FORCE SHOE

1
00:00:03,990 --> 00:00:02,629
good morning and welcome to mission

2
00:00:05,829 --> 00:00:04,000
control houston we have with us here

3
00:00:07,749 --> 00:00:05,839
today the principal investigator for a

4
00:00:09,910 --> 00:00:07,759
new experiment that's going up on the

5
00:00:11,669 --> 00:00:09,920
soyuz at the end of the month uh it's

6
00:00:13,669 --> 00:00:11,679
going to be helping the astronauts

7
00:00:15,430 --> 00:00:13,679
improve the exercise that they do in

8
00:00:17,910 --> 00:00:15,440
space to stay healthy and i think it's

9
00:00:19,349 --> 00:00:17,920
called four shoes so we've got andrea

10
00:00:21,269 --> 00:00:19,359
hansen who is again the principal

11
00:00:23,830 --> 00:00:21,279
investigator and a member of the

12
00:00:25,509 --> 00:00:23,840
exercise physiology and countermeasures

13
00:00:27,029 --> 00:00:25,519

lab here at johnson space center thanks

14
00:00:29,589 --> 00:00:27,039
so much for joining us hi brandi thanks

15
00:00:31,669 --> 00:00:29,599
for having me today so you've got a shoe

16
00:00:33,830 --> 00:00:31,679
with you what exactly is this

17
00:00:36,069 --> 00:00:33,840
i do this is the four shoe and this is a

18
00:00:38,389 --> 00:00:36,079
commercial off the shelf product

19
00:00:41,430 --> 00:00:38,399
a company called accents makes and it's

20
00:00:42,869 --> 00:00:41,440
a tool to help measure underfoot forces

21
00:00:45,110 --> 00:00:42,879
it looks like a goofy sandal but it's

22
00:00:47,110 --> 00:00:45,120
actually a high fidelity research tool

23
00:00:49,350 --> 00:00:47,120
and what it has included here are load

24
00:00:51,430 --> 00:00:49,360
cells underneath both the heel and the

25
00:00:53,510 --> 00:00:51,440
toe of the shoe that help us measure

26
00:00:55,830 --> 00:00:53,520
forces in three different directions and

27
00:00:57,350 --> 00:00:55,840
also torque that's the twisty motion you

28
00:00:58,549 --> 00:00:57,360
can kind of think of it as a high-tech

29
00:01:00,389 --> 00:00:58,559
bathroom scale

30
00:01:01,590 --> 00:01:00,399
okay well why why would we need this on

31
00:01:02,950 --> 00:01:01,600
the space station

32
00:01:05,350 --> 00:01:02,960
we're really interested in measuring

33
00:01:07,350 --> 00:01:05,360
exercise loads on the a-red the advanced

34
00:01:09,750 --> 00:01:07,360
resistive exercise device we can use

35
00:01:11,590 --> 00:01:09,760
that data in a lot of different ways

36
00:01:13,429 --> 00:01:11,600
why is why do we care about load what

37
00:01:15,190 --> 00:01:13,439
what is what is that i guess first of

38
00:01:17,190 --> 00:01:15,200

all and why do we care about it

39
00:01:19,429 --> 00:01:17,200
sure if you go into the gym and decide

40
00:01:20,950 --> 00:01:19,439
that you want to do say squat exercises

41
00:01:23,350 --> 00:01:20,960
you're going to put a certain amount of

42
00:01:25,109 --> 00:01:23,360
weights on that bar well a red works in

43
00:01:26,630 --> 00:01:25,119
a similar way except you're now

44
00:01:29,190 --> 00:01:26,640
exercising against the resistance of

45
00:01:32,069 --> 00:01:29,200
vacuum cylinders when you dial in a load

46
00:01:33,670 --> 00:01:32,079
on a red it's not an exact science so

47
00:01:36,630 --> 00:01:33,680
when you dial in 100 you might be

48
00:01:38,630 --> 00:01:36,640
lifting at 110 or maybe 90 give or take

49
00:01:39,990 --> 00:01:38,640
that 10 pounds on any given day

50
00:01:41,030 --> 00:01:40,000
depending on the performance of the

51
00:01:42,550 --> 00:01:41,040
system

52
00:01:44,870 --> 00:01:42,560
right now we don't have insight to the

53
00:01:46,950 --> 00:01:44,880
exercise load so it's important that we

54
00:01:49,109 --> 00:01:46,960
can measure that using tools like the

55
00:01:52,310 --> 00:01:49,119
horseshoe so we can better understand

56
00:01:53,590 --> 00:01:52,320
what we're asking the crew to exercise

57
00:01:55,670 --> 00:01:53,600
and is that something i guess you'll

58
00:01:57,030 --> 00:01:55,680
want to keep track on as they as they do

59
00:01:58,870 --> 00:01:57,040
their exercise

60
00:02:00,550 --> 00:01:58,880
absolutely we'd like to collect this

61
00:02:02,709 --> 00:02:00,560
load data every day during every

62
00:02:05,030 --> 00:02:02,719
exercise session but right now we're not

63
00:02:06,389 --> 00:02:05,040

