorry.

261
00:12:17,920 --> 00:12:22,980
>> Yeah. We've had all different
types of, some insects and some,

262
00:12:22,980 --> 00:12:27,330
and we've had the fish
experiments on board as well.

263
00:12:27,330 --> 00:12:29,020
We have investigators
on the ground

264
00:12:29,020 --> 00:12:30,360
that plan those experiments.

265
00:12:30,360 --> 00:12:34,870
The crew checks on those
types of living animal

266
00:12:34,870 --> 00:12:38,620
or insect experiments
throughout the flight,

267
00:12:38,620 --> 00:12:42,100
and then when they're brought

back, the investigators look

268
00:12:42,100 --> 00:12:44,980
at those to see what
changes occurred.

269
00:12:44,980 --> 00:12:49,310
We don't hear the direct
feedback from those, you know,

270
00:12:49,310 --> 00:12:54,130
here in the room, but, you
know, learning about animals

271
00:12:54,130 --> 00:12:58,210
and insects, well, it sounds
strange, but it will help

272
00:12:58,210 --> 00:13:01,630
in the long term when we
try to send humans further

273
00:13:01,630 --> 00:13:06,490
out into space as well because
anything that happens to insects

274
00:13:06,490 --> 00:13:07,830
over short periods of times

275
00:13:07,830 --> 00:13:10,910
or small animals could
happen to human beings.

276
00:13:10,910 --> 00:13:12,270
And so we need to learn all

277
00:13:12,270 --> 00:13:15,500
of that before we send humans
further than the altitude

278
00:13:15,500 --> 00:13:18,040
that the Space Station's at
right now, which is, you know,

279
00:13:18,040 --> 00:13:22,540
about only 250 miles away
from us, but if we go further

280
00:13:22,540 --> 00:13:25,210
out into space, obviously,
we need to be able

281
00:13:25,210 --> 00:13:28,150
to protect a crew for
those long periods of time.

282
00:13:28,150 --> 00:13:30,980
>> Jason Barbour: And to give
you an example of an experiment

283
00:13:30,980 --> 00:13:33,500
that will have direct impact
to people on the ground,

284
00:13:33,500 --> 00:13:36,510
it's not necessarily
using insects,

285
00:13:36,510 --> 00:13:39,490
but it's a lung experiment
that will be launched

286
00:13:39,490 --> 00:13:42,710
in the next year or so, and
that'll give us more insight

287
00:13:42,710 --> 00:13:46,170
on asthma and help
us to be able to come

288
00:13:46,170 --> 00:13:48,660
up with better treatments
for people with asthma.

289
00:13:48,660 --> 00:13:51,310
So that'll be launched
in the next year.

290
00:13:51,310 --> 00:13:53,170
>> Brendon: Hi.

291
00:13:53,170 --> 00:13:55,240
My name is Brendon,

292
00:13:55,240 --> 00:13:59,150
and my question is what does
Mission Control have to do

293
00:13:59,150 --> 00:14:02,980
when there's a problem to be
solved such as the ammonia leak

294
00:14:02,980 --> 00:14:05,440
on the International
Space Station.

295
00:14:05,440 --> 00:14:06,700
>> Great question.

296
00:14:06,700 --> 00:14:09,840
>> Jason Barbour: Well,
actually, it was Mission Control

297
00:14:09,840 --> 00:14:11,750
that found the leak
in the first place

298
00:14:11,750 --> 00:14:17,470
through monitoring our data,

and basically once we observed

299
00:14:17,470 --> 00:14:22,860
that we had the leak, we at that
stage pulled the team together

300
00:14:22,860 --> 00:14:24,430
and figured out, OK.

301
00:14:24,430 --> 00:14:26,900
Is this something we can solve
from Commanding on the ground?

302
00:14:26,900 --> 00:14:28,690
Are we going to have
to send a crew out EVA,

303
00:14:28,690 --> 00:14:30,570
which is what we ended up doing.

304
00:14:30,570 --> 00:14:34,600
So once we made that decision
to go EVA, the ground here

305
00:14:34,600 --> 00:14:36,890
in Mission Control figured
out, OK, what do we need

306
00:14:36,890 --> 00:14:38,660
to do during this EVA.

307
00:14:38,660 --> 00:14:40,000
Do we replace the pump?

