1
00:00:01,740 --> 00:00:04,570
NARRATOR: There's more to the universe than meets the eye,

2
00:00:04,570 --> 00:00:09,070
so NASA is going to launch an observatory called NuSTAR to see some of the things

3
00:00:09,070 --> 00:00:11,750
we've been missing.

4
00:00:11,750 --> 00:00:17,190
NuSTAR stands for Nuclear Spectroscopic Telescope Array, and it is designed to give

5
00:00:17,190 --> 00:00:21,350
astronomers unprecedented looks at some of the highest-energy objects

6
00:00:21,350 --> 00:00:27,300
in the universe, from stars that recently exploded to black holes.

7
00:00:27,300 --> 00:00:29,350
Fiona Harrison, Principal Investigator, NuSTAR: NuSTAR will be the very first high

8
00:00:29,350 --> 00:00:32,700
energy x-ray telescope that can actually focus.

9
00:00:32,700 --> 00:00:37,860
That'll make images that are 10 times crisper, sharper, than anything that's been made

10
00:00:37,860 --> 00:00:41,380
in this part of the electromagnetic spectrum before.

11
00:00:41,380 --> 00:00:43,490
Daniel Stern, NuSTAR Project Scientist: NuSTAR's going to teach us fundamental

12
00:00:43,490 --> 00:00:47,830
things about the universe, from what heats the corona of the sun

13
00:00:47,830 --> 00:00:52,400

or the atmosphere of the sun to understanding black holes distributed

14
00:00:52,400 --> 00:00:54,700
across the universe.

15
00:00:54,700 --> 00:01:00,330
We think that two out of three black holes in the universe are hidden.

16
00:01:00,330 --> 00:01:04,230
NARRATOR: Instead of looking at visible light the way a traditional telescope does,

17
00:01:04,230 --> 00:01:08,490
NuSTAR is equipped with specialized equipment that will see what are known as hard X-rays.

18
00:01:08,490 --> 00:01:13,360
Produced by extremely violent events in the universe,

19
00:01:13,360 --> 00:01:18,400
hard X-rays are similar to the X-rays dentists use to look into teeth.

20
00:01:18,400 --> 00:01:22,690
Daniel Stern: It's much like Galileo 400 years ago was the first person to focus visible

21
00:01:22,690 --> 00:01:25,060
light with his new telescope.

22
00:01:25,060 --> 00:01:28,540
NuSTAR is the first instrument that's going to focus high-energy X-ray light.

23
00:01:28,540 --> 00:01:34,340
And this buys us more than 10 times sharper images, more than 100 times more

24
00:01:34,340 --> 00:01:40,170
sensitive pictures and allows us to study some of the most energetic phenomena across

25
00:01:40,170 --> 00:01:43,840
the universe.

26
00:01:43,840 --> 00:01:47,500
NARRATOR: For as big a task as it is taking on, the NuSTAR observatory

27
00:01:47,500 --> 00:01:49,770
is not very large.

28
00:01:49,770 --> 00:01:51,300
Garrett Skrobot, NuSTAR Mission Manager: Compared to a Juno

29
00:01:51,300 --> 00:01:56,000
or an MSL (Mars Science Laboratory), it's a lot smaller. It's about 350 kilograms,

30
00:01:56,000 --> 00:01:59,740
about the size of a refrigerator or a little less.

31
00:01:59,740 --> 00:02:05,090
It's compact, but it only has one basic instrument on the spacecraft itself where the

32
00:02:05,090 --> 00:02:08,760
other spacecraft have multiple instruments on them.

33
00:02:08,760 --> 00:02:11,480
NARRATOR: A Pegasus rocket, the smallest available to NASA's

34
00:02:11,480 --> 00:02:15,880
Launch Services Program, is to lift NuSTAR into Earth orbit.

35
00:02:15,880 --> 00:02:19,520
Omar Baez, Launch Director: Pegasus is our most unique rocket, period.

36
00:02:19,520 --> 00:02:27,410
If you take a look at it, it's got a wing on it, which the rest of our ELV launch vehicles

37
00:02:27,410 --> 00:02:33,620
don't. The next thing you notice is it's hanging off the bottom of an L-1011 carrier

38
00:02:33,620 --> 00:02:40,430

aircraft, which is quite unique also. To top it off, the way we launch it is we drop it just

39
00:02:40,430 --> 00:02:47,420
like you would a weapon or a bomb and a few seconds later this thing lights off and

40
00:02:47,420 --> 00:02:53,040
scoots in front of the L-1011. It's unique in all kinds of aspects.

41
00:02:53,040 --> 00:02:56,750
NARRATOR: Launching from an airplane add another aspect of critical timing for the

42
00:02:56,750 --> 00:02:58,950
launch team to consider.

43
00:02:58,950 --> 00:03:03,240
Omar Baez: You've got to be at the right place, the right point, at the right time and

44
00:03:03,240 --> 00:03:07,060
everything's got to mesh to be able to do that correctly.

45
00:03:07,060 --> 00:03:14,950
So as far as my launch director role, this is one of our most challenging types of

46
00:03:14,950 --> 00:03:19,650
missions, but it's also more fun because of that.

47
00:03:19,650 --> 00:03:23,060
NARRATOR: The NuSTAR spacecraft will launch from an island in the Pacific Ocean

48
00:03:23,060 --> 00:03:26,950
called Kwajalein, part of the Ronald Reagan Test Site.

49
00:03:26,950 --> 00:03:30,480
Garrett Skrobot: NuSTAR has some particular requirements to be around an equatorial

50
00:03:30,480 --> 00:03:35,250
orbit so they can do some observations of the science they want to perform.

51
00:03:35,250 --> 00:03:44,060
Kwajalein is not really a launch site, it's more of a receive kind of site where the

52
00:03:44,060 --> 00:03:49,790
Pegasus and the L-1011, we're bringing the rocket to them and we'll go forth and fly it

53
00:03:49,790 --> 00:03:52,140
off the L-1011.

54
00:03:52,140 --> 00:03:56,410
NARRATOR: Once flying on its own in orbit, NuSTAR will deploy a solar array to

55
00:03:56,410 --> 00:03:58,100
produce electricity.

56
00:03:58,100 --> 00:04:03,800
Later, NuSTAR will extend a 33-foot-long span with sensors on one end that will capture

57
00:04:03,800 --> 00:04:09,140
X-rays so astronomers can see what's out there.

58
00:04:09,140 --> 00:04:12,690
Daniel Stern: We have a set of planned observations of things we're safely sure we're

59
00:04:12,690 --> 00:04:16,920
going to see, but the big excitement is we might see things that are unexpected.