

1
00:00:13,048 --> 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
00:00:30,908 --> 00:00:35,689
will survive the stresses of launch is a big part of the testing going on here at Ball

5
00:00:35,689 --> 00:00:37,500
Aerospace in Boulder, Colorado.

6
00:00:37,500 --> 00:00:41,460
Mary Estacion/Reporter: So Paul, these vibration tests... how long do you actually vibrate

7
00:00:41,460 --> 00:00:42,460
these mirrors?

8
00:00:42,460 --> 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
00:00:48,799 --> 00:00:51,448
in the rocket while it's launching.

11
00:00:51,448 --> 00:00:55,259
Mary: Because the launch doesn't take a long time, right?

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00:00:55,259 --> 00:01:00,128
Paul: No, most of the vibration occurs early in the launch and very soon will dissipate.

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00:01:00,128 --> 00:01:04,909
Paul: We're about to hit full level sine sweep
on this mirror.

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00:01:04,909 --> 00:01:06,950
Mary: What do you mean 'sine sweep'?

15
00:01:06,950 --> 00:01:11,109
Paul: What it does it starts at very low frequency
where you'll see the greatest displacement

16
00:01:11,109 --> 00:01:15,459
of the mirror, it will move the most at the
beginning and it will get to higher frequencies

17
00:01:15,459 --> 00:01:19,178
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 --> 00:01:23,618
So you can actually see the mirror speed up
as it goes through the sweep.

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00:01:23,618 --> 00:01:26,329
Mary: So, it that kind of like what it will
see during launch?

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00:01:26,329 --> 00:01:30,219
Paul: We'll cover all the same range, the
spectrum of forces, just like on launch.

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00:01:30,219 --> 00:01:32,959
Mary: So how do you know that the mirror passed?

23
00:01:32,959 --> 00:01:37,459
Paul: We have 40 accelerometers mounted at
different locations, different components

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00:01:37,459 --> 00:01:38,459
on this mirror assembly.

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00:01:38,459 --> 00:01:43,849
So each of those accelerometers is measuring essentially the forces that are being applied

26
00:01:43,849 --> 00:01:46,000
at every little component of the mirror.

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

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00:01:50,099 --> 00:01:54,219
By looking at the different components, if one component were to fracture or experience

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00:01:54,219 --> 00:01:57,609
strain or something, we'd be able to see a difference in the behavior of that component

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00:01:57,609 --> 00:01:58,909
before and after the test.

31
00:01:58,909 --> 00:02:03,819
Mary: Now I noticed it's in a plastic casing, kind of like it's in its own cleanroom, essentially.

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00:02:03,819 --> 00:02:09,199
Paul: We're already inside a clean tent... this plastic casing is really there for safety

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00:02:09,199 --> 00:02:14,378
for us just because the mirror itself is made of beryllium... if there were to be a fracture,

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00:02:14,378 --> 00:02:19,349
damage to the mirror... that beryllium dust can be toxic and so it's contained in such

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00:02:19,349 --> 00:02:24,439
a way that if there were any kind of problem, at least we would be safe... but to date,

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00:02:24,439 --> 00:02:26,650
we haven't had any such problem with these mirrors.

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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

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00:02:31,250 --> 00:02:32,250

going on here.

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00:02:32,250 --> 00:02:36,062

Paul: Oh you're very welcome

Mary: This vibration test is just one of the

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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

00:02:41,479 --> 00:02:45,289

reaches its destination one million miles from earth.

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00:02:45,289 --> 00:02:48,060

Thanks for joining us on this edition of Behind The Webb.