308
00:14:40,000 --> 00:14:44,780
Do we do tests along the way,
or what do we need to do?

309
00:14:44,780 --> 00:14:48,190

So it's the team here working
together to figure out how

310
00:14:48,190 --> 00:14:49,920
to solve that problem.

311
00:14:49,920 --> 00:14:54,300
>> That's a perfect
example of teamwork.

312
00:14:54,300 --> 00:14:57,490
Because, you know,
Mission Control is critical

313
00:14:57,490 --> 00:14:59,570
to what happens on the
Space Station in terms

314
00:14:59,570 --> 00:15:04,140
of seeing all the data and
being able to, you know,

315
00:15:04,140 --> 00:15:05,540
tell the crew what's going on

316
00:15:05,540 --> 00:15:07,020
and not only tell the
crew what's going on

317
00:15:07,020 --> 00:15:10,210
but have the crew help if there
is a troubleshooting procedure

318
00:15:10,210 --> 00:15:13,430
like what we ended up having to
do with what you just mentioned,

319
00:15:13,430 --> 00:15:15,710
you know, with that
ammonia leak.

320
00:15:15,710 --> 00:15:18,980
We ended up sending a
crew out to track it down

321
00:15:18,980 --> 00:15:21,610
and actually fix it
physically, and we, obviously,

322
00:15:21,610 --> 00:15:25,100
couldn't do that from here,
but it was a great example

323
00:15:25,100 --> 00:15:27,910
of teamwork and teamwork
that occurred

324
00:15:27,910 --> 00:15:31,000
over a very short period of
time to make that happen,

325
00:15:31,000 --> 00:15:33,900
and keep the vehicle
and the crew safe.

326
00:15:33,900 --> 00:15:34,690
Great question.

327
00:15:34,690 --> 00:15:35,960
>> Jason Barbour:
Another example

328
00:15:35,960 --> 00:15:37,990
of a team working together.

329
00:15:37,990 --> 00:15:40,540
We had a, this is about
three years ago now,

330

00:15:40,540 --> 00:15:45,800
but our CO2 removal device, it
suffered a software failure.

331
00:15:45,800 --> 00:15:47,170
The hardware itself was fine,

332
00:15:47,170 --> 00:15:49,560
but the software
wasn't working properly.

333
00:15:49,560 --> 00:15:53,000
So we ended up having
to do manual commanding

334
00:15:53,000 --> 00:15:55,490
from the ground to
basically manipulate it

335
00:15:55,490 --> 00:15:56,520
to do everything it needed

336
00:15:56,520 --> 00:15:59,510
to that software would
normally do for us.

337
00:15:59,510 --> 00:16:03,280
So the ground basically, that's
an example of the ground doing

338
00:16:03,280 --> 00:16:06,640
for the crew what the
crew didn't have to do.

339
00:16:06,640 --> 00:16:09,460
So we did all the
commanding and everything

340
00:16:09,460 --> 00:16:13,520
from the ground to

make that happen.

341
00:16:13,520 --> 00:16:13,870
>> Naomi: Wow.

342
00:16:13,870 --> 00:16:14,820
That's really something.

343
00:16:14,820 --> 00:16:15,940
Thank you.

344
00:16:15,940 --> 00:16:22,060
>> Hi. My name is [inaudible],
and this is my question.

345
00:16:24,620 --> 00:16:28,960
What's the algorithm
for solving an issue

346
00:16:28,960 --> 00:16:30,710
on the International
Space Station?

347
00:16:30,710 --> 00:16:36,140
Do you know the specific
procedure, and who is in charge?

348
00:16:36,140 --> 00:16:38,040
Thank you.

349
00:16:38,040 --> 00:16:39,880
>> Jason Barbour: I didn't
quite get all that question -

350
00:16:39,880 --> 00:16:42,720
>> Yeah. Actually, you
may have to repeat that.

351
00:16:42,720 --> 00:16:46,790

>> OK. What is the
algorithm for solving an issue

352
00:16:46,790 --> 00:16:51,220
on the International
Space Station?

353
00:16:51,220 --> 00:16:55,260
Do you have a specific
procedure, and who is in charge?

