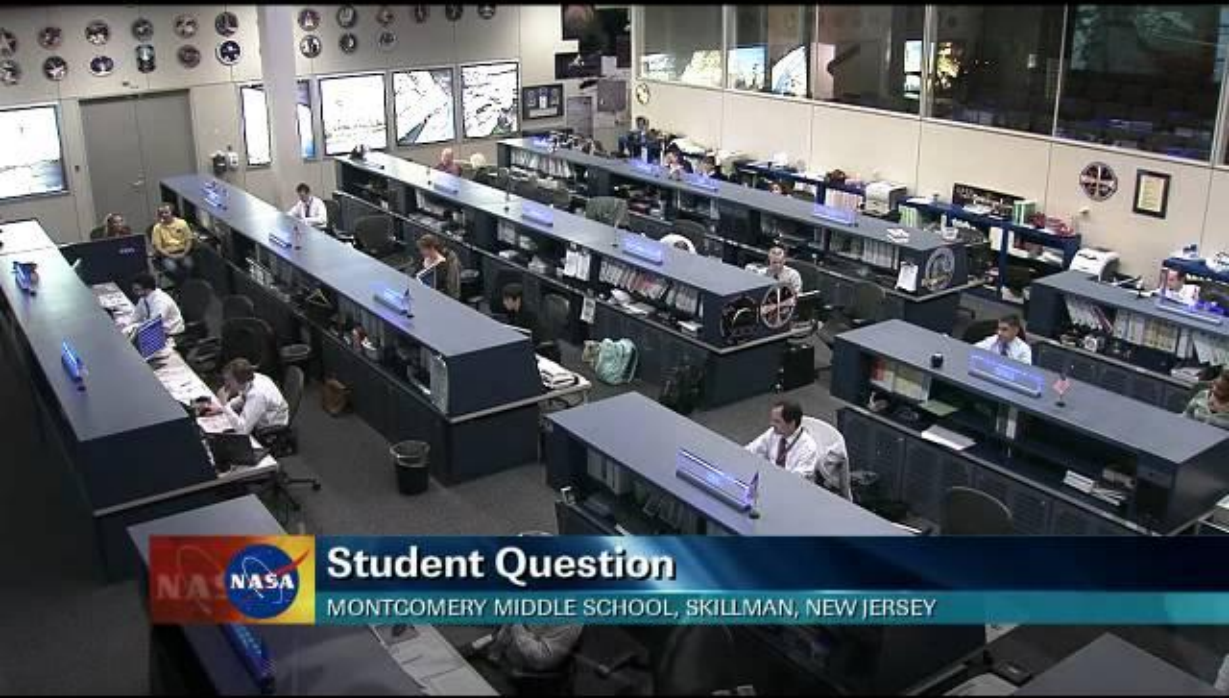
NASA
Student Question
MONTCOMERY MIDDLE SCHOOL, SKILLMAN, NEW JERSEY

1
00:00:03,436 --> 00:00:05,806
>> Now guys I've got a very
special treat for you.

2
00:00:06,026 --> 00:00:11,476
We're now going to go into the International
Space Station mission control room and speak

3
00:00:11,476 --> 00:00:17,756
with Public Affairs Commentator, Kylie Clem
and a robotics engineer, Jonathan Rogers.

4
00:00:17,986 --> 00:00:19,406
Are you guys there in mission control?

5
00:00:20,876 --> 00:00:22,686
>> Kylie Clem: Hello, we're
here in mission control.

6
00:00:22,686 --> 00:00:26,426
Welcome, we're glad you could join us
today and we're happy to take questions.

7
00:00:26,426 --> 00:00:28,326
I'd like to introduce Jonathan to you first.

8
00:00:28,326 --> 00:00:30,636
Jonathan Rogers is a robotics engineer.

9
00:00:31,136 --> 00:00:34,766
He works with Robonaut 2 and
other robotics here on the ground.

10
00:00:35,206 --> 00:00:38,296
Robonaut 2 as you mentioned is on
board the International Space Station

11
00:00:38,656 --> 00:00:40,566
which is controlled from this room.

12
00:00:40,566 --> 00:00:45,176
The team here is watching over the systems
and following along with the six crew members

13
00:00:45,176 --> 00:00:46,776
who are living and working on board.

14
00:00:47,366 --> 00:00:52,326
So I'd like to talk to Jonathan first about
his background and how he came to work at NASA.

