

1
00:00:12,599 --> 00:00:18,390
the James Webb Space Telescope at launch

2
00:00:15,150 --> 00:00:20,880
will be seeing forces as high as 20 G's

3
00:00:18,390 --> 00:00:22,859
that's 20 times greater than the force

4
00:00:20,879 --> 00:00:25,799
of gravity that you and I feel just

5
00:00:22,859 --> 00:00:27,839
walking around here on earth making sure

6
00:00:25,800 --> 00:00:30,570
the various parts of the observatory

7
00:00:27,839 --> 00:00:32,429
like this primary mirror segments behind

8
00:00:30,570 --> 00:00:34,619
me will survive the stresses of launch

9
00:00:32,429 --> 00:00:36,539
is a big part of the testing going on

10
00:00:34,619 --> 00:00:37,619
here at Ball Aerospace in Boulder

11
00:00:36,539 --> 00:00:40,439
Colorado

12
00:00:37,619 --> 00:00:42,119
so Paul these vibration tests how long

13
00:00:40,439 --> 00:00:43,890
do you actually vibrate these mirrors oh

14
00:00:42,119 --> 00:00:45,538
it's really only for a few seconds at a

15
00:00:43,890 --> 00:00:48,000
time when we vibrate it but we're

16
00:00:45,539 --> 00:00:49,739
mimicking the same loads that it will

17
00:00:48,000 --> 00:00:53,909
see while it's in the rocket while it's

18
00:00:49,738 --> 00:00:56,128
launching because the launch doesn't

19
00:00:53,909 --> 00:00:58,169
take a long time right no most of the

20
00:00:56,128 --> 00:01:02,308
vibration occurs early in the launch and

21
00:00:58,170 --> 00:01:04,588
then very soon will dissipate we're

22
00:01:02,308 --> 00:01:06,509
about to hit full level sine sweep on

23
00:01:04,588 --> 00:01:08,609
this mirror what do you mean sine sweep

24
00:01:06,509 --> 00:01:10,500
what it does it starts at very low

25
00:01:08,609 --> 00:01:11,819
frequency where you'll see the greatest

26
00:01:10,500 --> 00:01:13,590
displacement of the mirror it'll move

27
00:01:11,819 --> 00:01:16,169
the most at the beginning and then it'll

28
00:01:13,590 --> 00:01:17,130
get to higher frequencies and as it gets

29

00:01:16,170 --> 00:01:19,290
the higher frequency the mirror is

30
00:01:17,129 --> 00:01:21,658
moving faster not moving as far at that

31
00:01:19,290 --> 00:01:24,060
point so you can actually see the mirror

32
00:01:21,659 --> 00:01:25,799
speed up as it goes through the suite so

33
00:01:24,060 --> 00:01:27,540
is that kind of like what it will see

34
00:01:25,799 --> 00:01:29,430
during launch it will cover all the same

35
00:01:27,540 --> 00:01:32,130
range the spectrum of course is just

36
00:01:29,430 --> 00:01:34,079
like on launch so how do you know that

37
00:01:32,129 --> 00:01:35,789
the mirror past we have 40

38
00:01:34,078 --> 00:01:37,709
accelerometers mounted at different

39
00:01:35,790 --> 00:01:39,299
locations different components on this

40
00:01:37,709 --> 00:01:41,938
mirror assembly so each of those

41
00:01:39,299 --> 00:01:44,009
accelerometers is measuring essentially

42
00:01:41,938 --> 00:01:45,449
the forces that are being applied at

43
00:01:44,009 --> 00:01:47,489

every little component of the mirror

44

00:01:45,450 --> 00:01:48,899

we're continuously getting feedback from

45

00:01:47,489 --> 00:01:51,089

those while it's going through the

46

00:01:48,899 --> 00:01:52,469

vibration by looking at all the

47

00:01:51,090 --> 00:01:54,570

different components of one component

48

00:01:52,469 --> 00:01:55,769

where the fracture or experience screen

49

00:01:54,569 --> 00:01:57,059

or something we'd be able to see a

50

00:01:55,769 --> 00:01:58,978

difference in the behavior of that

51

00:01:57,060 --> 00:02:01,769

component before and after the test I

52

00:01:58,978 --> 00:02:03,359

noticed it's in a plastic casing kind of

53

00:02:01,769 --> 00:02:05,099

like it's in its own cleanroom

54

00:02:03,359 --> 00:02:07,890

essentially and we're already inside a

55

00:02:05,099 --> 00:02:10,799

clean tent this plastic casing is really

56

00:02:07,890 --> 00:02:12,959

there for safety for us just because the

57

00:02:10,799 --> 00:02:15,000

mirror itself is made of beryllium if

58
00:02:12,959 --> 00:02:17,250
there were to be a fracture damage to

59
00:02:15,000 --> 00:02:19,409
the mirror that beryllium dust can be

60
00:02:17,250 --> 00:02:21,209
toxic and so it's contained in such a

61
00:02:19,409 --> 00:02:22,240
way that if there were any kind of

62
00:02:21,209 --> 00:02:24,490
problem at

63
00:02:22,240 --> 00:02:25,960
we would be safe but but to date we

64
00:02:24,490 --> 00:02:28,600
haven't add any such problem with these

65
00:02:25,960 --> 00:02:30,760
mirrors well thanks so much for giving

66
00:02:28,599 --> 00:02:32,169
us a closer look at the vibration

67
00:02:30,759 --> 00:02:33,000
testing that's going on here you're very

68
00:02:32,169 --> 00:02:35,979
welcome

69
00:02:33,000 --> 00:02:38,020
this vibration test is just one of the

70
00:02:35,979 --> 00:02:40,359
many ways engineers are making sure that

71
00:02:38,020 --> 00:02:43,270
James Webb Space Telescope is ready to

72
00:02:40,360 --> 00:02:45,490
go when it reaches its destination 1

73
00:02:43,270 --> 00:02:47,380
million miles from Earth thanks for

74
00:02:45,490 --> 00:02:49,860
joining us for this edition of behind

75
00:02:47,379 --> 00:02:49,859
the Webb

76
00:02:53,189 --> 00:02:55,250
you