NASA's InSight Lander

Reveals the Deep Interior of Mars

Jet Propulsion Laboratory
California Institute of Technology

[animation]

1
00:00:19,830 --> 00:00:17,349
insight has been fantastically

2
00:00:21,750 --> 00:00:19,840
successful we've gotten more science

3
00:00:23,830 --> 00:00:21,760
than we had ever dreamed that we would

4
00:00:26,630 --> 00:00:23,840
get during the course of this mission

5
00:00:29,349 --> 00:00:26,640
insight's primary goal was to better

6
00:00:31,109 --> 00:00:29,359
understand how the terrestrial planets

7
00:00:32,709 --> 00:00:31,119
the rocky planets

8
00:00:35,190 --> 00:00:32,719
formed and evolved

9
00:00:37,430 --> 00:00:35,200
first we landed an incredibly sensitive

10
00:00:39,430 --> 00:00:37,440
seismometer on the surface of mars and

11
00:00:42,150 --> 00:00:39,440
with that we are able to record over

12
00:00:44,549 --> 00:00:42,160
1300 mars quakes and these range all the

13
00:00:47,670 --> 00:00:44,559

way from tiny little tumblers that just

14
00:00:49,590 --> 00:00:47,680
barely go over the noise background to a

15
00:00:51,750 --> 00:00:49,600
handful of quakes that were larger than

16
00:00:53,670 --> 00:00:51,760
magnitude four and feeling those

17
00:00:55,430 --> 00:00:53,680
vibrations the scientists can actually

18
00:00:58,470 --> 00:00:55,440
take that information and use that to

19
00:01:00,310 --> 00:00:58,480
reconstruct all the material that those

20
00:01:02,950 --> 00:01:00,320
mars quakes traveled through and thereby

21
00:01:05,429 --> 00:01:02,960
see the interior of the planet

22
00:01:07,510 --> 00:01:05,439
we looked at its core which is

23
00:01:09,270 --> 00:01:07,520
big and not very dense we looked at its

24
00:01:11,670 --> 00:01:09,280
mantle which is

25
00:01:12,870 --> 00:01:11,680
not so hot and we looked at its crust

26
00:01:15,350 --> 00:01:12,880
which is

27
00:01:17,830 --> 00:01:15,360
not too thick and not too dense compared

28
00:01:19,510 --> 00:01:17,840
to some of our pre-mission expectations

29
00:01:20,310 --> 00:01:19,520
by measuring

30
00:01:26,950 --> 00:01:20,320
the

31
00:01:29,350 --> 00:01:26,960
planet looked like

32
00:01:30,710 --> 00:01:29,360
four and a half billion years ago

33
00:01:33,590 --> 00:01:30,720
the other thing that we've been able to

34
00:01:36,149 --> 00:01:33,600
do is make a very detailed

35
00:01:38,149 --> 00:01:36,159
record of the weather at mars

36
00:01:40,230 --> 00:01:38,159
we have a really good weather station

37
00:01:41,910 --> 00:01:40,240
which has allowed meteorologists to

38
00:01:44,469 --> 00:01:41,920

study the the weather at the at the

39
00:01:47,109 --> 00:01:44,479
insight landing site and relate that to

40
00:01:49,109 --> 00:01:47,119
the climate changes on mars

41
00:01:50,630 --> 00:01:49,119
what we didn't do unfortunately was make

42
00:01:52,789 --> 00:01:50,640
the heat flow measurement we wanted to

43
00:01:55,270 --> 00:01:52,799
make our heat flow probe was supposed to

44
00:01:57,910 --> 00:01:55,280
get three to five meters down and we

45
00:01:59,190 --> 00:01:57,920
were unable to reach that depth but we

46
00:02:01,590 --> 00:01:59,200
were able to get some of those

47
00:02:03,270 --> 00:02:01,600
measurements such as the heat transfer

48
00:02:05,670 --> 00:02:03,280
amongst the soil

49
00:02:07,749 --> 00:02:05,680
insight is a solar powered mission we

50
00:02:09,830 --> 00:02:07,759
have solar panels and they were designed

