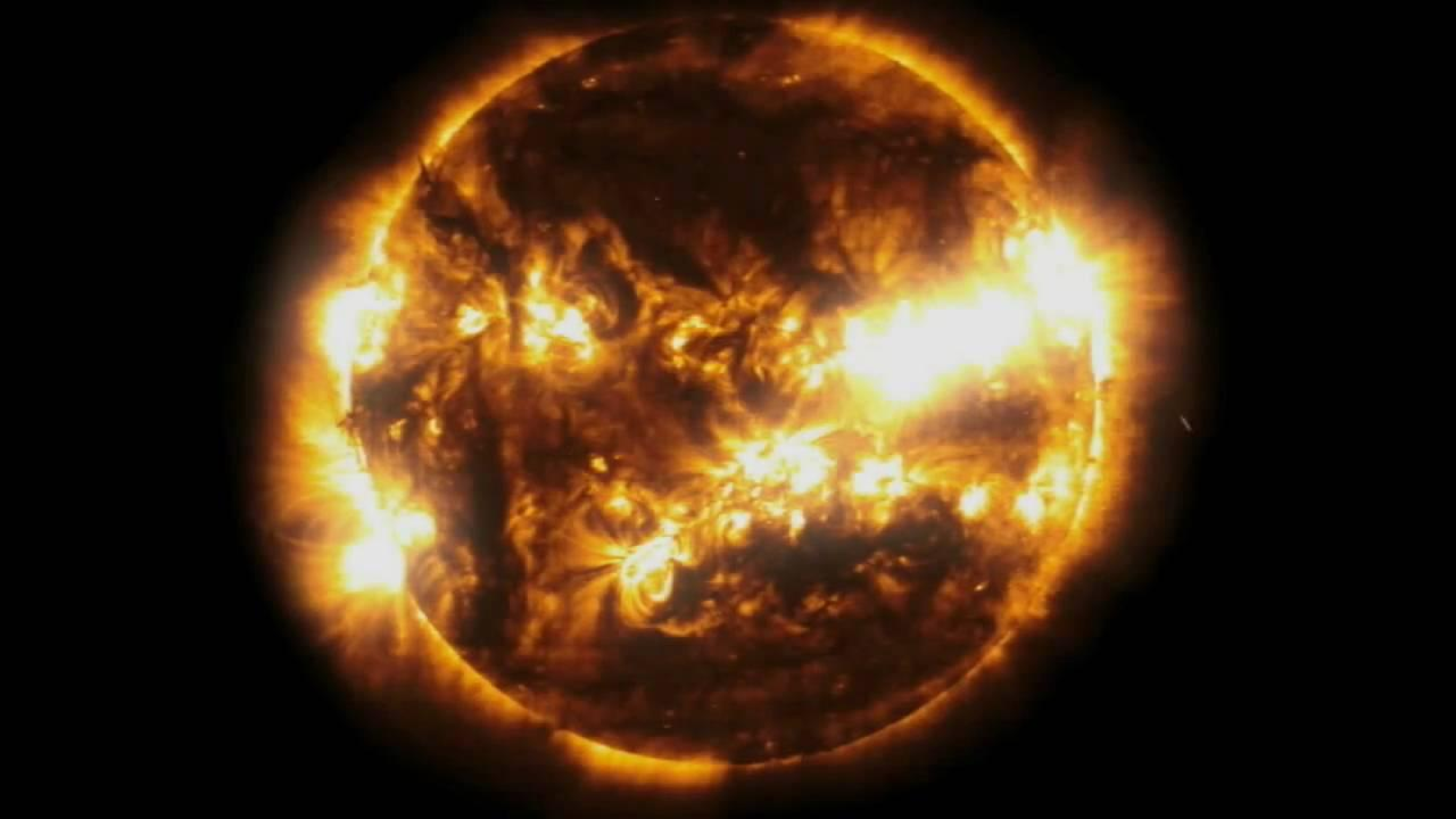

1
00:00:00,000 --> 00:00:02,350
\h Music.

2
00:00:02,350 --> 00:00:08,020
\h NARRATOR : When it comes to learning about stars, there is no closer classroom than our sun.

