1
00:00:23,269 --> 00:00:21,830
traditional space flight hardware

2
00:00:26,310 --> 00:00:23,279
development timelines are measured in

3
00:00:28,550 --> 00:00:26,320
order of years we were given six months

4
00:00:30,310 --> 00:00:28,560
to take robonaut from its lab

5
00:00:32,150 --> 00:00:30,320
environment and to get it qualified for

6
00:00:33,910 --> 00:00:32,160
the space station by september and

7
00:00:37,030 --> 00:00:33,920
actually it's not even by september we

8
00:00:38,869 --> 00:00:37,040
have an on-dock date at ksc of july 2nd

9
00:00:40,470 --> 00:00:38,879
robonaut was designed to be a human

10
00:00:41,990 --> 00:00:40,480
assistant just kind of the same way a

11
00:00:43,350 --> 00:00:42,000
nurse would be to a doctor in an

12
00:00:45,830 --> 00:00:43,360
operating room

13
00:00:48,470 --> 00:00:45,840

so you can think of robonaut as helping

14
00:00:50,229 --> 00:00:48,480
a human worker set up a work site tear

15
00:00:52,630 --> 00:00:50,239
down a work site hand them a tool please

16
00:00:55,110 --> 00:00:52,640
hold this for a while and so we want to

17
00:00:56,869 --> 00:00:55,120
use robonaut in the same exact way

18
00:00:59,110 --> 00:00:56,879
in the space station and help the crew

19
00:01:01,189 --> 00:00:59,120
out in in a lot of those same uh types

20
00:01:04,070 --> 00:01:01,199
we're interested in showcasing the

21
00:01:06,149 --> 00:01:04,080
technologies that that comprise robonaut

22
00:01:08,310 --> 00:01:06,159
and chief among those is the dexterity

23
00:01:09,190 --> 00:01:08,320
that robonaut possesses and so what we'd

24
00:01:11,030 --> 00:01:09,200
like to

25
00:01:12,469 --> 00:01:11,040
demonstrate with that is robonaut's

26
00:01:14,310 --> 00:01:12,479
ability to

27
00:01:16,710 --> 00:01:14,320
utilize the same connectors the same

28
00:01:18,310 --> 00:01:16,720
tools and do the same sorts of tasks

29
00:01:20,870 --> 00:01:18,320
that the astronauts can do on the space

30
00:01:22,469 --> 00:01:20,880
station in a way to aid them

31
00:01:24,310 --> 00:01:22,479
so we're going to control robonaut on

32
00:01:26,310 --> 00:01:24,320
the space station using a space station

33
00:01:27,429 --> 00:01:26,320
laptop and the ground controllers here

34
00:01:29,590 --> 00:01:27,439
on the ground are going to be logged

35
00:01:31,510 --> 00:01:29,600
into that laptop issuing commands to the

36
00:01:33,030 --> 00:01:31,520
robot to performance activities one of

37
00:01:34,870 --> 00:01:33,040
the main challenges that we faced

38
00:01:36,710 --> 00:01:34,880

getting robonaut to fly on the

39
00:01:38,550 --> 00:01:36,720
international space station has been

40
00:01:41,350 --> 00:01:38,560
taking a fully developed piece of

41
00:01:43,350 --> 00:01:41,360
prototype hardware and and getting it

42
00:01:44,789 --> 00:01:43,360
qualified to meet the rigors of space

43
00:01:47,109 --> 00:01:44,799
flight

44
00:01:49,030 --> 00:01:47,119
this has involved analyzing the system

45
00:01:50,230 --> 00:01:49,040
from a materials point of view from a

46
00:01:52,149 --> 00:01:50,240
circuit's point of view from a

47
00:01:53,190 --> 00:01:52,159
mechanic's point of view

48
00:01:56,230 --> 00:01:53,200
and and

49
00:01:57,990 --> 00:01:56,240
figuring out what it is we had to change

50
00:01:59,990 --> 00:01:58,000
on the system so that it would be

51
00:02:01,510 --> 00:02:00,000
qualifiable for the rigors of

52
00:02:03,910 --> 00:02:01,520
spaceflight

53
00:02:06,630 --> 00:02:03,920
emi is electromagnetic interference and

54
00:02:08,869 --> 00:02:06,640
so what you have to do is you do two

55
00:02:10,949 --> 00:02:08,879
kinds of testing you look for emi and

56
00:02:12,550 --> 00:02:10,959
emc and emc is electromagnetic

57
00:02:14,630 --> 00:02:12,560
compatibility

58
00:02:15,990 --> 00:02:14,640
when you're a payload or when you have a

59
00:02:17,270 --> 00:02:16,000