354
00:16:55,260 --> 00:16:57,790
>> Jason Barbour: Ultimately,
the flight director's in charge

355
00:16:57,790 --> 00:17:01,600
for approving our
troubleshooting methods,

356
00:17:01,600 --> 00:17:05,730
but typically what happens is
say, like, with the [inaudible],

357
00:17:05,730 --> 00:17:09,160
or, excuse me, the CO2
example that I used earlier.

358
00:17:09,160 --> 00:17:13,240
When the failure occurs,
my team was looking at, OK,

359
00:17:13,240 --> 00:17:18,950
how do we keep CO2 removal going
and not impact the mission.

360
00:17:18,950 --> 00:17:23,590
So we sat down, figured out,
OK, how do we make this work.

361
00:17:23,590 --> 00:17:26,090

Once we had the plan,
we presented

362
00:17:26,090 --> 00:17:31,220
that to the flight director,
and they said, yup, sounds good.

363
00:17:31,220 --> 00:17:32,780
Go ahead and do what
you need to do.

364
00:17:32,780 --> 00:17:36,190
We documented that
in a procedure.

365
00:17:36,190 --> 00:17:39,330
Flight approved it, and then
we started implementing it.

366
00:17:39,330 --> 00:17:40,890
>> Naomi: Thank you.

367
00:17:42,520 --> 00:17:43,140
>> Thank you.

368
00:17:43,140 --> 00:17:43,410
>> Daniel: Hello.

369
00:17:43,410 --> 00:17:44,430
My name is Daniel,

370
00:17:44,430 --> 00:17:48,590
and my question is can
you put [inaudible]

371
00:17:48,590 --> 00:17:52,900
with the ISS directly, or do
you have to use a satellite

372

00:17:52,900 --> 00:17:55,690
to connect to communications,

373
00:17:55,690 --> 00:17:58,180
and what type of
signal do you use?

374
00:17:58,180 --> 00:18:00,430
Is that a cell phone
signal, a radio,

375
00:18:00,430 --> 00:18:04,040
or what's the primary
type [inaudible]?

376
00:18:04,040 --> 00:18:04,520
Thank you.

377
00:18:04,520 --> 00:18:05,700
>> Jason Barbour: We do
have to use satellite

378
00:18:05,700 --> 00:18:06,840
to talk to the Space Station.

379
00:18:06,840 --> 00:18:09,620
There is no direct line
of sight communication.

380
00:18:09,620 --> 00:18:14,560
We use two types of signals
to talk to the Space Station.

381
00:18:14,560 --> 00:18:17,320
One is called S band, which is
similar to what you would think

382
00:18:17,320 --> 00:18:21,250
of as a cell phone, which gives
us our telemetry that we look

383
00:18:21,250 --> 00:18:22,500
at for all of our
troubleshooting,

384
00:18:22,500 --> 00:18:23,940
our day-to-day monitoring,

385
00:18:23,940 --> 00:18:27,070
and our voice communication
with the crew.

386
00:18:27,070 --> 00:18:31,360
The second set is KU band, which
think of that like the Internet.

387
00:18:31,360 --> 00:18:35,680
That's what gives us all of our
payload information that we get

388
00:18:35,680 --> 00:18:39,720
and all of our video that
we see coming from space.

389
00:18:39,720 --> 00:18:44,470
>> So just to add to
that, the communications

390
00:18:44,470 --> 00:18:45,770
that we get from the Station.

391
00:18:45,770 --> 00:18:48,200
They have a big dish
on the station just

392
00:18:48,200 --> 00:18:51,540
like a satellite dish, and
that can communicate directly

393

00:18:51,540 --> 00:18:54,060
with communications satellites,

394
00:18:54,060 --> 00:18:56,890
and then that transmission
is bounced to the ground

395
00:18:56,890 --> 00:18:58,500
and bounced here
to Mission Control.

396
00:18:58,500 --> 00:19:02,420
So we can stay in pretty
constant contact with the crew.

397
00:19:02,420 --> 00:19:04,380
We have short periods
of time here and there

398
00:19:04,380 --> 00:19:05,750
where we lose the
signal, right -

399
00:19:05,750 --> 00:19:05,850
>> Jason Barbour: Yes -

400
00:19:05,850 --> 00:19:09,520
>> And that, and, but
for the most part,

401
00:19:09,520 --> 00:19:12,140
we can stay in pretty
close contact with them.

