1
00:00:08,070 --> 00:00:04,030
[building music]

2
00:00:08,090 --> 00:00:12,080
[drumbeats] >>KATRINA: The Magnetospheric Multiscale Mission.

3
00:00:12,100 --> 00:00:16,110
Designed to study the fundamental physics phenomenon called "magnetic

4
00:00:16,130 --> 00:00:20,140
reconnection," it's a complex conglomeration of advanced instruments

5
00:00:20,160 --> 00:00:24,200
developed by NASA and France, Austria, Sweden, Germany, Japan

6
00:00:24,220 --> 00:00:28,270
and several American universities and research institutes. [swoosh]

7
00:00:28,290 --> 00:00:32,290
And right here at NASA's Goddard Space Flight Center, we're proud to contribute with

8
00:00:32,310 --> 00:00:36,390
a whole suite of instruments called the Fast Plasma Investigation.

9
00:00:36,410 --> 00:00:40,400
[drums, music]

10
00:00:40,420 --> 00:00:44,430
>>CRAIG: Magnetic reconnection is a phenomenon where magnetic fields come together and essentially merg

11
00:00:44,450 --> 00:00:48,480
energy. It occurs in stellar environments, our own Sun,

12
00:00:48,500 --> 00:00:52,500
it occurs in planetary environments like around the Earth, and it occurs

13
00:00:52,520 --> 00:00:56,530

in the interplanetary space. For another thing, we're trying to learn how to

14
00:00:56,550 --> 00:01:00,580
harness nuclear fusion as an energy source

15
00:01:00,600 --> 00:01:04,610
and one of the roadblocks is our lack of understanding of magnetic reconnection.

16
00:01:04,630 --> 00:01:08,650
>>KATRINA: So why have we chosen Earth's magnetosphere to study this process

17
00:01:08,670 --> 00:01:12,690
of magnetic reconnection? >>CRAIG: The magnetosphere is a convenient location

18
00:01:12,710 --> 00:01:16,750
to study it. And we need to understand magnetic reconnection in the Earth's

19
00:01:16,770 --> 00:01:20,770
magnetosphere because it has a profound influence on space weather. >>KATRINA: And

20
00:01:20,790 --> 00:01:24,830
space weather near Earth is caused by storms on the Sun that can affect our satellites

21
00:01:24,850 --> 00:01:28,840
and communications, right? >>CRAIG: Yes, you could put it that way. >>KATRINA: How long do we have

22
00:01:28,860 --> 00:01:32,870
to make these measurements? >>CRAIG: Only a very short period of time. The region where the

23
00:01:32,890 --> 00:01:36,890
magnetic reconnection is occurring sweeps over the spacecraft in only about

24
00:01:36,910 --> 00:01:40,930
a tenth of a second, so we have to get our measurements made in that short time.

25
00:01:40,950 --> 00:01:45,000
[drumming]

26
00:01:45,020 --> 00:01:49,030
>>KATRINA: So I'm told that magnetic reconnection happens really quickly,

27
00:01:49,050 --> 00:01:53,070
from the perspective of the spacecraft anyway as they fly through the region. How does the

28
00:01:53,090 --> 00:01:57,080
Fast Plasma Investigation suite of instruments help us to measure this?

29
00:01:57,100 --> 00:02:01,110
>>ULRIK: So on each satellite we have four spectrometers,

30
00:02:01,130 --> 00:02:05,160
dual ion spectrometers and dual electron

31
00:02:05,180 --> 00:02:09,170
spectrometers, and as the satellite goes around, we can very quickly all the way

32
00:02:09,190 --> 00:02:13,200
around the satellite capture the events. >>KATRINA: So the dual electron spectrometer

33
00:02:13,220 --> 00:02:17,250
is developed here at Goddard. What exactly does that measure? >>ULRIK: They're measuring the energy,

34
00:02:17,270 --> 00:02:21,270
the direction, and the abundance of the electrons, how many electrons there are there.

35
00:02:21,290 --> 00:02:25,320
>>KATRINA: Could you show me a little bit about how it works? >>ULRIK: The instrument has this box at the e

36
00:02:25,340 --> 00:02:29,360
here which is our electronics box, where we have all the power supplies and the controls

37
00:02:29,380 --> 00:02:33,420
for the instrument. [instrument moving] And you can see the

38
00:02:33,440 --> 00:02:37,430

aperture opening here of one of the sensor heads, and that enables, that opening goes

39
00:02:37,450 --> 00:02:41,480
180 degrees around. >>KATRINA: So you have four of these instruments

40
00:02:41,500 --> 00:02:45,500
on each of the four satellites, so you have 16 in total of

41
00:02:45,520 --> 00:02:49,530
the electron spectrometers. That's a lot of instruments! Has Goddard ever done

42
00:02:49,550 --> 00:02:53,570
something like this before where it's had to build and test so many

43
00:02:53,590 --> 00:02:57,600
instruments at once? >>ULRIK: To the best of my knowledge, this is the

44
00:02:57,620 --> 00:03:01,660
largest multiple build that has been done at Goddard.

45
00:03:01,680 --> 00:03:05,670
[door opening] >>KATRINA: Well the hard work is about to pay off!

46
00:03:05,690 --> 00:03:09,700
The four MMS spacecraft are set to launch in March of 2015.

47
00:03:09,720 --> 00:03:13,720
Thanks to the incredible talents and collaborations of scientists and

48
00:03:13,740 --> 00:03:17,740
engineers, here at Goddard and across the globe, we're finally on our way to solving this

49
00:03:17,760 --> 00:03:21,780
physics mystery, and uncovering the dynamics of magnetic reconnection.