
NASA
SPACESTATION
LIVE

1
00:00:08,230 --> 00:00:06,309
we're here at glenn research center in

2
00:00:10,230 --> 00:00:08,240
the exercise countermeasures lab gail

3
00:00:12,709 --> 00:00:10,240
perusic joins me now she is the project

4
00:00:14,870 --> 00:00:12,719
manager for advanced exercise concepts

5
00:00:16,550 --> 00:00:14,880
for the human research program and gail

6
00:00:18,070 --> 00:00:16,560
we have a lot of concepts around us a

7
00:00:19,590 --> 00:00:18,080
lot of real things that are used on the

8
00:00:21,990 --> 00:00:19,600
space station right now tell us about

9
00:00:25,109 --> 00:00:22,000
what you do in this lab sure

10
00:00:27,589 --> 00:00:25,119
the exercise countermeasures lab is a

11
00:00:30,070 --> 00:00:27,599
place where we can

12
00:00:31,750 --> 00:00:30,080
test develop new equipment for for

13
00:00:33,350 --> 00:00:31,760

astronauts in the area of exercise

14
00:00:36,310 --> 00:00:33,360
countermeasures

15
00:00:37,990 --> 00:00:36,320
in a realistic environment here on earth

16
00:00:40,150 --> 00:00:38,000
so

17
00:00:43,830 --> 00:00:40,160
we're developing new equipment new

18
00:00:46,549 --> 00:00:43,840
sensor technology new protocols to

19
00:00:48,310 --> 00:00:46,559
improve the exercise countermeasures

20
00:00:50,950 --> 00:00:48,320
hardware and routines that the

21
00:00:53,910 --> 00:00:50,960
astronauts use to stay healthy in zero

22
00:00:56,069 --> 00:00:53,920
gravity and mitigate the the bone and

23
00:00:58,229 --> 00:00:56,079
muscle loss that that we see when they

24
00:00:59,830 --> 00:00:58,239
they don't get adequate exercise and we

25
00:01:01,750 --> 00:00:59,840
really don't think about it but exercise

26
00:01:03,110 --> 00:01:01,760
is a lot different in space well maybe

27
00:01:05,030 --> 00:01:03,120
not a lot different but there are things

28
00:01:06,630 --> 00:01:05,040
you have to do differently because

29
00:01:08,950 --> 00:01:06,640
nothing to weight you down right that's

30
00:01:10,710 --> 00:01:08,960
true yeah that's true so um the

31
00:01:13,429 --> 00:01:10,720
equipment that we've got on on space

32
00:01:15,429 --> 00:01:13,439
station now we've got a

33
00:01:17,910 --> 00:01:15,439
an advanced resistive exercise device

34
00:01:19,910 --> 00:01:17,920
which is a lot like lifting free weights

35
00:01:22,550 --> 00:01:19,920
but in zero gravity

36
00:01:24,630 --> 00:01:22,560
it uses a principle of vacuum cylinders

37
00:01:25,830 --> 00:01:24,640
and flywheels to provide that resistive

38
00:01:27,670 --> 00:01:25,840

load

39
00:01:29,590 --> 00:01:27,680
we've got a cycle ergometer with

40
00:01:31,429 --> 00:01:29,600
vibration isolation

41
00:01:34,390 --> 00:01:31,439
system and that's a lot like a

42
00:01:36,710 --> 00:01:34,400
stationary bike for an aerobic workout

43
00:01:39,429 --> 00:01:36,720
and then there's the second generation

44
00:01:40,950 --> 00:01:39,439
treadmill or t2

45
00:01:42,870 --> 00:01:40,960
which is

46
00:01:45,030 --> 00:01:42,880
basically a commercial treadmill that's

47
00:01:48,230 --> 00:01:45,040
been fitted to a space station rack

48
00:01:50,389 --> 00:01:48,240
again with a vibration isolation system

49
00:01:52,630 --> 00:01:50,399
and as opposed to a treadmill at the gym

50
00:01:55,590 --> 00:01:52,640
where you just jump on and go