15
00:00:52,986 --> 00:00:53,446
>> Jonathan Rogers: Hello.

16
00:00:54,946 --> 00:00:56,366
As we've said my name's Jonathan Rogers.

17
00:00:56,366 --> 00:01:01,256
I actually came to NASA through an
outreach program that my current group.

18
00:01:01,536 --> 00:01:06,056
It was called First Robotics [phonetic] and it
gives an opportunity for high school students

19
00:01:06,416 --> 00:01:10,446
to work with professional
engineers, in my case NASA engineers

20
00:01:10,906 --> 00:01:13,756
to develop a robot to play a game each year.

21
00:01:14,446 --> 00:01:18,446
And that competition just started a couple of
weeks ago so we're looking forward to that.

22
00:01:19,676 --> 00:01:23,926
Following participating in the First Robotics

program, I went to Texas A&M University

23
00:01:23,926 --> 00:01:29,256
where I got a degree in aerospace engineering
and during that time I was able to take part

24
00:01:29,316 --> 00:01:34,906
in NASA's Cooperative Education Program
which allowed me to spend semesters here

25
00:01:34,906 --> 00:01:38,196
at the Johnson Space Center working
on robots and then I would take

26
00:01:38,196 --> 00:01:40,606
that knowledge and apply it to my classes.

27
00:01:41,476 --> 00:01:45,766
And then I've been full-time working on the
Robonaut 2 project for the last four years.

28
00:01:46,766 --> 00:01:49,456
>> Kylie Clem: So how's it been
like sending the Robonaut to space

29
00:01:49,516 --> 00:01:51,236
and then working with it in space?

30
00:01:51,656 --> 00:01:53,266
>> Jonathan Rogers: It's
been an amazing opportunity.

31
00:01:53,536 --> 00:01:57,556
When we developed the project, we
started in 2007 and it was a partnership

32
00:01:57,606 --> 00:01:59,006
with the General Motors Corporation.

33

00:01:59,576 --> 00:02:04,476
We found out that a lot of the goals that we
have match up with the goals they have in terms

34
00:02:04,476 --> 00:02:07,016
of helping people through
the use of advanced robotics.

35
00:02:07,486 --> 00:02:12,026
So we began this project purely as a technology
demonstration platform where we could try

36
00:02:12,026 --> 00:02:17,386
out new things and really push the envelope
of what robotics are capable of doing.

37
00:02:18,196 --> 00:02:22,346
When we announced the project to the world
in 2010, we were given the unique opportunity

38
00:02:22,346 --> 00:02:27,266
to fly it onboard the International
Space Station on STS-133

39
00:02:27,566 --> 00:02:29,706
which was just about a year ago, last February.

40
00:02:30,746 --> 00:02:36,766
And in August we began working with it and
we're continuing to check out the robot

41
00:02:36,836 --> 00:02:39,666
and make sure it traveled safely to space.

42
00:02:40,496 --> 00:02:43,386
And we really look forward to the future in
finding out what it can do to help astronauts.

43
00:02:44,046 --> 00:02:45,296
>> Kylie Clem: So what have you had to do --

44
00:02:45,296 --> 00:02:49,016
you work with the Robonaut here on earth
for quite a while before it actually

45
00:02:49,016 --> 00:02:51,776
to the space station and other robots also.

46
00:02:51,866 --> 00:02:54,496
So now that it's onboard the space
station what have you been going

47
00:02:54,496 --> 00:02:56,256
through to make sure that it's working well?

48
00:02:57,566 --> 00:03:01,976
>> Jonathan Rogers: So to begin we just turned
on the robot and let it sit there for a couple

49
00:03:01,976 --> 00:03:03,576
of hours onboard the space station.

50
00:03:03,766 --> 00:03:09,246
During the time, here in the mission control
center we watched data and you know we checked

51
00:03:09,246 --> 00:03:11,536
out all the censors aboard
the robot to make sure

52
00:03:11,536 --> 00:03:14,416
that they had successfully
made the trip into space.

53
00:03:15,126 --> 00:03:19,486
And we were also learning, you know, how to
interact with the other crew members on board

54
00:03:19,486 --> 00:03:22,406

and the other flight controllers
here in mission control to,

55
00:03:22,406 --> 00:03:24,516
you know, safely accomplish our goals.