3
00:00:08,020 --> 00:00:15,410
\h That's why NASA began an in-depth study of the sun and Earth relationship in a program dubbed "Livin

4
00:00:15,410 --> 00:00:20,830
\h The first mission in the space weather
program is the Solar Dynamics Observatory,

5
00:00:20,830 --> 00:00:31,080
\h or SDO, scheduled to launch from Cape Canaveral Air Force Station in Florida.

6
00:00:31,080 --> 00:00:35,490
\h Tiffany Nail/NASA's Launch Services
Program: Welcome to the Solar Dynamics
Observatory webcast.

7
00:00:35,490 --> 00:00:39,540
\h I'm Tiffany Nail of NASA's Launch Services Program.

8
00:00:39,540 --> 00:00:45,510
\h In the next few minutes, we'll tell you what
SDO might uncover about the sun and how

9
00:00:45,510 --> 00:00:53,110
\h all of us on Earth can benefit from finding out more about that bright orange disk in the sky.

10
00:00:53,110 --> 00:00:57,660
\h But SDO is not NASA's first mission to study the sun.

11
00:00:57,660 --> 00:01:00,820
\h NARRATOR: Several of NASA's past missions focused on the sun.

12
00:01:00,820 --> 00:01:08,300

\h Pioneer 5 was the first. It launched in 1960 with instruments to study the solar wind and other phenomer

13
00:01:08,300 --> 00:01:11,800
\h The instruments are primitive by today's
standards, but back then,

14
00:01:11,800 --> 00:01:16,140
\h Pioneer gave researchers their first up-close look at a star.

15
00:01:16,140 --> 00:01:23,020
\h In 1973, NASA made observing the sun a
central goal of the Skylab space station.

16
00:01:23,020 --> 00:01:28,040
\h The agency's first space station included a telescope designed to look closely at the sun.

17
00:01:28,040 --> 00:01:32,690
\h Astronauts living on the station spent hours making specialized observations.

18
00:01:32,690 --> 00:01:37,010
\h Dean Pesnell/SDO Project Scientist: What
they found on Skylab was what we call
coronal holes.

19
00:01:37,010 --> 00:01:41,420
\h And we did not know about coronal holes until they started taking these images.

20
00:01:41,420 --> 00:01:49,630
\h I would say that Skylab coming out with that type of photography was one of its most important things.

21
00:01:49,630 --> 00:01:52,650
\h NARRATOR: SDO's cutting-edge
instruments offer researchers an

22
00:01:52,650 --> 00:01:58,430
\h unprecedented opportunity to examine the star at the center of our solar system.

23
00:01:58,430 --> 00:02:04,210
\h In fact, the readings are expected to be precise enough for researchers to forecast solar weather,

24
00:02:04,210 --> 00:02:11,780
\h and predict when satellites in space and even electronics on Earth will be endangered by a storm on the

25
00:02:11,780 --> 00:02:16,010
\h Dean Pesnell/SDO Project Scientist: We
had 15 years of fairly constant data stream.

26
00:02:16,010 --> 00:02:25,020
\h And we've taken that data and designed SDO to improve the ability to do science and the ability to pred

27
00:02:25,020 --> 00:02:30,410
\h We measure not just the strength of the magnetic field, we measure also its direction.

28
00:02:30,410 --> 00:02:35,660
\h And we think that how much the magnetic
field direction changes over a small part of

29
00:02:35,660 --> 00:02:41,500
\h the sun is probably related to whether or not space weather things are going to happen.

30
00:02:41,500 --> 00:02:48,550
\h NARRATOR: Solar flares can cause power surges on Earth, and wreak havoc on space stations and sa

31
00:02:48,550 --> 00:02:55,960
\h So researchers want to find out what makes
solar flares and other turbulent events occur
on the sun and then find out if there is a

32
00:02:55,960 --> 00:03:00,910
\h pattern or signs that we could use on Earth to predict future flares.

33
00:03:00,910 --> 00:03:07,070
\h Dean Pesnell/SDO Project Scientist: SDO
will look at the sun and try to understand
where the magnetic field comes from.

34
00:03:07,070 --> 00:03:12,710
\h When we talk about flares and coronal mass ejections, that's the sun getting rid of stuff.

35
00:03:12,710 --> 00:03:16,620
\h	That magnetic field is no longer in the sun, it
wants it gone.