51
00:02:11,910 --> 00:02:09,840
to give us enough power to easily get

52
00:02:13,589 --> 00:02:11,920
through the first two years but there's

53
00:02:15,430 --> 00:02:13,599
a lot of dust in mars atmosphere and

54
00:02:18,390 --> 00:02:15,440
that's falling down on top of our solar

55
00:02:20,070 --> 00:02:18,400
arrays and slowly blocking the sun

56
00:02:21,830 --> 00:02:20,080
as the panels are getting dustier we

57
00:02:23,589 --> 00:02:21,840
started racking our brains with whether

58
00:02:25,670 --> 00:02:23,599
there's anything we can do to try to

59
00:02:27,589 --> 00:02:25,680
clean off those panels ourselves when

60
00:02:29,750 --> 00:02:27,599
the idea of using dirt to clean the

61
00:02:31,270 --> 00:02:29,760
solar arrays was first proposed it

62
00:02:32,869 --> 00:02:31,280
seemed counter-intuitive we were

63
00:02:34,710 --> 00:02:32,879

actually able to use the arm and the

64
00:02:37,589 --> 00:02:34,720
scoop to scoop up some soil from the

65
00:02:40,710 --> 00:02:37,599
ground and dump it over the lander

66
00:02:42,309 --> 00:02:40,720
having some of that heavier sand blow

67
00:02:44,229 --> 00:02:42,319
onto the arrays and knock some of the

68
00:02:47,110 --> 00:02:44,239
dust off so we essentially used it as an

69
00:02:49,430 --> 00:02:47,120
array cleaning tool cleaning with dirt

70
00:02:51,110 --> 00:02:49,440
actually worked it allowed us to

71
00:02:53,750 --> 00:02:51,120
actually keep the instruments going

72
00:02:55,830 --> 00:02:53,760
during the low power season where the

73
00:02:56,869 --> 00:02:55,840
the mars is farthest from the sun during

74
00:02:58,869 --> 00:02:56,879
the winter

75
00:02:59,990 --> 00:02:58,879
unfortunately later in the summer we

76
00:03:02,149 --> 00:03:00,000
think that the power is going to be

77
00:03:04,550 --> 00:03:02,159
dropping so quickly due to

78
00:03:07,110 --> 00:03:04,560
the atmosphere getting dustier due to

79
00:03:08,470 --> 00:03:07,120
the alignment of mars in the sun we're

80
00:03:10,790 --> 00:03:08,480
going to be at a point where we can no

81
00:03:12,070 --> 00:03:10,800
longer have all of our instruments on

82
00:03:14,470 --> 00:03:12,080
which means we'll be turning off the

83
00:03:16,309 --> 00:03:14,480
seismometer and other instruments on

84
00:03:17,670 --> 00:03:16,319
board the last day is going to be

85
00:03:19,430 --> 00:03:17,680
bittersweet

86
00:03:20,790 --> 00:03:19,440
obviously we're preparing for it we know

87
00:03:22,949 --> 00:03:20,800
it's coming

88
00:03:26,149 --> 00:03:22,959

but that first moment where we don't

89
00:03:27,670 --> 00:03:26,159
hear from the lander when we expect to

90
00:03:30,149 --> 00:03:27,680
that's going to be tough

91
00:03:32,710 --> 00:03:30,159
it's left a permanent mark on me i

92
00:03:34,390 --> 00:03:32,720
literally tattooed insight onto my arm

93
00:03:37,670 --> 00:03:34,400
i'll never let it go

94
00:03:39,910 --> 00:03:37,680
we've really rewritten sort of the the

95
00:03:41,670 --> 00:03:39,920
chapter of the encyclopedia on the

96
00:03:43,830 --> 00:03:41,680
interior of mars

97
00:03:45,750 --> 00:03:43,840
that was our last big hole in our

98
00:03:47,270 --> 00:03:45,760
understanding of the planet

99
00:03:48,789 --> 00:03:47,280
there's a lot of data that people are

100
00:03:50,789 --> 00:03:48,799
going to be looking at for decades to

101
00:03:52,789 --> 00:03:50,799
come we accomplished so many of our