
NASA
SPACESTATION
LIVE

1
00:00:08,070 --> 00:00:06,150
i'm here with ken rovat and he is a

2
00:00:10,709 --> 00:00:08,080
microgravity data analyst and we're

3
00:00:13,190 --> 00:00:10,719
talking about one of the longest running

4
00:00:15,509 --> 00:00:13,200
payloads on the space station sam's what

5
00:00:17,109 --> 00:00:15,519
is sam's sams that's an acronym it

6
00:00:19,590 --> 00:00:17,119
stands for the space acceleration

7
00:00:21,189 --> 00:00:19,600
measurement system so we're measuring

8
00:00:23,990 --> 00:00:21,199
the vibrations

9
00:00:25,109 --> 00:00:24,000
very minute very tiny vibrations so i

10
00:00:26,870 --> 00:00:25,119
guess we don't think about the space

11
00:00:28,470 --> 00:00:26,880
station vibrating but what kinds of

12
00:00:30,710 --> 00:00:28,480
things make it vibrate and why do you

13
00:00:32,950 --> 00:00:30,720

have to measure this okay so on the very

14
00:00:36,150 --> 00:00:32,960
low frequency and below about five hertz

15
00:00:38,069 --> 00:00:36,160
or so we're actually monitoring the um

16
00:00:39,910 --> 00:00:38,079
structural vibrations of the space

17
00:00:41,670 --> 00:00:39,920
station there's very large structures a

18
00:00:43,510 --> 00:00:41,680
truss sort of the skeleton the backbone

19
00:00:45,830 --> 00:00:43,520
of the space station and that thing is

20
00:00:47,910 --> 00:00:45,840
actually oscillating at about 0.1 hertz

21
00:00:49,750 --> 00:00:47,920
all the time continuously and when the

22
00:00:51,830 --> 00:00:49,760
crew moves around they have to push off

23
00:00:53,590 --> 00:00:51,840
or land on structure they actually

24
00:00:55,830 --> 00:00:53,600
excite those structures and so those

25
00:00:57,750 --> 00:00:55,840
vibrations are important to the

26
00:00:59,830 --> 00:00:57,760
longevity of the space station a

27
00:01:01,830 --> 00:00:59,840
structure that's constantly bending and

28
00:01:04,630 --> 00:01:01,840
flexing it only has so many of those

29
00:01:06,950 --> 00:01:04,640
load cycles before it you have to say

30
00:01:08,950 --> 00:01:06,960
no more so that's on the low frequency

31
00:01:10,230 --> 00:01:08,960
end on the high frequency end we're

32
00:01:13,190 --> 00:01:10,240
looking at

33
00:01:15,590 --> 00:01:13,200
very tiny vibrations from

34
00:01:17,270 --> 00:01:15,600
experiment equipment like fans

35
00:01:19,109 --> 00:01:17,280
compressors

36
00:01:22,710 --> 00:01:19,119
wrote any sort of rotating machinery

37
00:01:24,310 --> 00:01:22,720
will vibrate and also life

38
00:01:27,190 --> 00:01:24,320

life support equipment

39
00:01:28,630 --> 00:01:27,200
also vibrates so it's not really of any

40
00:01:31,270 --> 00:01:28,640
interest really to the crew about

41
00:01:33,190 --> 00:01:31,280
vibrating but it is very

42
00:01:35,270 --> 00:01:33,200
interesting to i guess the principal

43
00:01:37,670 --> 00:01:35,280
investigators and their payloads yes so

44
00:01:39,109 --> 00:01:37,680
our two primary customers are

45
00:01:40,710 --> 00:01:39,119
principal investigators trying to

46
00:01:42,870 --> 00:01:40,720
conduct science and they're in the

47
00:01:45,350 --> 00:01:42,880
microgravity environment for a reason

48
00:01:48,550 --> 00:01:45,360
they want to take advantage of

49
00:01:49,830 --> 00:01:48,560
a pure a pristine environment so we

50
00:01:52,069 --> 00:01:49,840
we're sort of the environmental

51
00:01:55,030 --> 00:01:52,079
monitoring for microgravity we'll mount

52
00:01:57,030 --> 00:01:55,040
a sensor right near their payload and as

53
00:01:58,149 --> 00:01:57,040
they conduct their science they will

54
00:02:00,230 --> 00:01:58,159
often

55
00:02:01,990 --> 00:02:00,240
try to correlate or sometimes correlate

56
00:02:04,069 --> 00:02:02,000
what's happening but in a vibrational

57
00:02:05,990 --> 00:02:04,079
sense it's what it is they're actually

58
00:02:09,589 --> 00:02:06,000
studying so we can provide them that

59
00:02:11,830 --> 00:02:09,599
feedback and they can use that to

60
00:02:13,030 --> 00:02:11,840
make more sense of what they're seeing

61
00:02:16,070 --> 00:02:13,040
in their data

62
00:02:18,229 --> 00:02:16,080
and then another big customer of ours is

63
00:02:20,150 --> 00:02:18,239

at the johnson space center there's a

64
00:02:22,470 --> 00:02:20,160
loads and dynamics group

65
00:02:24,710 --> 00:02:22,480
they're in charge of validating a model

66
00:02:25,830 --> 00:02:24,720
of the space station so if you imagine

67
00:02:27,510 --> 00:02:25,840
on earth

68
00:02:30,229 --> 00:02:27,520
bridges and so forth you can have

69
00:02:32,309 --> 00:02:30,239
engineers go out and sort of take a look

70
00:02:33,430 --> 00:02:32,319