getting any data from a red so we're

64
00:02:08,070 --> 00:02:06,399
looking at these portable load

65
00:02:10,229 --> 00:02:08,080
monitoring tools to help us collect that

66
00:02:11,750 --> 00:02:10,239
data i know the astronauts do quite a

67
00:02:13,510 --> 00:02:11,760
bit of exercise to stay healthy and it

68
00:02:15,270 --> 00:02:13,520
seems like it's been working pretty good

69
00:02:16,790 --> 00:02:15,280
we've kind of got it down so how will

70
00:02:17,830 --> 00:02:16,800
these how will these measurements help

71
00:02:20,150 --> 00:02:17,840
us with that

72
00:02:22,390 --> 00:02:20,160
absolutely since the a red and the new

73
00:02:24,710 --> 00:02:22,400
treadmill were installed in late 2009

74
00:02:26,869 --> 00:02:24,720
and early 2010 the crew have been coming

75
00:02:28,710 --> 00:02:26,879
back a lot stronger but we know we have

76
00:02:31,110 --> 00:02:28,720
work to do they're coming back with

77
00:02:33,430 --> 00:02:31,120
stronger muscles and even some increased

78
00:02:35,350 --> 00:02:33,440
quality in bone but we're still worried

79
00:02:37,670 --> 00:02:35,360
about the strength of their bone and the

80
00:02:39,750 --> 00:02:37,680
quality of the the inside of their bone

81
00:02:41,509 --> 00:02:39,760
and how that strength is going to be

82
00:02:43,910 --> 00:02:41,519
compromised when they come back to earth

83
00:02:46,070 --> 00:02:43,920
so we know we have work to do okay have

84
00:02:47,990 --> 00:02:46,080
you have you tried these on yourself

85
00:02:49,990 --> 00:02:48,000
yes i have tried the shoes on um they

86
00:02:52,229 --> 00:02:50,000
are really a pretty comfortable sandal

87
00:02:53,750 --> 00:02:52,239
they're a little stiff so we don't run

88
00:02:56,150 --> 00:02:53,760

in these shoes and we don't do a lot of

89
00:02:58,229 --> 00:02:56,160
jumping but to stand and take a static

90
00:02:59,910 --> 00:02:58,239
load measure they are they measure very

91
00:03:02,309 --> 00:02:59,920
accurately seeing another picture of

92
00:03:05,110 --> 00:03:02,319
them here on the on the screen and a

93
00:03:07,190 --> 00:03:05,120
good view of the the force measurement

94
00:03:10,390 --> 00:03:07,200
or load measurement uh

95
00:03:11,430 --> 00:03:10,400
devices on the bottom there um how many

96
00:03:12,470 --> 00:03:11,440
crew members are going to be wearing

97
00:03:14,229 --> 00:03:12,480
these

98
00:03:15,990 --> 00:03:14,239
we have two crew members going up

99
00:03:18,229 --> 00:03:16,000
launching on may 28th who are going to

100
00:03:20,550 --> 00:03:18,239
participate in the four shoe evaluation

101
00:03:22,710 --> 00:03:20,560
and that's reid wiseman and alex alex

102
00:03:24,550 --> 00:03:22,720
gerst both of those crew members will be

103
00:03:26,869 --> 00:03:24,560
helping us evaluate the shoe and

104
00:03:29,350 --> 00:03:26,879
understanding how accurate we can get

105
00:03:32,390 --> 00:03:29,360
the measures during a red exercise

106
00:03:34,710 --> 00:03:32,400
and how will you how do you what i guess

107
00:03:36,149 --> 00:03:34,720
what gets the data to the ground is it

108
00:03:38,229 --> 00:03:36,159
do you bring the shoes back or is it

109
00:03:39,910 --> 00:03:38,239
transmitted or the data is going to be

110
00:03:43,030 --> 00:03:39,920
collected real time on a space station

111
00:03:44,949 --> 00:03:43,040
computer during the evaluation so the

112
00:03:47,270 --> 00:03:44,959
test itself is pretty simple we're going

113
00:03:50,470 --> 00:03:47,280

to have the crew dial in a number of

114
00:03:53,750 --> 00:03:50,480
loads on a red anywhere say from 0 to

115
00:03:55,429 --> 00:03:53,760
100 200 and higher at 25 pound

116
00:03:57,429 --> 00:03:55,439
increments we're going to look at that

117
00:03:59,190 --> 00:03:57,439
data in the repeated

118
00:04:01,589 --> 00:03:59,200
measures that we asked the crew to take

119
00:04:03,990 --> 00:04:01,599
to look for repeatability in the in the

120
00:04:05,429 --> 00:04:04,000
load data in those measures between the

121
00:04:07,509 --> 00:04:05,439
crew members and also in their

122
00:04:09,750 --> 00:04:07,519
individual sessions that'll help us

123
00:04:12,470 --> 00:04:09,760
determine if these four shoes are

124
00:04:14,710 --> 00:04:12,480
performing and behaving as we'd expect

125
00:04:16,789 --> 00:04:14,720