56
00:03:25,416 --> 00:03:28,736
Over the next couple of checkout
activities we've begun moving the robot

57
00:03:29,266 --> 00:03:33,056
so we exercise every single
joint aboard the robot.

58
00:03:33,606 --> 00:03:39,356
And we learn how it's different to operate it
in space than we've been working with it here

59
00:03:39,356 --> 00:03:40,786
on the ground for the last few years.

60
00:03:41,236 --> 00:03:44,546
And while it may seem very, very
similar there are subtle differences

61
00:03:45,186 --> 00:03:46,966
that really change how you control a robot.

62
00:03:47,706 --> 00:03:49,566
>> Kylie Clem: And what do you
think it might be able to do

63
00:03:49,566 --> 00:03:50,926
in the future onboard the space station?

64
00:03:51,196 --> 00:03:56,326
>> Jonathan Rogers: So some of the tasks that
we're really going for are things that are dull

65

00:03:56,326 --> 00:03:58,666
or boring for the crew, that
take up a lot of their time.

66
00:03:59,056 --> 00:04:03,356
For example we would love to have
the robot to be able to clean.

67
00:04:04,006 --> 00:04:08,706
The crew devotes a significant portion of
their time on the weekends to just cleaning

68
00:04:08,706 --> 00:04:13,576
up around the space station that way it's nice
and tidy and you know it's a good place to live.

69
00:04:13,786 --> 00:04:18,226
So if we can have a robot go take care of
some of those tasks and you know off load it

70
00:04:18,226 --> 00:04:22,566
from the crew, they could either have
more free time or more time to spend

71
00:04:22,566 --> 00:04:24,606
on different science experiments.

72
00:04:25,536 --> 00:04:26,586
>> Kylie Clem: That sounds good.

73
00:04:26,586 --> 00:04:31,436
Well, we'll go ahead and start
with questions from the students.

74
00:04:31,846 --> 00:04:32,486
>> Questions?

75
00:04:32,546 --> 00:04:38,986
What questions do you have about the man who
actually was instrumental in building Robonaut?

76
00:04:38,986 --> 00:04:39,846
Go ahead, nice and loud.

77
00:04:40,016 --> 00:04:42,066
>> Will you ever add legs to Robonaut?

78
00:04:42,846 --> 00:04:44,856
>> Jonathan Rogers: Yes, we're
actually working on legs right now.

79
00:04:44,856 --> 00:04:48,456
We've got a pair of them in our lab
here at the Johnson Space Center.

80
00:04:49,236 --> 00:04:53,556
And we're learning how to control those here
on the ground before we send them to space.

81
00:04:54,926 --> 00:05:00,876
But the Robonaut is unique in that we can
suit the lower body to the task at hand.

82
00:05:00,876 --> 00:05:06,816
So if we were to send Robonaut to a planet
as we go and explore the solar system,

83
00:05:07,066 --> 00:05:12,626
we might find that like an off roader type of
vehicle might be suitable for the lower base.

84
00:05:13,296 --> 00:05:15,916
You know climbing around on
space station we've determined

85
00:05:15,916 --> 00:05:19,586
that two legs will be the
best way to get around.

86

00:05:20,766 --> 00:05:23,106
And you know that might change as
we go outside the space station

87
00:05:23,106 --> 00:05:32,926
to help astronauts with space walks.

88
00:05:33,046 --> 00:05:33,696
>> Go ahead Stephanie [phonetic].

89
00:05:33,696 --> 00:05:34,256
Nice and loud.

90
00:05:34,456 --> 00:05:35,726
>> Stephanie: What [inaudible]
Robonaut's helmet?

91
00:05:37,746 --> 00:05:41,346
>> Jonathan Rogers: Inside Robonaut's
helmet are actually five cameras.

92
00:05:41,906 --> 00:05:45,686
We've got two cameras that
are used by a human operator.

93
00:05:46,516 --> 00:05:51,876
One of the modes we have to control Robonaut
is where a person puts on virtual reality gear.

94
00:05:51,876 --> 00:05:57,636
So you wear a headset and put on gloves and
the robot will actually mimic your motions.

95
00:05:58,686 --> 00:06:02,546
So we have cameras in there
that are used for teleoperation

96
00:06:02,786 --> 00:06:07,006
and then we also have two more cameras
that are used for machine vision.