402
00:19:12,140 --> 00:19:16,880
Now way, way back in the Gemini
days, you know, we were talking

403
00:19:16,880 --> 00:19:20,850
about Gemini earlier that we

didn't have the communication

404
00:19:20,850 --> 00:19:21,920
satellite capabilities.

405
00:19:21,920 --> 00:19:23,760
So we did have ground stations -

406
00:19:23,760 --> 00:19:24,350
>> Jason Barbour: Correct -

407
00:19:24,350 --> 00:19:26,800
>> And the spacecraft could
talk directly to the ground,

408
00:19:26,800 --> 00:19:28,860
but only during short
periods of time -

409
00:19:28,860 --> 00:19:29,170
>> Jason Barbour: Yes -

410
00:19:29,170 --> 00:19:34,490
>> So the ability to talk to
the Space Station has changed

411
00:19:34,490 --> 00:19:39,100
so dramatically over the
last forty, fifty years,

412
00:19:39,100 --> 00:19:43,180
and that allows us, and
not only do we communicate

413
00:19:43,180 --> 00:19:46,470
on one channel, but we actually
have four different voice

414
00:19:46,470 --> 00:19:47,470

channels now -

415
00:19:47,470 --> 00:19:47,710
>> Jason Barbour: Right -

416
00:19:47,710 --> 00:19:51,280
>> So the crews can actually be
talking on different channels

417
00:19:51,280 --> 00:19:55,490
about different experiments
just like we would on the ground

418
00:19:55,490 --> 00:19:57,330
in offices to get work done.

419
00:19:57,330 --> 00:20:00,560
It's a, that's a great question.

420
00:20:00,560 --> 00:20:01,080
>> Daniel:

421
00:20:01,080 --> 00:20:03,100
Thank you.

422
00:20:03,100 --> 00:20:07,520
>> Nicole: I'm Nicole, and we
were watching the launch replay

423
00:20:07,520 --> 00:20:13,710
of the Soyuz spacecraft, and I'm
wondering why were there stuffed

424
00:20:13,710 --> 00:20:15,300
animals taken from
the [inaudible]?

425
00:20:15,300 --> 00:20:20,810
>> Jason Barbour: Well, it

gave us something entertaining

426
00:20:20,810 --> 00:20:22,270
to watch, didn't it?

427
00:20:22,270 --> 00:20:27,700
It, that varies from
crew to crew.

428
00:20:27,700 --> 00:20:30,850
Some crew like having stuffed
animals to play with on orbit.

429
00:20:30,850 --> 00:20:35,530
And it gave you a
pretty good view of, OK,

430
00:20:35,530 --> 00:20:38,270
how much rocking is the
Soyuz going through as it's

431
00:20:38,270 --> 00:20:42,850
on its way up, but
generally the stuffed animals,

432
00:20:42,850 --> 00:20:44,480
that's a crew preference item.

433
00:20:44,480 --> 00:20:47,200
>> Yeah. It's interesting.

434
00:20:47,200 --> 00:20:50,710
It's, it is a scientific
approach, like Jason says.

435
00:20:50,710 --> 00:20:53,230
It shows the crew when
they actually, you know,

436

00:20:53,230 --> 00:20:56,430
they can obviously feel the
gravity building up on them

437
00:20:56,430 --> 00:20:58,780
or the g forces, excuse
me, building up on them

438
00:20:58,780 --> 00:21:00,530
as they climb into space.

439
00:21:00,530 --> 00:21:04,020
Once they get into space and the
engines shut down, it's like,

440
00:21:04,020 --> 00:21:07,690
it's instant, and now you
see a view inside the vehicle

441
00:21:07,690 --> 00:21:09,350
for the launch the other day.

442
00:21:09,350 --> 00:21:14,430
But it actually, when
that engine shuts off,

443
00:21:14,430 --> 00:21:19,610
it's instant microgravity
or zero g, and the commander

444
00:21:19,610 --> 00:21:22,340
of the Soyuz spacecraft
that you saw there,

445
00:21:22,340 --> 00:21:26,210
his children actually picked
the small toy to take.