36
00:03:16,620 --> 00:03:23,130
\h	And it gets rid of the energy by having magnetic flares that release bright flashes of light.

37
00:03:23,130 --> 00:03:27,140
\h	And it gets rid of the leftover magnetic field by just throwing it off.

38
00:03:27,140 --> 00:03:30,240
\h	NARRATOR: The spacecraft will use three
instruments to examine the sun,

39
00:03:30,240 --> 00:03:34,790
\h	including one that will take pictures rivaling the resolution of an IMAX movie.

40
00:03:34,790 --> 00:03:40,190
\h	Another instrument, called the Helioseismic
and Magnetic Imager, or HMI, will measure

41
00:03:40,190 --> 00:03:46,130
\h	 the sound waves bouncing around inside the sun to construct an image of the star's inner workings.

42
00:03:46,130 --> 00:03:50,980
\h	The data could reveal why the sun operates in an 11-year cycle of activity.

43
00:03:50,980 --> 00:03:55,620
\h	The Extreme Ultraviolet Variability
Experiment will monitor the sun's brightness

44
00:03:55,620 --> 00:03:59,670
\h	in the extreme ultraviolet wavelength, which changes constantly.

45
00:03:59,670 --> 00:04:02,940
\h	Elizabeth Citrin/SDO Project Manager: Our
three instruments on here are really new and

46
00:04:02,940 --> 00:04:07,420
\h improved versions of some other instruments that have flown. Of course,

47
00:04:07,420 --> 00:04:11,630
\h we have a lot more data and we take a lot
more pictures.

48
00:04:11,630 --> 00:04:15,730
\h So, and that's one thing the scientists love, because as they say, “The sun changes all of the time.

49
00:04:15,730 --> 00:04:21,770
\h It changes every second.” And we're going to be imaging it every second, and we image the full disc of t

50
00:04:21,770 --> 00:04:26,190
\h NARRATOR: Taken together, the information SDO collects could give scientists ways to

51
00:04:26,190 --> 00:04:29,400
\h predict future solar disturbances and help developers on

52
00:04:29,400 --> 00:04:34,960
\h Earth come up with ways to protect sensitive electronics in space and on the planet.

53
00:04:34,960 --> 00:04:42,350
\h While the work from SDO is expected to be
groundbreaking, it took a lot of researchers
and several previous missions to show

54
00:04:42,350 --> 00:04:46,660
\h scientists what kind of instruments they would need to put on the spacecraft.

55
00:04:46,660 --> 00:04:52,490
\h Solar studies have relied on data from a host of missions looking at the sun from different perspectives.

56
00:04:52,490 --> 00:04:58,510
\h The Solar Maximum Mission launched in
1980 to look at solar flares and other events.

57
00:04:58,510 --> 00:05:02,130

\h The mission was extended by shuttle astronauts in 1984,

58
00:05:02,130 --> 00:05:08,190
\h who repaired the spacecraft in orbit. Solar Max operated until 1989.

59
00:05:08,190 --> 00:05:12,450
\h NASA and the European Space Agency
jointly developed the Ulysses spacecraft,

60
00:05:12,450 --> 00:05:15,890
\h which launched on shuttle Discovery in 1990.

61
00:05:15,890 --> 00:05:21,180
\h Ulysses gave researchers unique looks at the sun's north and south poles.

62
00:05:21,180 --> 00:05:28,710
\h The Solar and Heliospheric Observatory, known as SOHO, launched in 1995 aboard an Atlas II.

63
00:05:28,710 --> 00:05:36,630
\h SOHO's observations are similar to those envisioned for SDO, although SDO is carrying more advanced

64
00:05:36,630 --> 00:05:40,730
\h Elizabeth Citrin/SDO Project Manager: Well, the big challenge of this mission is its data
rate.

65
00:05:40,730 --> 00:05:45,650
\h It's 150 megabits per second, 24 hours a day.

66
00:05:45,650 --> 00:05:52,860
\h It's relentless. Most of the astronomical spacecraft are looking at sort of faint sources, so they don't have

67
00:05:52,860 --> 00:05:59,610
\h We're looking at the sun. A lot of photons come off the sun and we've got to process those and get them

68
00:05:59,610 --> 00:06:04,220
\h NARRATOR: But before SDO can start its observations, it has to get into space.