97
00:06:07,466 --> 00:06:13,226
Robonaut is programmed to identify things in its
environment and we use those cameras to do that.

98
00:06:13,686 --> 00:06:17,656
They're really high resolution and
allows the robot to see very good.

99
00:06:17,656 --> 00:06:23,466
And then finally we have an infrared
camera which allows the robot

100
00:06:23,466 --> 00:06:28,286
to get a sense of depth in front of it.

101
00:06:31,056 --> 00:06:31,886
>> Nice. More questions?

102
00:06:33,156 --> 00:06:34,856
Go ahead Emily [phonetic], nice and loud.

103
00:06:35,096 --> 00:06:36,216
>> Emily: What's the robot power [inaudible]?

104
00:06:38,536 --> 00:06:39,876
>> Jonathan Rogers: So right
now we're getting power

105
00:06:39,876 --> 00:06:42,436
from the International Space Station itself.

106
00:06:43,676 --> 00:06:45,786
We get power off the solar rays.

107
00:06:45,786 --> 00:06:48,946
That's you know passed through a number
of systems before it gets to the robot.

108
00:06:50,006 --> 00:06:54,496
Inside the robot's backpack we
have power conversion that turns

109
00:06:54,496 --> 00:06:58,056
into the different voltages
that the robot needs to run.

110
00:06:58,946 --> 00:07:04,436
One of the things that we're working on as we
develop legs is also a large battery backpack.

111
00:07:04,956 --> 00:07:11,946
That way it won't have to
be plugged in all the time.

112
00:07:12,046 --> 00:07:12,786
>> Go ahead, nice and loud.

113
00:07:12,786 --> 00:07:16,536
>> How many people are needed to make a robot?

114
00:07:17,666 --> 00:07:20,736
>> Jonathan Rogers: So to build Robonaut
we had a team of about 25 people.

115
00:07:21,176 --> 00:07:25,646
So it's pretty small but as we've gone
through the process to send it to space,

116
00:07:25,646 --> 00:07:27,356
we've had to bring in a lot more experts.

117
00:07:27,356 --> 00:07:29,566
You know we're very good at designing robots.

118
00:07:29,636 --> 00:07:33,926
We don't know anything about how to prepare
them for space flight and there are experts here

119
00:07:33,926 --> 00:07:37,406
at the Johnson Space Center
who specialize in that.

120
00:07:37,716 --> 00:07:41,936
Those folks work on things from
making sure that we're compatible

121
00:07:41,936 --> 00:07:46,386
with the power system onboard space
station and making sure that we don't put

122
00:07:46,386 --> 00:07:50,376
out any harmful radio waves that might interfere
with other experiments on space station.

123
00:07:50,776 --> 00:07:55,026
And then one of the biggest surprises we had
was that we had to change the robot's suit.

124
00:07:55,536 --> 00:08:00,636
The clothes that we had put on Robonaut we're
actually too flammable to be considered safe

125
00:08:00,636 --> 00:08:02,736
for space station so we had
to make that change as well.

126
00:08:03,596 --> 00:08:06,856
And you know we brought in the right folks from
here at the Johnson Space Center to help us.

127
00:08:07,516 --> 00:08:14,986
Now I'd say we probably have between 75 and 100
people working on Robonaut at least part-time.

128
00:08:18,096 --> 00:08:19,656
>> Wow. Good, nice and loud.

129
00:08:19,906 --> 00:08:22,386
>> How did you guys get the idea for Robonaut?

130
00:08:23,086 --> 00:08:28,976
>> Jonathan Rogers: So the Robonaut project
started in 1997 with a goal of designing a robot

131
00:08:29,386 --> 00:08:31,176
to help astronauts on space walks.

132
00:08:31,716 --> 00:08:36,026
As astronauts were building the International
Space Station there were many times

133
00:08:36,026 --> 00:08:41,246
where identified you know a need for
an assistant or a surrogate to go out

134
00:08:41,396 --> 00:08:45,026
and help astronauts do different tasks.

135
00:08:45,966 --> 00:08:48,516
So we've been working on the robot ever since

136
00:08:48,516 --> 00:08:53,596
and this is Robonaut 2 that's onboard the
space station which is our second generation.

137
00:08:54,026 --> 00:08:58,366
>> Go ahead, nice and loud.

138
00:08:58,686 --> 00:09:01,796
>> What materials or tools did you
use to make [inaudible] Robonaut?