446
00:21:26,210 --> 00:21:29,150
And each crew member,

each flight is different,

447
00:21:29,150 --> 00:21:32,260
but that's what that's all
about, and it's, obviously,

448
00:21:32,260 --> 00:21:36,800
a sentimental item, but it
also has a scientific purpose

449
00:21:36,800 --> 00:21:38,250
as well.

450
00:21:39,310 --> 00:21:40,450
>> Naomi: Amara.

451
00:21:40,450 --> 00:21:40,870
>> Amara: Hi.

452
00:21:40,870 --> 00:21:44,840
I'm Amara, and my question
is when new materials

453
00:21:44,840 --> 00:21:48,460
or [inaudible] do, does the
new crew on the ISS hope

454
00:21:48,460 --> 00:21:51,990
to bring back to Earth?

455
00:21:51,990 --> 00:21:54,630
>> Jason Barbour: The main
thing is basically the

456
00:21:54,630 --> 00:21:55,510
crew themselves.

457
00:21:55,510 --> 00:21:58,860
The experiments on them

458
00:21:58,860 --> 00:22:02,030
as we determine how is
space affecting them.

459
00:22:02,030 --> 00:22:03,840
So that helps us
determine more data

460
00:22:03,840 --> 00:22:06,710
for when we to go moon and Mars.

461
00:22:06,710 --> 00:22:10,720
How is long-term exposure to
space going to affect them?

462
00:22:10,720 --> 00:22:14,980
>> Jaime: My name is Jaime,

463
00:22:14,980 --> 00:22:20,600
and my question is what
is a favorite mission

464
00:22:20,600 --> 00:22:23,360
that you're working
on in Mission Control?

465
00:22:23,360 --> 00:22:25,910
>> Naomi: Do you
have a favorite?

466
00:22:25,910 --> 00:22:28,220
>> Jason Barbour: What
was my favorite mission?

467
00:22:29,720 --> 00:22:31,030
>> Jaime: Yes.

468
00:22:31,030 --> 00:22:34,590

>> Jason Barbour: Oh,
there's been so many.

469
00:22:34,590 --> 00:22:42,400
I'd have to say my
favorite mission was my,

470
00:22:42,400 --> 00:22:44,820
when I did the Columbus
mission when I was lead for that

471
00:22:44,820 --> 00:22:47,280
when we launched
the Columbus module.

472
00:22:47,280 --> 00:22:50,560
It was fun working with
the international partners

473
00:22:50,560 --> 00:22:53,970
and attaching a brand-new
module to the Space Station.

474
00:22:53,970 --> 00:22:56,060
So I'd have to say
that was probably,

475
00:22:56,060 --> 00:22:58,460
holds a special place
in my heart.

476
00:22:59,950 --> 00:23:01,060
>> Naomi: Thank you.

477
00:23:01,060 --> 00:23:01,780
Ben.

478
00:23:01,780 --> 00:23:02,720
>> Benjamin: Hi.

479
00:23:02,720 --> 00:23:06,970
My name is Benjamin, and my dad
was Tyler Hammond, and he worked

480
00:23:06,970 --> 00:23:12,220
in the Community and Space
Agency on a satellite, and my,

481
00:23:12,220 --> 00:23:17,030
I'm wondering what was
the second most important

482
00:23:17,030 --> 00:23:23,590
contribution to the ISS
other than the [inaudible]?

483
00:23:23,590 --> 00:23:25,560
>> Naomi: Notice
[inaudible] became number one

484
00:23:25,560 --> 00:23:27,850
from a Canadian point of view?

485
00:23:27,850 --> 00:23:29,690
>> Well, [inaudible], obviously.

486
00:23:29,690 --> 00:23:33,310
That's, and it is a
very important component

487
00:23:33,310 --> 00:23:35,920
of the International
Space Station, for sure.

488
00:23:35,920 --> 00:23:39,220
Jason's going to
say Columbus again

489
00:23:39,220 --> 00:23:40,670

because he worked
the shuttle flight

490
00:23:40,670 --> 00:23:45,290
that delivered the European
laboratory, right, but.

491
00:23:45,290 --> 00:23:46,080
>> Jason Barbour:
Well, you know,

492
00:23:46,080 --> 00:23:47,600
Canada holds a special
place in my heart

493
00:23:47,600 --> 00:23:49,180
since I grew up on the border.