69
00:06:04,220 --> 00:06:13,890

\h	That is the job of a powerful Atlas V rocket. The Atlas will lift the 6,800-pound spacecraft to an orbit abou

70
00:06:13,890 --> 00:06:19,570
\h	The Atlas V is one of the largest boosters
available to NASA, and was used to launch

71
00:06:19,570 --> 00:06:23,960
\h	the Lunar Reconnaissance Orbiter and moon-impacting LCROSS spacecraft.

72
00:06:23,960 --> 00:06:27,450
\h	Rex Engelhardt/SDO Mission Integration Manager: SDO is one of the largest solar observatories we've

73
00:06:27,450 --> 00:06:32,180
\h	It had a heavy-lift requirement, so we chose the Atlas V as the rocket for this mission.

74
00:06:32,180 --> 00:06:36,660
\h	NARRATOR: The Atlas V also is unique for its launch structure.

75
00:06:36,660 --> 00:06:38,960
\h	Rex Engelhardt/SDO Mission Integration
Manager: Atlas V has been a very reliable
rocket.

76
00:06:38,960 --> 00:06:41,350
\h	We've used it on a couple of NASA missions.

77
00:06:41,350 --> 00:06:46,770
\h	It's unique in that it's chosen a clean-pad
concept for its launch processing.

78
00:06:46,770 --> 00:06:50,580
\h	The rocket's actually built on a mobile launch platform in the vehicle behind me,

79
00:06:50,580 --> 00:06:56,250
\h	the Vertical Integration Facility, and then rolled out with rail cars out to the pad the day of launch.

80
00:06:56,250 --> 00:06:59,640
\h	One advantage of this clean-pad concept
that they chose is that the rocket is

81
00:06:59,640 --> 00:07:04,460
\h processed safe and secure in a building and then it rolls out the day of launch.

82
00:07:04,460 --> 00:07:09,060
\h And that way if they have a problem, a storm or something like that, they can roll back into the facility.

83
00:07:09,060 --> 00:07:11,580
\h It's not exposed to the elements for very long.

84
00:07:11,580 --> 00:07:17,430
\h It just gives them a lot of flexibility in the
processing and a lot of protection for the
rocket as well as the spacecraft.

85
00:07:17,430 --> 00:07:22,770
\h NARRATOR: The day before launch, technicians will roll the rocket out of its protective service structure

86
00:07:22,770 --> 00:07:28,500
\h They'll fuel the first stage and the Centaur upper stage as the Atlas stands on the pad.

87
00:07:28,500 --> 00:07:36,950
\h The spacecraft was built in Maryland at NASA's Goddard Space Flight Center and it arrived in Florida in

88
00:07:36,950 --> 00:07:43,220
\h It went through a number of comprehensive tests, including deploying the spacecraft's solar arrays .

89
00:07:43,220 --> 00:07:50,550
\h Technicians installed SDO's batteries and loaded fuel into the spacecraft before it was trucked to the lau

90
00:07:50,550 --> 00:07:57,270
\h Spacecraft typically spend several months in launch integration and testing because the machines are c

91
00:07:57,270 --> 00:08:04,180
\h harsh place that technicians and scientists want to make sure everything is just right before launch.

92
00:08:04,180 --> 00:08:06,300
\h Dean Pesnell/SDO Project Scientist: The

sun is our astrophysical laboratory.

93
00:08:06,300 --> 00:08:11,700
\h This is the place where we look at the sun and stop calling it the sun. When we look at the sun,

94
00:08:11,700 --> 00:08:17,370
\h it's just an average star. When we look out in the universe and we plot star stuff up,

95
00:08:17,370 --> 00:08:22,220
\h the sun's always right in the middle. It's like the perfect average star.

96
00:08:22,220 --> 00:08:30,250
\h And if our average star has solar activity, then we should see activity on other stars, and indeed we do.

97
00:08:30,250 --> 00:08:36,350
\h Elizabeth Citrin/SDO Project Manager: You know, we need to know when a solar event is going to happ

98
00:08:36,350 --> 00:08:40,260
\h Tiffany Nail/NASA's Launch Services
Program: A day before the Solar Dynamics
Observatory begins its mission,

99
00:08:40,260 --> 00:08:45,680
\h the excitement is reaching a crescendo here at NASA's Kennedy Space Center.