1
00:00:13,049 --> 00:00:20,300
The James Webb Space Telescope will be seeing
forces as high as 20 Gs, or 20 times greater

2
00:00:20,300 --> 00:00:25,190
than the force of gravity you and I feel just
walking around here on earth.

3
00:00:25,190 --> 00:00:30,909
Making sure the various parts of the observatory,
like this primary mirror segment behind me,

4
00:00:30,909 --> 00:00:35,690
will survive the stresses of launch is a big
part of the testing going on here at Ball

5
00:00:35,690 --> 00:00:37,500
Aerospace in Boulder, Colorado.

6
00:00:37,500 --> 00:00:40,149
Mary Estacion/Reporter: So Paul, these vibration
tests...

7
00:00:40,149 --> 00:00:41,920
how long do you actually vibrate these mirrors?

8
00:00:41,920 --> 00:00:43,850
Paul Finley/Optical Telescope Element Test
Lead: Oh it's only for a few seconds at a

9
00:00:43,850 --> 00:00:48,800
time when we vibrate it but we're mimicking
the same loads that it will see while it's

10
00:00:48,800 --> 00:00:51,449
in the rocket while it's launching.

11
00:00:51,449 --> 00:00:55,260
Mary: Because the launch doesn't take a long

time, right?

12
00:00:55,260 --> 00:01:00,129
Paul: No, most of the vibration occurs early
in the launch and very soon will dissipate.

13
00:01:00,129 --> 00:01:04,910
Paul: We're about to hit full level sine sweep
on this mirror.

14
00:01:04,910 --> 00:01:06,950
Mary: What do you mean 'sine sweep'?

15
00:01:06,950 --> 00:01:11,110
Paul: What it does it starts at very low frequency
where you'll see the greatest displacement

16
00:01:11,110 --> 00:01:15,460
of the mirror, it will move the most at the
beginning and it will get to higher frequencies

17
00:01:15,460 --> 00:01:19,179
and as it gets to higher frequencies, the
mirror is moving faster, not moving as far

18
00:01:19,179 --> 00:01:20,179
at that point.

19
00:01:20,179 --> 00:01:23,619
So you can actually see the mirror speed up
as it goes through the sweep.

20
00:01:23,619 --> 00:01:26,330
Mary: So, it that kind of like what it will
see during launch?

21
00:01:26,330 --> 00:01:30,220
Paul: We'll cover all the same range, the
spectrum of forces, just like on launch.

22
00:01:30,220 --> 00:01:32,960
Mary: So how do you know that the mirror passed?

23
00:01:32,960 --> 00:01:37,460
Paul: We have 40 accelerometers mounted at
different locations, different components

24
00:01:37,460 --> 00:01:38,460
on this mirror assembly.

25
00:01:38,460 --> 00:01:43,850
So each of those accelerometers is measuring
essentially the forces that are being applied

26
00:01:43,850 --> 00:01:46,000
at every little component of the mirror.

27
00:01:46,000 --> 00:01:50,099
We're continuously getting feedback from those
while it's going through the vibration.

28
00:01:50,099 --> 00:01:54,220
By looking at the different components, if
one component were to fracture or experience

29
00:01:54,220 --> 00:01:57,610
strain or something, we'd be able to see a
difference in the behavior of that component

30
00:01:57,610 --> 00:01:58,910
before and after the test.

31
00:01:58,910 --> 00:02:03,820
Mary: Now I noticed it's in a plastic casing,
kind of like it's in its own cleanroom, essentially.

32
00:02:03,820 --> 00:02:09,200
Paul: We're already inside a clean tent...
this plastic casing is really there for safety

33
00:02:09,200 --> 00:02:14,379
for us just because the mirror itself is made
of beryllium... if there were to be a fracture,

34
00:02:14,379 --> 00:02:19,350
damage to the mirror... that beryllium dust
can be toxic and so it's contained in such

35
00:02:19,350 --> 00:02:24,440
a way that if there were any kind of problem,
at least we would be safe... but to date,

36
00:02:24,440 --> 00:02:26,650
we haven't had any such problem with these
mirrors.

37
00:02:26,650 --> 00:02:31,250
Mary: Well thanks so much for giving us a
closer look at the vibration testing that's

38
00:02:31,250 --> 00:02:32,250
going on here.

39
00:02:32,250 --> 00:02:36,062
Paul: Oh you're very welcome
Mary: This vibration test is just one of the

40
00:02:36,062 --> 00:02:41,480
many ways, engineers are making sure the James
Webb Space Telescope is ready to go when it

41
00:02:41,480 --> 00:02:45,290
reaches its destination one million miles
from earth.