piece of hardware on the space station

60
00:02:18,949 --> 00:02:17,280
you need to be sure that you don't

61
00:02:21,430 --> 00:02:18,959
interfere with the hardware that's on

62
00:02:24,150 --> 00:02:21,440
station or that you don't enter get

63
00:02:26,229 --> 00:02:24,160

interfered with in a way that causes you

64
00:02:28,229 --> 00:02:26,239
to create a hazardous condition and so

65
00:02:30,070 --> 00:02:28,239
what every payload has to do or every

66
00:02:32,070 --> 00:02:30,080
piece of hardware that's powered has to

67
00:02:33,589 --> 00:02:32,080
do as one before it goes up on the space

68
00:02:34,790 --> 00:02:33,599
station or if it's powered on the

69
00:02:36,949 --> 00:02:34,800
shuttle for that matter has to go

70
00:02:42,229 --> 00:02:36,959
through a certain set of

71
00:02:47,030 --> 00:02:44,630
one of the tests we have to perform

72
00:02:50,070 --> 00:02:47,040
when getting the robot ready for the

73
00:02:51,990 --> 00:02:50,080
rigors of space flight is simulating in

74
00:02:53,990 --> 00:02:52,000
a very real sense the vibration

75
00:02:56,070 --> 00:02:54,000
environment of a shuttle flight and this

76
00:02:58,710 --> 00:02:56,080
involves mounting robonaut in its cargo

77
00:03:06,070 --> 00:02:58,720
carrier on a vibration table and shaking

78
00:03:12,949 --> 00:03:09,509
robonaut launches on sts-133 which is in

79
00:03:15,190 --> 00:03:12,959
uh september 16th i believe ulf-5

80
00:03:17,030 --> 00:03:15,200
and our idea for robonaut is to

81
00:03:19,190 --> 00:03:17,040
initially get it up on the space station

82
00:03:20,869 --> 00:03:19,200
and have it prove out a lot of the

83
00:03:22,630 --> 00:03:20,879
the same sort of tasks we've been doing

84
00:03:24,309 --> 00:03:22,640
here on the ground it's going to be in a

85
00:03:26,070 --> 00:03:24,319
stationary it's going to be in a

86
00:03:27,110 --> 00:03:26,080
stationary format where the robot's

87
00:03:29,110 --> 00:03:27,120
going to be hard mounted with a

88
00:03:30,710 --> 00:03:29,120

stanchion to a seat track assembly and

89
00:03:32,630 --> 00:03:30,720
so the robot's going to be set up by the

90
00:03:34,630 --> 00:03:32,640
astronauts and performance tasks be torn

91
00:03:36,710 --> 00:03:34,640
down and stored so the robot was

92
00:03:38,229 --> 00:03:36,720
designed on a very in a very modular way

93
00:03:40,630 --> 00:03:38,239
so you can replace an arm you can

94
00:03:42,949 --> 00:03:40,640
replace a hand you can replace a limb

95
00:03:45,350 --> 00:03:42,959
you can replace a head and so that this

96
00:03:47,830 --> 00:03:45,360
affords us the opportunity to fly up

97
00:03:50,149 --> 00:03:47,840
individual pieces or individual parts of

98
00:03:51,910 --> 00:03:50,159
the robot that are approved for its next

99
00:03:54,390 --> 00:03:51,920
stages in life for example we could fly

100
00:03:55,990 --> 00:03:54,400
up an arm or a set of arms that are eva

101
00:03:58,789 --> 00:03:56,000
arms we could fly up a body that's an

102
00:04:01,830 --> 00:03:58,799
eva body and so we can replace the robot

103
00:04:03,910 --> 00:04:01,840
over time to to make it meet the rigors

104
00:04:05,190 --> 00:04:03,920
of of an eva environment our second

105
00:04:07,589 --> 00:04:05,200
stage

106
00:04:09,589 --> 00:04:07,599
of of the robot's life on the space

107
00:04:11,509 --> 00:04:09,599
station is going to involve a mobility

108
00:04:14,550 --> 00:04:11,519
package which is going to involve a leg

109
00:04:16,789 --> 00:04:14,560
that that it can use to move around the

110
00:04:19,189 --> 00:04:16,799
space station and so the third stage of

111
00:04:20,949 --> 00:04:19,199
this is going to be a

112
00:04:23,030 --> 00:04:20,959
an eva package so we're going to be

113
00:04:24,390 --> 00:04:23,040

upgrading the robot through through the

114
00:04:25,670 --> 00:04:24,400
course of its life over the next couple