at that bridge for structural health and

71
00:02:36,390 --> 00:02:33,440
life

72
00:02:38,949 --> 00:02:36,400
whereas sam's provides 24 7 coverage of

73
00:02:40,949 --> 00:02:38,959
space station vibrations

74
00:02:43,910 --> 00:02:40,959
so we help with that model validation

75
00:02:45,670 --> 00:02:43,920
and that ultimately plays a role in

76
00:02:47,830 --> 00:02:45,680
extending the life of space station or

77
00:02:49,430 --> 00:02:47,840
giving feedback to the program about

78
00:02:51,509 --> 00:02:49,440
where we're at in terms of these loads

79
00:02:52,869 --> 00:02:51,519
and dynamics and how far out in the

80
00:02:54,390 --> 00:02:52,879
future we can go

81
00:02:56,390 --> 00:02:54,400
and we're here in the telescience

82
00:02:58,710 --> 00:02:56,400
support center here at glenn research

83
00:03:00,550 --> 00:02:58,720
center this is i guess

84
00:03:02,790 --> 00:03:00,560
data ground zero where it all comes to

85
00:03:05,509 --> 00:03:02,800
yes that's true for sams and mams and

86
00:03:07,670 --> 00:03:05,519
various payloads for space station

87
00:03:11,509 --> 00:03:07,680
and so the the consoles that you see

88
00:03:13,830 --> 00:03:11,519

here are where we receive this

89
00:03:15,990 --> 00:03:13,840
sams data from space station can we see

90
00:03:17,509 --> 00:03:16,000
some of that data up close sure

91
00:03:19,350 --> 00:03:17,519
so ken is there a whole lot of shaking

92
00:03:21,350 --> 00:03:19,360
going on when they're exercising abs

93
00:03:24,149 --> 00:03:21,360
absolutely lori so in this particular

94
00:03:25,750 --> 00:03:24,159
case we're looking at uh velo exercise

95
00:03:27,750 --> 00:03:25,760
and if you look at this somewhat

96
00:03:29,670 --> 00:03:27,760
schematic down here in the lower right

97
00:03:31,750 --> 00:03:29,680
um the sam sensor that we're going to

98
00:03:34,789 --> 00:03:31,760
talk about here in a second is located

99
00:03:37,030 --> 00:03:34,799
in the u.s lab and about 100 feet away

100
00:03:38,630 --> 00:03:37,040
in the russian service module

101
00:03:41,350 --> 00:03:38,640
is where the actual exercise is

102
00:03:43,589 --> 00:03:41,360
happening so you can see that events in

103
00:03:46,550 --> 00:03:43,599
one part of the station have an impact

104
00:03:47,910 --> 00:03:46,560
on another part but you have sensors

105
00:03:50,630 --> 00:03:47,920
strategically placed throughout where

106
00:03:53,910 --> 00:03:50,640
are they yes uh we have um eight sensors

107
00:03:55,350 --> 00:03:53,920
on space station right now for sams um

108
00:03:58,630 --> 00:03:55,360
they're they're located in all three

109
00:04:00,390 --> 00:03:58,640
labs in the u.s lab in the japanese lab

110
00:04:02,630 --> 00:04:00,400
and in the european lab

111
00:04:05,110 --> 00:04:02,640
these sensors are designed for

112
00:04:07,910 --> 00:04:05,120
to pick up very minute vibrations

113
00:04:09,589 --> 00:04:07,920

over a wide frequency range so

114
00:04:12,149 --> 00:04:09,599
they they really do a great job of

115
00:04:15,589 --> 00:04:12,159
monitoring the microgravity environment

116
00:04:17,189 --> 00:04:15,599
and giving feedback to investigators who

117
00:04:19,110 --> 00:04:17,199
need to know this information can you

118
00:04:20,550 --> 00:04:19,120
show us one of the sensors sure yep

119
00:04:22,629 --> 00:04:20,560
right here we have one of the sam

120
00:04:24,390 --> 00:04:22,639
sensors this is just the mass model that

121
00:04:26,550 --> 00:04:24,400
we keep on the ground uh but it's

122
00:04:29,189 --> 00:04:26,560
representative of what we'd see on orbit

123
00:04:30,950 --> 00:04:29,199
and so you see that the sensor has these

124
00:04:32,870 --> 00:04:30,960
what look like knobs on the three ends

125
00:04:35,030 --> 00:04:32,880
that's because it's a tri-axial sensor

126
00:04:37,430 --> 00:04:35,040
head so it's measuring accelerations in

127
00:04:39,510 --> 00:04:37,440
this direction what we call the x-axis

128
00:04:42,230 --> 00:04:39,520
in this direction for this sensor what

129
00:04:44,390 --> 00:04:42,240
we call the y-axis and in this direction

130
00:04:46,230 --> 00:04:44,400
for what we call the z-axis so all at

131
00:04:48,870 --> 00:04:46,240
the same time we're getting three sets

132
00:04:50,790 --> 00:04:48,880
of measurements uh x y and z

133
00:04:52,469 --> 00:04:50,800
and these measurements will continue as

134
00:04:53,909 --> 00:04:52,479
long as the station's there right yes

135
00:04:55,350 --> 00:04:53,919
and not only will it continue as long as

136
00:04:57,030 --> 00:04:55,360
the space station's there but they are

137
00:04:59,350 --> 00:04:57,040
helping to