51
00:01:58,389 --> 00:01:55,600
the crew members don a harness and they

52
00:02:00,469 --> 00:01:58,399
tether themselves down to the treadmill

53
00:02:02,709 --> 00:02:00,479
with a set of bungees or a subject load

54
00:02:04,709 --> 00:02:02,719
system and that allows them to generate

55
00:02:06,630 --> 00:02:04,719
the the forces under their feet to get

56
00:02:09,830 --> 00:02:06,640
that impact loading that's so important

57
00:02:11,910 --> 00:02:09,840
for for bone health and

58
00:02:14,150 --> 00:02:11,920
allows them to get it get a good workout

59
00:02:15,589 --> 00:02:14,160
so is that something like we see here or

60
00:02:16,869 --> 00:02:15,599
is this something new

61
00:02:18,070 --> 00:02:16,879
exactly so

62
00:02:19,589 --> 00:02:18,080
so this

63
00:02:21,830 --> 00:02:19,599

treadmill

64
00:02:24,309 --> 00:02:21,840
now this is a this one has an acronym

65
00:02:25,350 --> 00:02:24,319
and it's a mouthful but

66
00:02:28,070 --> 00:02:25,360
yeah

67
00:02:30,710 --> 00:02:28,080
we call this the ezls or enhanced zero

68
00:02:34,790 --> 00:02:30,720
gravity locomotion simulator

69
00:02:36,790 --> 00:02:34,800
we can simulate the the iss treadmill

70
00:02:39,910 --> 00:02:36,800
and uh some of the unique things about

71
00:02:42,949 --> 00:02:39,920
this uh system is that um

72
00:02:45,990 --> 00:02:42,959
we we can actually float this on a film

73
00:02:48,470 --> 00:02:46,000
of air on air bearings so it reacts to

74
00:02:50,949 --> 00:02:48,480
the uh the footfalls of our our human

75
00:02:53,910 --> 00:02:50,959
test subjects are our human volunteers

76
00:02:56,070 --> 00:02:53,920
that we appreciate so much

77
00:02:58,229 --> 00:02:56,080
and so we can really get a good

78
00:03:00,949 --> 00:02:58,239
simulation of what the the loading

79
00:03:03,509 --> 00:03:00,959
regime what the what what the

80
00:03:05,270 --> 00:03:03,519
exercise prescriptions are really really

81
00:03:07,270 --> 00:03:05,280
doing from uh you know from an

82
00:03:09,430 --> 00:03:07,280
engineering perspective in terms of

83
00:03:11,350 --> 00:03:09,440
loading into the vehicle loading into

84
00:03:13,670 --> 00:03:11,360
the body

85
00:03:15,430 --> 00:03:13,680
so it's a it's a great simulation a

86
00:03:17,350 --> 00:03:15,440
great analog for developing new

87
00:03:20,390 --> 00:03:17,360
equipment

88
00:03:24,229 --> 00:03:20,400

so one of the uh one of the the success

89
00:03:26,470 --> 00:03:24,239
stories to come out of this lab is is a

90
00:03:28,470 --> 00:03:26,480
new more ergonomic more comfortable

91
00:03:30,869 --> 00:03:28,480
treadmill harness

92
00:03:32,710 --> 00:03:30,879
that was developed with

93
00:03:33,589 --> 00:03:32,720
our collaborators at the cleveland

94
00:03:34,470 --> 00:03:33,599
clinic

95
00:03:36,550 --> 00:03:34,480
and

96
00:03:39,190 --> 00:03:36,560
the crew members were coming back from

97
00:03:41,589 --> 00:03:39,200
the expeditions with complaints of the

98
00:03:44,949 --> 00:03:41,599
previous harness design of causing

99
00:03:47,350 --> 00:03:44,959
discomfort and so we we worked with the

100
00:03:49,430 --> 00:03:47,360
clinic and our engineering teams

101
00:03:52,070 --> 00:03:49,440
here at glenn and at johnson space

102
00:03:55,030 --> 00:03:52,080
