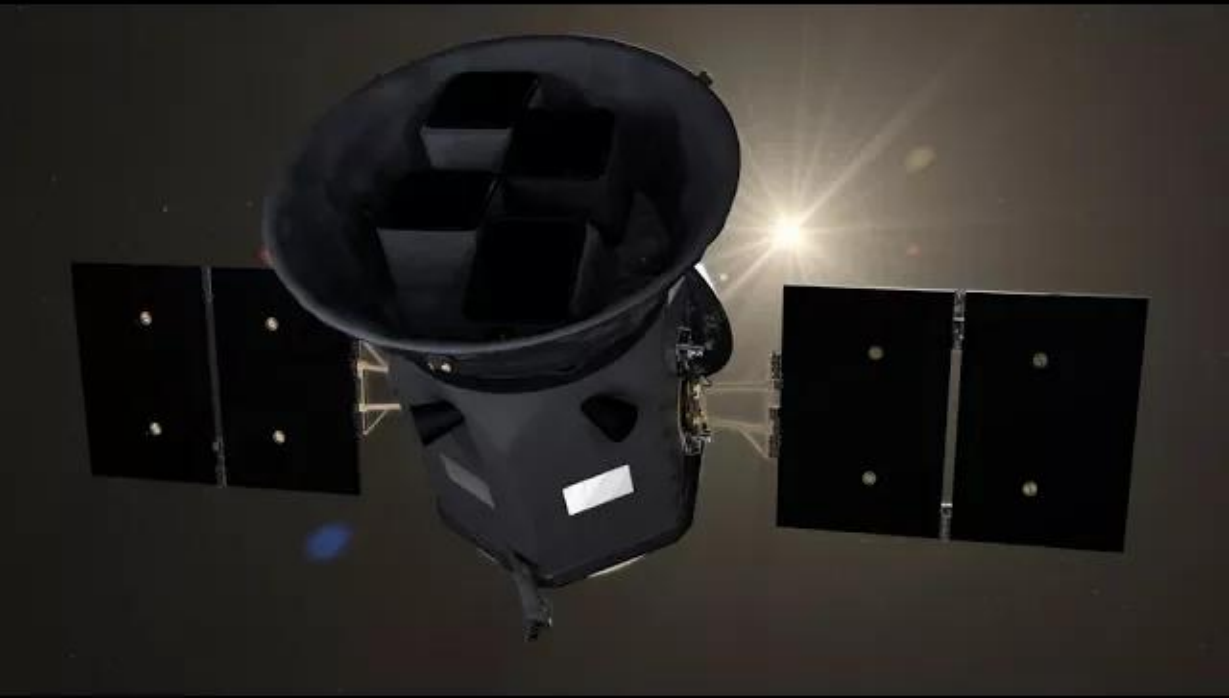

1
00:00:00,020 --> 00:00:04,100
Narrator: In the last few decades

2
00:00:04,100 --> 00:00:08,210
we have found thousands of worlds around other stars.

3
00:00:08,210 --> 00:00:12,330
A new NASA astrophysics mission will help us find

4
00:00:12,330 --> 00:00:16,520
many more. Elisa Quintana: TESS, the Transiting Exoplanet Survey Satellite,

5
00:00:16,520 --> 00:00:20,590
is NASA's newest exoplanet mission. It's being led out of MIT,

6
00:00:20,590 --> 00:00:24,680
and it's going to find thousands of new planets orbiting bright nearby stars.

7
00:00:24,680 --> 00:00:28,800
And it's going to build upon the legacy of the Kepler mission,

8
00:00:28,800 --> 00:00:32,950
only it's going focus on nearby bright stars that are sprinkled across the whole sky,

9
00:00:32,950 --> 00:00:37,040
and it's going to help us answer a really important question. And that is: which of

10
00:00:37,040 --> 00:00:40,620
our nearest stellar neighbors has planets? Narrator: During its

11
00:00:40,620 --> 00:00:45,320
two year survey, TESS will look for signs of planets, ranging

12
00:00:45,320 --> 00:00:49,200
from Earth size, to giants larger than Jupiter.

13
00:00:49,200 --> 00:00:53,600

TESS will search for these new worlds, or exoplanets, using

14
00:00:53,610 --> 00:00:57,730
transits, the same method as the Kepler mission.

15
00:00:57,730 --> 00:01:01,830
As a planet passes in front of its star, it blocks some of the

16
00:01:01,830 --> 00:01:05,990
light, causing a slight drop in brightness.