139
00:09:02,826 --> 00:09:03,666
>> Jonathan Rogers: That's a very good question.

140

00:09:03,756 --> 00:09:07,006
So primarily it's aluminum.

141
00:09:07,066 --> 00:09:12,736
In certain places we have steel where we needed
a stronger material and then we also have a lot

142
00:09:12,736 --> 00:09:17,336
of plastic where, you know, we didn't
need as much as strength in an area

143
00:09:17,336 --> 00:09:21,426
but you wanted electronics
or something to be protected.

144
00:09:21,576 --> 00:09:24,116
For example, the helmet is plastic.

145
00:09:29,086 --> 00:09:33,686
>> Go ahead, you have a question.

146
00:09:34,306 --> 00:09:37,106
Anybody else?

147
00:09:40,156 --> 00:09:40,896
Go ahead [inaudible].

148
00:09:40,896 --> 00:09:45,876
>> What did you add to Robonaut
2 that Robonaut 1 didn't have?

149
00:09:46,776 --> 00:09:47,786
>> Jonathan Rogers: Another great question.

150
00:09:49,036 --> 00:09:54,936
With Robonaut 2 we concentrated on making
the robot faster, stronger and smarter.

151
00:09:55,816 --> 00:09:59,606

So in addition to changing the motors
and things and allow the robot to move,

152
00:09:59,606 --> 00:10:01,296
we also added a lot more sensing.

153
00:10:01,636 --> 00:10:07,546
For example, the robot has sensors in each
of its finger types that allow it to feel.

154
00:10:08,096 --> 00:10:11,246
You can think of the technology
as you know reaching

155
00:10:11,246 --> 00:10:14,936
into your pocket to tell a nickel from a dime.

156
00:10:14,936 --> 00:10:20,226
We have different cameras onboard that,
like I said, have higher resolution

157
00:10:20,226 --> 00:10:22,596
so we can see the environment
in front of the robot better.

158
00:10:23,856 --> 00:10:27,836
And then the control system, the software
that runs the robot is also very different.

159
00:10:27,836 --> 00:10:31,086
You know our partnership with GM we found

160
00:10:31,086 --> 00:10:34,506
out that we want robots to
work very close to people.

161
00:10:35,006 --> 00:10:40,686
And traditional robotics on assembly lines you
have cages and a number of different things

162
00:10:40,686 --> 00:10:43,716
to keep robots away from people
so that people don't get hurt.

163
00:10:46,046 --> 00:10:48,616
In our view of the way of robots
and people should work together.

164
00:10:49,116 --> 00:10:53,406
They'll be very close so we
added sensing and programming

165
00:10:54,136 --> 00:10:55,836
to allow the robot to work safely around people.

166
00:10:55,986 --> 00:11:02,866
For example it can bump into
you and not hurt you.

167
00:11:03,066 --> 00:11:06,296
>> And learn to say excuse me.

168
00:11:06,296 --> 00:11:07,236
[Laughter]

169
00:11:07,236 --> 00:11:08,546
>> Jonathan Rogers: It actually can't talk yet.

170
00:11:08,546 --> 00:11:10,336
That's one of the things
that we haven't worked in.

171
00:11:11,126 --> 00:11:13,186
We need to put some speakers in
but we didn't have time to do

172
00:11:13,186 --> 00:11:18,866
that before we launched it to Space Station.

173
00:11:18,866 --> 00:11:19,166
[Crosstalk]

174
00:11:19,166 --> 00:11:25,206
>> Did it go up on a separate mission or did
it go with astronauts that we're going up?

175
00:11:25,206 --> 00:11:27,806
Or did it go up by itself automatically?

176
00:11:27,996 --> 00:11:31,586
>> Jonathan Rogers: It flew
up as a payload on STS-133.

177
00:11:32,576 --> 00:11:32,806
>> Right.

178
00:11:33,046 --> 00:11:35,706
>> Jonathan Rogers: And there
were astronauts aboard as well.

179
00:11:36,296 --> 00:11:39,936
It was Discovery I believe.

180
00:11:40,266 --> 00:11:41,426
>> Kylie Clem: Yeah the space shuttle Discovery.

181
00:11:41,426 --> 00:11:43,076
>> Go ahead.

182
00:11:43,936 --> 00:11:46,466
>> What does payload mean?