center to develop a new and better

103
00:03:58,390 --> 00:03:55,040
design so that that design was tested

104
00:04:03,030 --> 00:03:58,400
here in the simulator and

105
00:04:05,270 --> 00:04:03,040
it was it was flown in about 2009 2010

106
00:04:08,470 --> 00:04:05,280
it was met with uh

107
00:04:10,710 --> 00:04:08,480
great feedback from the crew and

108
00:04:13,910 --> 00:04:10,720
we transitioned to operations and now

109
00:04:15,910 --> 00:04:13,920
the crew members each get a get a what's

110
00:04:18,390 --> 00:04:15,920
called a glenn harness

111
00:04:20,870 --> 00:04:18,400
and that that was developed right here

112
00:04:22,469 --> 00:04:20,880
so also with the success stories we want

113
00:04:24,550 --> 00:04:22,479

to talk about how these exercise

114
00:04:26,390 --> 00:04:24,560
countermeasures everything they do is

115
00:04:28,629 --> 00:04:26,400
really helping them now at first you

116
00:04:31,110 --> 00:04:28,639
didn't know a lot about what was causing

117
00:04:33,830 --> 00:04:31,120
bone loss and muscle loss

118
00:04:36,550 --> 00:04:33,840
and now they exercise two hours two plus

119
00:04:38,230 --> 00:04:36,560
hours a day two plus hours a day six

120
00:04:40,550 --> 00:04:38,240
days a week

121
00:04:43,430 --> 00:04:40,560
we're we are definitely learning more

122
00:04:45,990 --> 00:04:43,440
about the optimal regimen the optimal

123
00:04:48,870 --> 00:04:46,000
equipment what the exercise hardware

124
00:04:51,830 --> 00:04:48,880
needs to do in terms of providing

125
00:04:54,070 --> 00:04:51,840
optimal force

126
00:04:56,469 --> 00:04:54,080
characteristics if you will

127
00:04:58,390 --> 00:04:56,479
the a-red the new advanced resistive

128
00:05:01,189 --> 00:04:58,400
exercise device which was flown on

129
00:05:05,270 --> 00:05:01,199
station in 2008

130
00:05:08,150 --> 00:05:05,280
provides a 600 pound resistive force

131
00:05:10,150 --> 00:05:08,160
and the previous irad or interim

132
00:05:12,230 --> 00:05:10,160
resistive exercise device was limited to

133
00:05:14,390 --> 00:05:12,240
300 pounds

134
00:05:16,390 --> 00:05:14,400
and since the a-red has flown we've seen

135
00:05:19,510 --> 00:05:16,400
crew members come back healthier than

136
00:05:21,430 --> 00:05:19,520
ever so we are taking

137
00:05:23,590 --> 00:05:21,440
that capability

138
00:05:25,830 --> 00:05:23,600

and we're benchmarking it for our next

139
00:05:27,430 --> 00:05:25,840
generation designs for

140
00:05:29,430 --> 00:05:27,440
missions to mars

141
00:05:31,510 --> 00:05:29,440
mars transit these

142
00:05:33,189 --> 00:05:31,520
long duration missions

143
00:05:34,870 --> 00:05:33,199
all of that is

144
00:05:37,430 --> 00:05:34,880
being taken

145
00:05:39,110 --> 00:05:37,440
and and the ultimate well the goal for

146
00:05:40,150 --> 00:05:39,120
towards the end of the decade for space

147
00:05:42,550 --> 00:05:40,160
station

148
00:05:44,070 --> 00:05:42,560
is to bring that all together in an

149
00:05:46,390 --> 00:05:44,080
integrated

150
00:05:48,629 --> 00:05:46,400
optimized countermeasure suite

151
00:05:51,189 --> 00:05:48,639
which will be our our best

152
00:05:52,790 --> 00:05:51,199
designs our best efforts for

153
00:05:55,110 --> 00:05:52,800
for the mars mission

154
00:05:56,629 --> 00:05:55,120
we're all counting on you