17
00:01:05,990 --> 00:01:10,070
TESS can detect those subtle dips, and even use them to

18
00:01:10,070 --> 00:01:14,150
determine some basic features of the planets, such as their size,

19
00:01:14,150 --> 00:01:18,320
and orbit. Each of TESS's cameras has

20
00:01:18,320 --> 00:01:22,440
a 16.8-megapixel sensor, covering a 24-degree square--

21
00:01:22,440 --> 00:01:26,530
large enough to contain an entire constellation.

22
00:01:26,530 --> 00:01:30,680
TESS has four of these cameras, arranged to view a vertical strip of

23
00:01:30,680 --> 00:01:34,810
the sky, called an observation sector. George Ricker: The coverage of

24
00:01:34,810 --> 00:01:38,930
the TESS cameras is unprecidented in terms of the amount of sky

25
00:01:38,930 --> 00:01:43,140
that they can actually see at any given time and also their

26
00:01:43,140 --> 00:01:47,320
ability to cover such a broad portion of the sky.

27
00:01:47,320 --> 00:01:51,520
The types of targets that TESS will allow us to find,

28
00:01:51,520 --> 00:01:55,580
will enclose essentially all of the bright nearby stars.

29
00:01:55,580 --> 00:01:59,640
Narrator: TESS will watch each observation sector for about 27 days

30
00:01:59,640 --> 00:02:03,750
before rotating to next one, covering first the south, and then the north

31
00:02:03,750 --> 00:02:07,870
to eventually build a map of 85 percent of the sky.

32
00:02:07,870 --> 00:02:11,950
This coverage--about 350 times

33
00:02:11,950 --> 00:02:16,060
what Kepler first observed--will make TESS the first

34
00:02:16,060 --> 00:02:20,180
exoplanet mission to survey almost the entire sky.

35
00:02:20,180 --> 00:02:24,360
TESS will fly in a highly elliptical orbit that maximizes

36
00:02:24,360 --> 00:02:28,490
the amount of sky the spacecraft can image and is carefully timed with the orbit

37
00:02:28,490 --> 00:02:32,490
of the moon. It will spend most of each 13.7 day

38
00:02:32,490 --> 00:02:36,640

orbit collecting data, and then, as it passes closer to Earth,

39
00:02:36,640 --> 00:02:40,750
it will transmit that data to the ground.

40
00:02:40,750 --> 00:02:44,870
Because TESS's observation sectors overlap, it will have

41
00:02:44,870 --> 00:02:48,910
an area near the pole under constant observation.

42
00:02:48,910 --> 00:02:53,000
This region is easily monitored by the James Webb Space Telescope,

43
00:02:53,000 --> 00:02:57,120
which allows the two missions to work together to first find, and then

44
00:02:57,120 --> 00:03:01,240
carefully study exoplanets. Since most of the exoplanets

45
00:03:01,240 --> 00:03:05,360
found by TESS will orbit bright stars, missions like Webb will be

46
00:03:05,360 --> 00:03:09,560
able to measure the spectra of starlight absorbed by the planets' atmospheres,

47
00:03:09,560 --> 00:03:13,740
which can indicate what they're made of. Ground-based measurements

48
00:03:13,740 --> 00:03:17,810
of the TESS Exoplanets can determine their masses. Combining

49
00:03:17,810 --> 00:03:21,950
the masses with TESS's size measurements reveals densities, allowing

50
00:03:21,950 --> 00:03:26,100
scientists to better understand the exoplanets' compositions.

51
00:03:26,100 --> 00:03:30,180
Jennifer Burt: The thing that we're really excited about with TESS is the way that it'll actually build

52
00:03:30,180 --> 00:03:34,290
on the momentum that we started with Kepler. So TESS is going to take that same

53
00:03:34,290 --> 00:03:38,430
search approach, but apply it to the vast majority of the sky, which still hasn't

54
00:03:38,430 --> 00:03:42,520
really been looked at in detail when searching for exoplanets. And by focusing

55
00:03:42,520 --> 00:03:46,700
especially on planets that orbit bright nearby stars, TESS allows us to start looking

56
00:03:46,700 --> 00:03:50,810
at things like composition and atmospheric makeup, and that'll then be crucial when we

57
00:03:50,810 --> 00:03:54,870
want to start looking around stars that are even further away and in deeper parts of the galaxy as well.

58
00:03:54,870 --> 00:03:59,030
Narrator: TESS is the vanguard of a new

59
00:03:59,030 --> 00:04:03,160
era of exoplanet study, and will forever expand

60
00:04:03,160 --> 00:04:07,220
our understanding of worlds beyond our own.

61
00:04:15,420 --> 00:04:11,310
■Music■