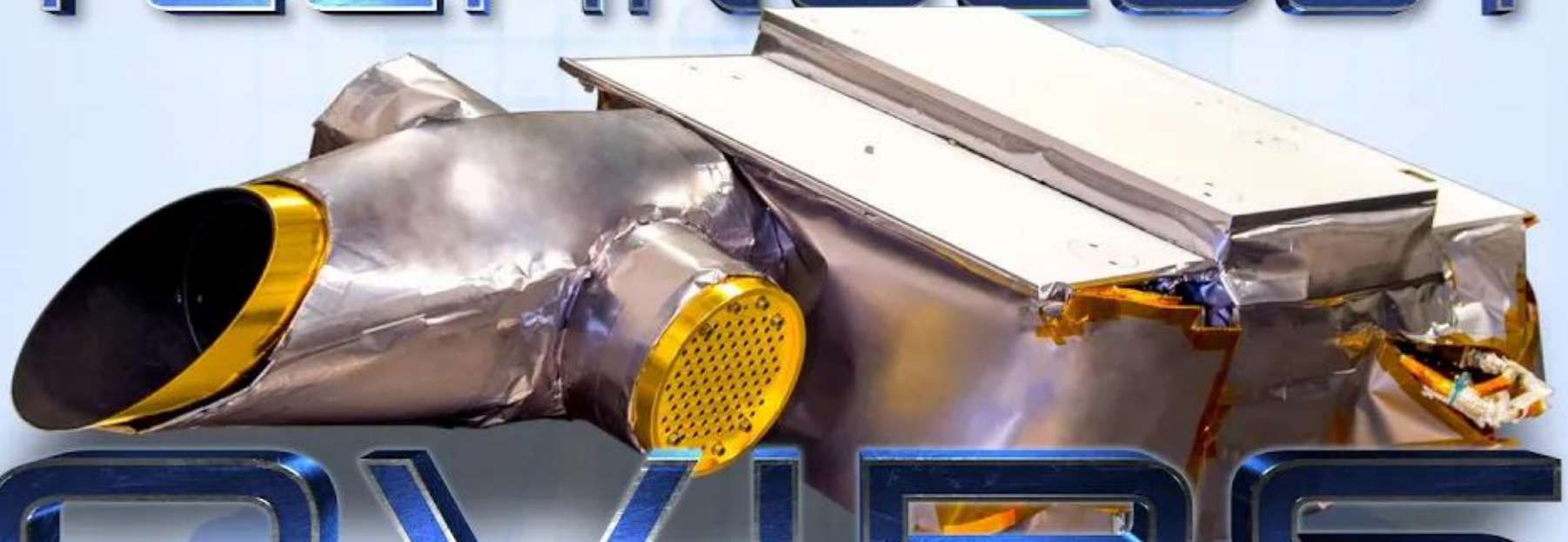
OSIRIS-REx TECHNOLOGY



OVIRS

1
00:00:00,033 --> 00:00:05,038
[Music]

2
00:00:05,038 --> 00:00:10,811
NASA is sending the OSIRIS-REx
spacecraft to explore near-Earth
asteroid Bennu.

3
00:00:10,811 --> 00:00:13,747
To carry out its mission,
OSIRIS-REx is equipped with a

4
00:00:13,747 --> 00:00:15,983
suite of remote sensing
instruments,

5
00:00:15,983 --> 00:00:19,887
including a spectrometer
called OVIRS.

6
00:00:19,887 --> 00:00:24,224
OSIRIS-REx is a mission to bring
a sample back from an asteroid.

7
00:00:24,224 --> 00:00:27,761
That's not something that we've
done before and that's
very exciting.

8
00:00:27,761 --> 00:00:31,899
The idea behind OSIRIS-REx is to
go to a pristine building block

9
00:00:31,899 --> 00:00:34,468
of the solar system to try to
find out more about how they

10
00:00:34,468 --> 00:00:37,537
formed, and to bring a
sample back here to Earth.

11
00:00:37,537 --> 00:00:40,540
OSIRIS-REx's primary
science goal is to grab a sample

12
00:00:40,540 --> 00:00:44,378
of asteroid Bennu and return
it to Earth for analysis.

13
00:00:44,378 --> 00:00:47,614
Planetary scientists are
interested in asteroids
because they're

14
00:00:47,614 --> 00:00:51,251
chemistry sets representing the
formation of the solar system.

15
00:00:51,251 --> 00:00:54,788
We can't learn that on Earth,
because the Earth has erosion

16
00:00:54,788 --> 00:00:58,592
and other processes that have
changed its pristine condition.

17
00:00:58,592 --> 00:01:01,128
Asteroid Bennu is interesting
because it's one of the blackest

18
00:01:01,128 --> 00:01:03,830
objects in the solar system,
so we think it's covered with

19
00:01:03,830 --> 00:01:07,267
carbon material, organics,
the building blocks of life.

20
00:01:08,302 --> 00:01:12,506
To search for organics on Bennu,

a team at NASA's Goddard Space Flight Center

21
00:01:12,506 --> 00:01:17,411
built the OSIRIS-REx Visible and Infrared Spectrometer, or OVIRS.

22
00:01:17,411 --> 00:01:20,747
OVIRS is a spectrometer, and what that means is it breaks

23
00:01:20,747 --> 00:01:24,384
down light into a lot of little individual wavelength packets.