while in use with a red

126
00:04:18,629 --> 00:04:16,799
what would what would i guess decide if

127
00:04:20,069 --> 00:04:18,639
they're performing well

128
00:04:22,069 --> 00:04:20,079
it would so what we're going to be

129
00:04:24,469 --> 00:04:22,079
looking at is to make sure that when we

130
00:04:27,430 --> 00:04:24,479
take a static load measure say at a 50

131
00:04:29,189 --> 00:04:27,440
pound load that when we take it three or

132
00:04:31,670 --> 00:04:29,199
four times in a row it gives us that

133
00:04:33,670 --> 00:04:31,680
same number so it's whether

134
00:04:35,990 --> 00:04:33,680
they match what you're expecting from

135
00:04:37,749 --> 00:04:36,000
the exercise machine or

136
00:04:39,670 --> 00:04:37,759
yeah we're not really interested in say

137
00:04:41,350 --> 00:04:39,680
calibrating the exercise machine at this

138
00:04:44,150 --> 00:04:41,360

point in time we just want to make sure

139
00:04:45,990 --> 00:04:44,160
we dial in the same load every time to

140
00:04:48,710 --> 00:04:46,000
look to see if that load measure is

141
00:04:51,030 --> 00:04:48,720
repeatable once we decide that this tool

142
00:04:53,350 --> 00:04:51,040
is working appropriately and as expected

143
00:04:55,430 --> 00:04:53,360
in space then we can go back and kind of

144
00:04:57,270 --> 00:04:55,440
do some of that fine tuning but right

145
00:04:59,510 --> 00:04:57,280
now we're just making sure the tool

146
00:05:01,430 --> 00:04:59,520
works so gersten and weisman are

147
00:05:03,670 --> 00:05:01,440
basically just checking it out and then

148
00:05:06,230 --> 00:05:03,680
future astronauts will be using it in a

149
00:05:08,629 --> 00:05:06,240
different way absolutely it works yes

150
00:05:10,390 --> 00:05:08,639
what our hope is is that one the shoes

151
00:05:12,629 --> 00:05:10,400
work well and do give us that accurate

152
00:05:14,230 --> 00:05:12,639
data and then we can apply these shoes

153
00:05:16,310 --> 00:05:14,240
and use them in our future research

154
00:05:18,070 --> 00:05:16,320
studies we can use this kind of data to

155
00:05:20,310 --> 00:05:18,080
do things like

156
00:05:22,950 --> 00:05:20,320
evaluate human motion

157
00:05:25,270 --> 00:05:22,960
and perform the future arid biomechanics

158
00:05:26,790 --> 00:05:25,280
study where we look at joint motion and

159
00:05:28,469 --> 00:05:26,800
the forces applied at different points

160
00:05:30,950 --> 00:05:28,479
on the body

161
00:05:32,230 --> 00:05:30,960
so now you said these are commercial

162
00:05:34,150 --> 00:05:32,240
off-the-shelf products is it something

163
00:05:36,070 --> 00:05:34,160

that would be helpful to people on earth

164
00:05:39,029 --> 00:05:36,080
as well or is it just of interest to us

165
00:05:41,110 --> 00:05:39,039
in space yeah it sure could right now we

166
00:05:42,870 --> 00:05:41,120
largely do biomechanics studies in

167
00:05:44,469 --> 00:05:42,880
laboratory settings

168
00:05:46,070 --> 00:05:44,479
it usually involves a lot of big

169
00:05:49,029 --> 00:05:46,080
equipment heavy equipment that's

170
00:05:50,790 --> 00:05:49,039
installed in long gateways what portable

171
00:05:53,830 --> 00:05:50,800
load monitoring tools like the foreshoe

172
00:05:56,870 --> 00:05:53,840
allow us to do is take the science to to

173
00:05:59,350 --> 00:05:56,880
the outside to remote areas like space

174
00:06:01,990 --> 00:05:59,360
station or even out into

175
00:06:04,309 --> 00:06:02,000
your everyday life situation so we can

176
00:06:06,150 --> 00:06:04,319
look at how people walk around and move

177
00:06:07,749 --> 00:06:06,160
doing their everyday activities okay

178
00:06:09,110 --> 00:06:07,759
well that's really interesting thanks so

179
00:06:10,469 --> 00:06:09,120
much and i guess we'll look forward to

180
00:06:12,469 --> 00:06:10,479
hearing how it works out and maybe

181
00:06:14,390 --> 00:06:12,479
seeing them more in use on the space

182
00:06:17,189 --> 00:06:14,400
station in the future sounds great thank

183
00:06:18,629 --> 00:06:17,199
you so much again this was andrea hansen

184
00:06:20,390 --> 00:06:18,639
who is the principal investigator for

185
00:06:22,390 --> 00:06:20,400
the force shoes experiment that's going

186
00:06:23,670 --> 00:06:22,400
up on the soyuz at the end of the month