494
00:23:49,180 --> 00:23:53,640
But I'd say the Canadian
crew probably is,

495
00:23:53,640 --> 00:23:57,730
probably the next
best thing to the arm

496
00:23:57,730 --> 00:23:59,720
in that the Canadian
crew that goes up there

497
00:23:59,720 --> 00:24:01,580
like Chris Hadfield
that was just there.

498
00:24:01,580 --> 00:24:06,290
He did a lot of good interaction
with a lot of children

499
00:24:06,290 --> 00:24:08,470
on the ground in

bringing them more closer

500
00:24:08,470 --> 00:24:11,000
to the experience of space.

501
00:24:11,000 --> 00:24:11,480
>> Naomi: [Inaudible].

502
00:24:11,480 --> 00:24:14,110
Last one I think.

503
00:24:14,110 --> 00:24:21,160
>> Do the different Mission
Controls connect to each other,

504
00:24:21,160 --> 00:24:22,920
and [inaudible] do that?

505
00:24:22,920 --> 00:24:25,250
>> Did you say the
Mission Controls

506
00:24:25,250 --> 00:24:30,450
for all around the world -

507
00:24:30,450 --> 00:24:31,600
>> [inaudible] Yes.

508
00:24:31,600 --> 00:24:33,560
>> Jason Barbour: We all
are connected to each other,

509
00:24:33,560 --> 00:24:38,090
and that's through basically
through the Internet.

510
00:24:38,090 --> 00:24:43,190
That we have interfaces so that
way we can talk to each other.

511
00:24:43,190 --> 00:24:47,530
Share telemetry, share
experimental information,

512
00:24:47,530 --> 00:24:53,070
but all of that is all
connected through the Internet.

513
00:24:53,070 --> 00:24:56,050
>> Well, that was a
great bunch of questions.

514
00:24:56,050 --> 00:24:58,750
If we had time, we'd sit
here with you guys all day,

515
00:24:58,750 --> 00:25:01,840
but y'all have schoolwork
probably to get back to,

516
00:25:01,840 --> 00:25:05,570
and Jason's got to get
back to work as well.

517
00:25:05,570 --> 00:25:09,400
But we really enjoyed y'all
coming inside Mission Control

518
00:25:09,400 --> 00:25:11,840
with us and talking
with us today,

519
00:25:11,840 --> 00:25:13,150
and we loved all the questions.

520
00:25:13,150 --> 00:25:14,920
We really appreciate it.

521

00:25:14,920 --> 00:25:16,160
>> Jason Barbour: Do
I have time to say -

522
00:25:16,160 --> 00:25:16,480
>> Yeah.

523
00:25:16,480 --> 00:25:20,260
>> Jason Barbour: The one thing
I wanted to say to you guys is

524
00:25:20,260 --> 00:25:22,760
if you can dream
it, you can do it.

525
00:25:22,760 --> 00:25:24,680
Don't let yourself
be put into a box

526
00:25:24,680 --> 00:25:26,780
of what you can and can't do.

527
00:25:26,780 --> 00:25:28,880
Follow your dreams.

528
00:25:29,910 --> 00:25:31,310
Work hard.

529
00:25:31,310 --> 00:25:32,980
Get that education.

530
00:25:32,980 --> 00:25:36,360
And just follow your hearts,

531
00:25:36,360 --> 00:25:39,150
and you'll do anything
that you want to do.

532
00:25:39,150 --> 00:25:40,320

>> Great advice.

533
00:25:40,320 --> 00:25:42,480
You guys have a great day,
and we really enjoyed it.

534
00:25:42,480 --> 00:25:43,250
>> Naomi: [Inaudible] We
appreciate you [inaudible]

535
00:25:43,250 --> 00:25:46,390
and the answers and all the
work that, that you took time

536
00:25:46,390 --> 00:25:52,660
out of your day and left a
seat empty on Mission Control

537
00:25:52,660 --> 00:25:54,000
so that you could be with us.

538
00:25:54,000 --> 00:25:55,930
We thank you for that.

539
00:25:55,930 --> 00:25:56,840
>> Jason Barbour:
Well, happy to be here.

540
00:25:56,840 --> 00:25:59,010
It was great fun
talking to you guys.

541
00:25:59,010 --> 00:26:00,130
>> Thanks a lot, guys.