1
00:00:00,020 --> 00:00:02,050
[music] Coming soon to the

2
00:00:02,050 --> 00:00:04,110
International Space Station,

3
00:00:04,110 --> 00:00:06,140
a multipurpose mission leveraging

4
00:00:06,140 --> 00:00:08,180
X-ray technology to uncover

5
00:00:08,180 --> 00:00:10,210
mysteries of the universe.

6
00:00:10,210 --> 00:00:12,230
It's

7
00:00:12,230 --> 00:00:14,280
nearly impossible to measure the

8
00:00:14,280 --> 00:00:16,330
sizes of neutron stars directly.

9
00:00:16,330 --> 00:00:18,390
They're only about the size of a city

10
00:00:18,390 --> 00:00:20,410
and very far away.

11
00:00:20,410 --> 00:00:22,450
They're very interesting in the sky to

12
00:00:22,450 --> 00:00:24,470
to study.

13
00:00:24,470 --> 00:00:26,500

It's matter at the cusp of

14
00:00:26,500 --> 00:00:28,530
becoming a black hole.

15
00:00:28,530 --> 00:00:30,540
NICER's 56 telescopes will

16
00:00:30,540 --> 00:00:32,580
make observations, enabling scientists

17
00:00:32,580 --> 00:00:34,610
to determine how rotating neutron

18
00:00:34,610 --> 00:00:36,630
stars - also called

19
00:00:36,630 --> 00:00:38,650
pulsars - are put together.

20
00:00:38,650 --> 00:00:40,690
What we're really interested in doing with NICER

21
00:00:40,690 --> 00:00:42,710
is understanding - um -

22
00:00:42,710 --> 00:00:44,750
really what the size of a neutron

23
00:00:44,750 --> 00:00:46,780
star is. Cause once we know the size of the

24
00:00:46,780 --> 00:00:48,800
radius of a neutron star very precisely,

25
00:00:48,800 --> 00:00:50,840
then we can put constraints on

26
00:00:50,840 --> 00:00:52,870
the density at the core.

27
00:00:52,870 --> 00:00:54,920
And once you have an idea of what the density is

28
00:00:54,920 --> 00:00:56,950
at the core you can constrain nuclear theories that

29
00:00:56,950 --> 00:00:58,970
describe how the particles at

30
00:00:58,970 --> 00:01:01,020
the core of neutron stars interact with each other.

31
00:01:01,020 --> 00:01:03,060
In addition to

32
00:01:03,060 --> 00:01:05,090
probing neutron stars, the

33
00:01:05,090 --> 00:01:07,130
two-in-one mission will advance GPS like

34
00:01:07,130 --> 00:01:09,160
navigation of spacecraft

35
00:01:09,160 --> 00:01:11,200
throughout the solar system and beyond.

36
00:01:11,200 --> 00:01:13,250
The embedded Station

37
00:01:13,250 --> 00:01:15,280
Explorer for X-ray Timing and

38
00:01:15,280 --> 00:01:17,330

Navigation Technology, or SEXTANT,

39
00:01:17,330 --> 00:01:19,400
uses NICER's observations

40
00:01:19,400 --> 00:01:21,410
of pulsars to demonstrate this

41
00:01:21,410 --> 00:01:23,440
potentially game-changing technology.

42
00:01:23,440 --> 00:01:25,460
It's goal as a technology demonstration

43
00:01:25,460 --> 00:01:27,490
as part of the NICER mission,

44
00:01:27,490 --> 00:01:29,520
is to try to turn the "G" in GPS

45
00:01:29,520 --> 00:01:31,570
into "Galactic."

46
00:01:31,570 --> 00:01:33,610
We want to use pulsars - this particular

47
00:01:33,610 --> 00:01:35,660
type of neutron star that spins

48
00:01:35,660 --> 00:01:37,700
hundreds of times a second that emits this

49
00:01:37,700 --> 00:01:39,720
atomic-like clock signal for us

50
00:01:39,720 --> 00:01:41,750
to receive. And so we observe

51
00:01:41,750 --> 00:01:43,780
multiple pulsars and stitch together a solution

52
00:01:43,780 --> 00:01:45,810
by looking at those precision timing

53
00:01:45,810 --> 00:01:47,850
signals from those pulsars to construct a

54
00:01:47,850 --> 00:01:49,900
spacecraft orbit determination solution.

55
00:01:49,900 --> 00:01:51,920
Both NICER and SEXTANT

56
00:01:51,920 --> 00:01:53,970
benefit existing and future NASA

57
00:01:53,970 --> 00:01:56,000
missions and will further

58
00:01:56,000 --> 00:01:58,060
expand humankind's understanding and