24
00:01:24,384 --> 00:01:28,088
When you look at very fine detail from spectra, you can

25
00:01:28,088 --> 00:01:30,824
tell what the material is that you're looking at, and that's

26
00:01:30,824 --> 00:01:33,961
what we're excited about – the idea of going out and looking at

27
00:01:33,961 --> 00:01:36,463
something and saying, "Oh, I know what that's made of, and

28
00:01:36,463 --> 00:01:38,899
that would be a good place to take a sample."

29
00:01:38,899 --> 00:01:41,702
Before arriving at asteroid Bennu, OVIRS will have to

30
00:01:41,702 --> 00:01:45,739

survive two years in the
unforgiving conditions of space.

31
00:01:45,739 --> 00:01:48,842
Fixing a broken part after
launch is not an option,

32
00:01:48,842 --> 00:01:51,812
so OVIRS has a
uniquely durable design.

33
00:01:51,812 --> 00:01:55,816
OVIRS is a very simple
instrument: it has two mirrors
and no moving parts.

34
00:01:55,816 --> 00:01:59,119
And the reason we like that
kind of design is because moving

35
00:01:59,119 --> 00:02:01,688
parts are one of the things we
worry about breaking in space,

36
00:02:01,688 --> 00:02:03,824
and once it breaks
your instrument is lost.

37
00:02:03,824 --> 00:02:07,194
The instrument has to operate
in a very harsh environment,

38
00:02:07,194 --> 00:02:10,597
there's no air in space, there's
a high vacuum, things can
heat up.

39
00:02:10,597 --> 00:02:14,534
Well if you can eliminate moving
parts, that's just one more risk

40
00:02:14,534 --> 00:02:16,036
that you don't
have to worry about.

41
00:02:16,036 --> 00:02:18,739
I don't have to worry about, "Oh
is that shutter open or closed?"

42
00:02:18,739 --> 00:02:19,940
or "Is that motor moving?"

43
00:02:19,940 --> 00:02:24,177
So we very specifically tried to
get rid of things that can fail,

44
00:02:24,177 --> 00:02:26,680
and fail in a bad way.

45
00:02:27,614 --> 00:02:30,784
Designing instruments to survive
in space is critical,

46
00:02:30,784 --> 00:02:33,520
but just getting there can
be a bumpy ride.

47
00:02:33,520 --> 00:02:37,591
Rockets shake their payloads
during launch, so instruments
like OVIRS

48
00:02:37,591 --> 00:02:41,862
must pass a vibration test
to prove that they are
launch-worthy.

49
00:02:41,862 --> 00:02:44,631
It is the test that I
hate the most in the world.

50
00:02:44,631 --> 00:02:48,168
You've spent five years making
this nice little beautiful thing

51
00:02:48,168 --> 00:02:50,470
and you hand it to somebody
and say, "Try to break it."

52
00:02:50,470 --> 00:02:53,040
So one of the things we do in
vibration testing is we'll shake

53
00:02:53,040 --> 00:02:56,643
it as hard as we think it's
going to see, plus a little
bit more,

54
00:02:56,643 --> 00:02:58,345
in every possible
direction just to make sure

55
00:02:58,345 --> 00:03:00,347
nothing is going to
break off during launch.

56
00:03:00,347 --> 00:03:04,584
On OVIRS we actually had a case
where the glue came a bit apart

57
00:03:04,584 --> 00:03:07,988
during thermal testing, and then
when we put it on the
vibration chamber

58
00:03:07,988 --> 00:03:11,758
a full assembly gave way
and there was a big pulse on
the instrument.

59
00:03:11,758 --> 00:03:15,595

We had to stop and go back and
make sure that everything
was fine,

60
00:03:15,595 --> 00:03:18,498
which it was, and we also
had to redesign things a
little bit.

61
00:03:18,498 --> 00:03:21,435
And that shows you the value of
testing – had that been on the

62
00:03:21,435 --> 00:03:26,039
launch chamber, we wouldn't have
been able to do anything
about it.

63
00:03:26,039 --> 00:03:28,875
OSIRIS-REx is a cutting-edge
mission to explore

64
00:03:28,875 --> 00:03:32,012
asteroid Bennu and the origins
of our solar system,

65
00:03:32,012 --> 00:03:35,082
and OVIRS is critical to the
mission's success.

66
00:03:35,082 --> 00:03:37,584
OSIRIS-REx is just such an
interesting mission,

67
00:03:37,584 --> 00:03:40,554
the concept of going to one of
these really primitive bodies

68
00:03:40,554 --> 00:03:43,757
and bringing back a sample that
we can then study here in

the Earth,

69
00:03:43,757 --> 00:03:46,626
is pretty spectacular
when you think about it.

70
00:03:46,626 --> 00:03:48,628
From the OVIRS instrument
itself, I'm actually quite

71
00:03:48,628 --> 00:03:52,065
excited to see if we can see
organics on the surface and what

72
00:03:52,065 --> 00:03:56,203
interesting minerals we actually
do find, because we won't know
that until we get there.

73
00:03:56,203 --> 00:04:00,907
We've got a very good instrument
compliment on top of a mission
that's taking a sample.

74
00:04:00,907 --> 00:04:04,578
So we can tell what we're taking
samples of, we understand the

75
00:04:04,578 --> 00:04:07,747
context of the sample that's
returned, and the sample when it

76
00:04:07,747 --> 00:04:12,786
comes back will be analyzed by
people all over the world for
the next forty years.

77
00:04:12,786 --> 00:04:16,990
So it's just this very
nice complete package.