183
00:11:47,026 --> 00:11:50,136
>> Payload means that supplies
that are going up.

184
00:11:50,136 --> 00:11:54,296

In other words, when they say they're
bringing payload, they're bringing food.

185
00:11:54,396 --> 00:11:55,566
They're bringing water.

186
00:11:55,566 --> 00:11:59,196
They're bringing machinery, tools, correct?

187
00:11:59,416 --> 00:11:59,976
Is that correct?

188
00:12:00,066 --> 00:12:00,806
>> Jonathan Rogers: That's exactly right.

189
00:12:01,886 --> 00:12:09,356
So we were packaged inside a protective
box and lot of foam along with a number

190
00:12:09,356 --> 00:12:15,956
of replacement supplies for Space Station
since the shuttle program was coming to an end.

191
00:12:17,196 --> 00:12:20,496
We were launching a number of
different things that'll ensure

192
00:12:20,496 --> 00:12:24,026
that the astronauts have what they need to
continue operating Space Station safely.

193
00:12:30,086 --> 00:12:32,096
>> This is a live picture
here at mission control.

194
00:12:32,096 --> 00:12:33,536
Go ahead. We'll let both of you, go ahead.

195
00:12:33,706 --> 00:12:36,496

>> How long has the Robonaut been up in space?

196
00:12:37,456 --> 00:12:39,216
>> Jonathan Rogers: It's
been there almost a year.

197
00:12:39,216 --> 00:12:46,686
STS-133 launched in February of 2011.

198
00:12:46,876 --> 00:12:48,286
>> And one more month will be a year.

199
00:12:48,286 --> 00:12:48,686
Go ahead Emily.

200
00:12:48,686 --> 00:12:52,166
>> And what are the similarities
between like the joints and things

201
00:12:52,166 --> 00:12:54,436
like that on the Robonaut and humans?

202
00:12:56,736 --> 00:12:57,786
>> Jonathan Rogers: Another great question.

203
00:12:58,966 --> 00:13:03,116
So Robonaut has electric
motors in each of its joints.

204
00:13:04,366 --> 00:13:09,176
So where you have muscles that allow your
arm to move, we do a little bit differently

205
00:13:09,176 --> 00:13:11,536
but the resulting motion is still the same.

206
00:13:11,966 --> 00:13:13,416
The hand is more similar though.

207
00:13:14,026 --> 00:13:17,356
If you move your hand you can kind
of feel muscles in your forearm move

208
00:13:17,616 --> 00:13:23,926
as your fingers move and in
Robonaut we have mechanical actuators

209
00:13:23,956 --> 00:13:26,356
that pull tendons to move the fingers.

210
00:13:26,356 --> 00:13:27,866
And that's exactly how the human hand is --

211
00:13:28,076 --> 00:13:33,096
there's a lot we can learn about how to build a
human shaped robot from the human body itself.

212
00:13:35,706 --> 00:13:38,806
>> I think somebody else had their hand up.

213
00:13:38,976 --> 00:13:39,546
Yeah go ahead [inaudible].

214
00:13:40,086 --> 00:13:43,106
>> [Inaudible] well why do you need
both human and robots up [inaudible]?

215
00:13:45,436 --> 00:13:49,406
>> Jonathan Rogers: So like I mentioned
earlier there's things that the crew has to do

216
00:13:49,406 --> 00:13:52,986
that takes a lot of their time that, you know,
maybe doesn't require their full attention.

217
00:13:53,206 --> 00:13:56,616
For example, cleaning takes
up a lot of their time.

218
00:13:56,616 --> 00:14:02,186
So we can, you know, have a robot that maybe
doesn't have to be as smart as a person

219
00:14:02,976 --> 00:14:04,406
but can take care of those things.

220
00:14:04,706 --> 00:14:11,726
A couple of other ways that we anticipate
using a Robonaut include being a surrogate

221
00:14:11,726 --> 00:14:12,326
for astronaut.

222
00:14:12,326 --> 00:14:15,816
So think of a mission that
might be kind of dangerous

223
00:14:15,816 --> 00:14:17,776
if we're exploring a planet
and there's somewhere new.

224
00:14:18,236 --> 00:14:22,786
Maybe you don't want to send an astronaut down
a cave or something that could be dangerous

225
00:14:22,846 --> 00:14:24,056
but you kind of want to know what's down there.

