

The image features a red-tinted background of an industrial workshop or factory floor. In the foreground, a white skull logo with red crosshairs is visible on a yellow object, possibly a hard hat. The text "PREPARING THE TEST" is overlaid in white on a dark blue horizontal bar.

**PREPARING THE TEST**

1  
00:00:07,607 --> 00:00:10,110  
(music throughout)  
NASA White Sands is a remote test

2  
00:00:10,110 --> 00:00:15,281  
facility that the agency uses  
for some of the more dangerous testing

3  
00:00:15,782 --> 00:00:18,084  
that is needed to support the NASA  
missions.

4  
00:00:19,085 --> 00:00:21,988  
The size of the guns,  
the biggest gun we have

5  
00:00:21,988 --> 00:00:25,458  
is about 225 feet

6  
00:00:25,825 --> 00:00:29,562  
and the building itself  
is only about 200 feet long.

7  
00:00:30,196 --> 00:00:33,433  
So part of the gun  
does actually stick out of the building.

8  
00:00:34,067 --> 00:00:38,772  
There is a very, very large  
project underway right now that started

9  
00:00:38,772 --> 00:00:42,742  
not too long ago with the landing  
of the Perseverance Rover on Mars.

10  
00:00:43,143 --> 00:00:46,679  
I am a systems engineer for the capture  
containment and return system.

11

00:00:46,713 --> 00:00:50,050

This system is the NASA payload  
which is basically responsible

12

00:00:50,050 --> 00:00:52,519

to bring the samples,  
the Mars samples back to Earth.

13

00:00:53,486 --> 00:00:57,624

When I'm standing in is actually called  
a hypervelocity test facility.

14

00:00:57,657 --> 00:01:01,861

It's where we shoot  
little projectiles at objects, basically

15

00:01:01,861 --> 00:01:05,131

as fast as we can achieve on on earth.

16

00:01:05,965 --> 00:01:08,868

In our case,  
we are testing to see what will happen

17

00:01:09,169 --> 00:01:12,072

to our designs if they were to be impacted

18

00:01:12,072 --> 00:01:14,908

by a micrometeoroid on the trip  
to or from Mars.

19

00:01:15,742 --> 00:01:19,813

The goal here is to see how  
well those materials withstand

20

00:01:19,813 --> 00:01:23,850

those impacts, to make sure that we don't  
lose containment of our sample.

21

00:01:23,850 --> 00:01:30,290

Hypervelocity guns work in two sections,

which are a two stage light gas gun.

22

00:01:30,290 --> 00:01:34,861

We pressurized hydrogen in the first section in the middle of the gun.

23

00:01:34,861 --> 00:01:35,795

There's a barrel.

24

00:01:35,795 --> 00:01:37,931

That's where the projectile is held.

25

00:01:38,498 --> 00:01:40,934

The pressures that are generated from these guns

26

00:01:40,934 --> 00:01:45,271

can actually level the building, and that pressure is suddenly released

27

00:01:45,271 --> 00:01:48,842

where the projectile is, where the barrel in the middle of the gun is.

28

00:01:49,342 --> 00:01:52,178

And then from that point on, there's

29

00:01:52,178 --> 00:01:55,548

a simulated vacuum which simulates space,

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00:01:57,183 --> 00:02:00,787

and then it is impacted where the target is.

31

00:02:02,188 --> 00:02:03,556

It's all about the timing.

32

00:02:03,556 --> 00:02:08,595

You're dealing with about 500

microseconds, for the timing of the event.

33

00:02:08,828 --> 00:02:13,032

So unlike a traditional firearm,  
a lot goes into preparing these guns

34

00:02:13,032 --> 00:02:18,471

for a shot set up  
takes anywhere from an hour to a full day.

35

00:02:18,638 --> 00:02:21,141

Gunpowder is prepared and loaded by hand.

36

00:02:22,275 --> 00:02:25,912

We're able to remotely operate  
the guns via

37

00:02:25,912 --> 00:02:27,347

the bunker

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00:02:32,652 --> 00:02:34,154

on the count of three,

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00:02:34,154 --> 00:02:41,427

three, two, one.

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00:02:41,427 --> 00:02:45,832

It's equal to 25 times  
faster than a 44 mag.

41

00:02:45,999 --> 00:02:50,670

The velocities are also like flying  
from New York to San Francisco

42

00:02:50,670 --> 00:02:53,540

in 5 minutes.

43

00:02:56,709 --> 00:02:59,012

One of the interesting things

that we learn

44

00:02:59,012 --> 00:03:03,750

is that a massive piece of metal does not offer the same level of protection

45

00:03:03,783 --> 00:03:07,387

of really thin pieces of metal, but stack all together.

46

00:03:07,520 --> 00:03:11,524

What we are doing is we have very light layers of material and those layers

47

00:03:11,524 --> 00:03:14,727

they function to progress, fully break the particles

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00:03:14,827 --> 00:03:18,798

until the very last layer that receives all the energy from the hit.

49

00:03:19,065 --> 00:03:20,133

And it stops right there.

50

00:03:21,901 --> 00:03:23,870

If it wasn't for this study,

51

00:03:23,870 --> 00:03:29,008

we would be sending up rockets and satellites and

52

00:03:29,642 --> 00:03:33,012

pieces of the space station, not knowing whether they were going

53

00:03:33,012 --> 00:03:36,416

to protect the astronauts or the equipment we send up.

54

00:03:36,583 --> 00:03:40,153

It's a really neat thing  
to see when you test something

55

00:03:40,153 --> 00:03:44,090

and have it correlate  
very well back to your your simulations.

56

00:03:44,123 --> 00:03:48,461

I am super excited to be working this  
mission to bring back samples from Mars.

57

00:03:48,494 --> 00:03:50,163

It is something that has

58

00:03:50,163 --> 00:03:53,900

never been done before  
and we are learning so much from this,

59

00:03:53,967 --> 00:03:58,171

especially because this Mars is a planet  
that we had fascinations for a very,

60

00:03:58,171 --> 00:03:59,072

very long time.

61

00:03:59,072 --> 00:04:01,374

So it is

62

00:04:01,608 --> 00:04:04,844

humbling and a lot a lot of work, right.