226
00:14:24,576 --> 00:14:29,046
If you send a robot and something
bad happens, you lose a Robonaut

227
00:14:29,386 --> 00:14:32,296
but the astronauts are still okay
and that's what we really care about.

228
00:14:33,406 --> 00:14:37,836

Additionally we want to use Robonaut
to help setup for space walks.

229
00:14:38,526 --> 00:14:42,616
A lot of time that astronauts use on a space
walk where they go outside the space station

230
00:14:42,616 --> 00:14:47,356
to do a maintenance activity or
assemble something is spent setting up.

231
00:14:47,836 --> 00:14:50,916
If you could have a robot go out there
and do it ahead of time for them,

232
00:14:51,296 --> 00:15:01,976
they can devote more time to their task at hand.

233
00:15:02,056 --> 00:15:03,006
>> Go ahead sweetheart, nice and loud.

234
00:15:03,096 --> 00:15:04,656
>> Have there been any issues yet?

235
00:15:06,476 --> 00:15:10,036
>> Jonathan Rogers: Well, we're
discovering that there are differences

236
00:15:10,036 --> 00:15:14,036
in between how we [inaudible] the robot on
the ground and how it's operating in space.

237
00:15:14,606 --> 00:15:19,956
For example, you don't have as much
friction in some of the joints.

238
00:15:19,956 --> 00:15:25,116
It's less resistance as you try to move
the robot because there's no gravity.

239
00:15:26,216 --> 00:15:31,076
So little things like that we're learning
and we're making adjustments as we go.

240
00:15:40,546 --> 00:15:42,116
>> Okay sounds good.

241
00:15:42,656 --> 00:15:43,946
I'll give you late passes.

242
00:15:44,576 --> 00:15:47,476
I think we're almost finished anyway.

243
00:15:47,476 --> 00:15:47,706
So --

244
00:15:47,956 --> 00:15:51,706
>> And if you guys have any
additional questions,

245
00:15:51,706 --> 00:15:53,936
for example about the Space Station itself

246
00:15:53,936 --> 00:15:57,606
or mission control I believe Kylie
would be able to answer those as well.

247
00:15:57,876 --> 00:16:02,966
>> Do you have any questions for
the woman who's here, Ms. Kylie?

248
00:16:02,966 --> 00:16:07,696
She can answer any questions about mission
control and the people who are sitting --

249
00:16:07,976 --> 00:16:12,546
did you notice the people sitting
at the desks and things like that?

250
00:16:12,546 --> 00:16:16,656
Do you have any questions for that group?

251
00:16:16,786 --> 00:16:18,276
Yeah I think we're okay.

252
00:16:18,276 --> 00:16:19,826
[Chuckles]

253
00:16:19,826 --> 00:16:21,256
>> All right wonderful.

254
00:16:21,446 --> 00:16:24,636
Well, Kylie and Jonathan I want to
thank you guys for joining us today

255
00:16:24,986 --> 00:16:28,366
from inside the International
Space Station flight control room.

256
00:16:28,686 --> 00:16:31,466
And boys and girls can we give
them a good round of applause.

257
00:16:33,266 --> 00:16:34,066
>> Jonathan Rogers: Thank you.

258
00:16:34,376 --> 00:16:35,516
>> Thank you so much.

259
00:16:35,676 --> 00:16:36,116
>> Kylie Clem: Thank you.

260
00:16:36,116 --> 00:16:38,506
>> We have one final thing we'd like to say too.

261
00:16:38,506 --> 00:16:39,256
>> Okay.

262
00:16:39,256 --> 00:16:39,676
>> Group of students: Thank you [inaudible].

263
00:16:39,996 --> 00:16:42,716
>> Yeah thanks so much.

264
00:16:42,976 --> 00:16:44,096
>> Kylie Clem: You're welcome.

265
00:16:44,416 --> 00:16:46,986
>> Thank you very much for your time.

266
00:16:46,986 --> 00:16:50,666
I can't tell you how informative
it was and you could tell

267
00:16:50,666 --> 00:16:52,836
by the questions the level of interests.

268
00:16:52,836 --> 00:16:55,506
And these are your future
robototists [phonetic] right here.

269
00:16:55,596 --> 00:16:57,496
Thank you.

270
00:16:58,286 --> 00:17:03,586
>> And before we close students if you
want to stay on the line I want to go