1
00:00:01,030 --> 00:00:03,180
[music]

2
00:00:03,200 --> 00:00:05,210
[robotic voice] 3, 2, 1...

3
00:00:05,230 --> 00:00:08,210
[Dana Hurley] I think that it's in human nature to explore.

4
00:00:11,260 --> 00:00:16,350
[Rich Vondrak] Understanding the moon better, will help us to understand our neighbors in the solar system.

5
00:00:17,500 --> 00:00:20,550
[Ashwin Vasavada] We're exploring the solar system here and not just the moon.

6
00:00:20,560 --> 00:00:23,610
[Cathy Peddie] The moon is the natural next step

7
00:00:23,630 --> 00:00:26,710
in our exploration of our own universe.

8
00:00:26,730 --> 00:00:29,780
[drum beats]

9
00:00:34,860 --> 00:00:36,850
[Craig Tooley] The Lunar Reconnaissance Orbiter

10
00:00:36,860 --> 00:00:40,029
is as its namesake says, a reconnaissance mission to the moon.

11
00:00:40,030 --> 00:00:44,059
Our job is to take a suite of very powerful scientific instruments and make

12
00:00:44,060 --> 00:00:48,059
an atlas of the entire moon, in some place in very great detail.

13
00:00:48,060 --> 00:00:52,080

Topography, mountain heights, minerology, temperatures,

14
00:00:52,100 --> 00:00:56,080
abundances of resources, including potentially the intriguing possibility that there's water

15
00:00:56,100 --> 00:01:00,110
at the moon. We put all this together into a dataset by flying low over the moon for a year,

16
00:01:00,130 --> 00:01:04,150
and this is the data that the people designing the systems, picking the sites,

17
00:01:04,160 --> 00:01:06,310
need to take us back to the moon.

18
00:01:06,330 --> 00:01:10,450
[Rich Vondrak] Well, we learned much about the moon from the Apollo Program,

19
00:01:10,460 --> 00:01:14,610
but now we want to return to the moon for a more intensive study.

20
00:01:14,630 --> 00:01:18,710
We want to be able to go back to the moon so that we can live there for longer

21
00:01:18,730 --> 00:01:21,810
periods and work on the moon, so we need a mission

22
00:01:21,830 --> 00:01:24,810
that can help us find the best places to go

23
00:01:24,830 --> 00:01:28,680
and determine how to go back there safely.

24
00:01:30,130 --> 00:01:31,250
[muffled] "it's a nice place to land"

25
00:01:31,260 --> 00:01:34,310
[Cathy Peddie] We know that, you know, Neil Armstrong and some of the others had

26
00:01:34,330 --> 00:01:37,510
a difficult time finding a safe landing site.

27
00:01:37,530 --> 00:01:41,580
The didn't see it until they got there. But now with our instruments, we'll be able to

28
00:01:41,600 --> 00:01:43,780
tell people ahead of time, "look, don't go there."

29
00:01:43,800 --> 00:01:47,780
[Rich Vondrak] LRO will have a laser system that will give

30
00:01:47,800 --> 00:01:51,980
us a high resolution topographic map of the moon.

31
00:01:52,000 --> 00:01:56,180
It als has high resolution cameras that will identify

32
00:01:56,200 --> 00:02:00,380
objects that are only a foot or two in size so that we know where there are

33
00:02:00,400 --> 00:02:04,380
no large boulders that could be a risk to astronauts.

34
00:02:04,400 --> 00:02:08,510
[Craig Tooley] So our job is to literally complete the job of mapping the moon, do it at high resolutions, and th

35
00:02:08,530 --> 00:02:11,610
enable the designers of the human systems

36
00:02:11,630 --> 00:02:14,680
the atlas they need to pick the safe places to go

37
00:02:14,700 --> 00:02:17,710
the beneficial places to go and where it's most fruitful to go.

38
00:02:20,930 --> 00:02:25,980

[Cathy Peddie] In addition to the safe landing sites, LRO is looking for potential resources, and now

39
00:02:26,000 --> 00:02:30,080
why are we doing that? Because it's really hard to carry all your supplies

40
00:02:30,100 --> 00:02:34,180
with you, I mean, you can do it, but really spend a lot of

41
00:02:34,200 --> 00:02:38,310
not only fuel, but cargo space. So it'd be really nice to go to a place that

42
00:02:38,330 --> 00:02:42,480
already has the resources, whether it's water ice to have water,

43
00:02:42,500 --> 00:02:46,580
or potential minerals that we could use as raw materials,

44
00:02:46,600 --> 00:02:48,780
to make into things that we would need.

45
00:02:48,800 --> 00:02:52,780
[Rich Vondrak] We think the most interesting parts of the moon may be polar

46
00:02:52,800 --> 00:02:56,780
regions of the moon because there could be resources there.

47
00:02:56,800 --> 00:03:00,950
And so we're going to study intesively the polar regions

48
00:03:00,960 --> 00:03:01,950
with LRO.

49
00:03:01,960 --> 00:03:05,080
[Craig Tooley] From the Apollo era we chose to go for good reasons, because

50
00:03:05,100 --> 00:03:08,180
it was literally the easiest, to go to the equatorial regions, and

51
00:03:08,200 --> 00:03:11,250
stay a very short time, and it was a very ambitious program but

52
00:03:11,260 --> 00:03:14,480
when you look at where would like to go and

53
00:03:14,500 --> 00:03:17,680
stay for awhile on the moon, you begin to realize that

54
00:03:17,700 --> 00:03:20,810
probably the poles are the most interesting place.

55
00:03:20,830 --> 00:03:23,910
[John Keller] Access to solar power, continuously, that may be

56
00:03:23,930 --> 00:03:27,950
the first and most important reason over, you know, the near term

57
00:03:27,960 --> 00:03:31,180
And then the possibility of resources being there.

58
00:03:31,200 --> 00:03:34,310
Those may take much longer time

59
00:03:34,330 --> 00:03:37,410
before we're able to really exploit those, but the solar power

60
00:03:37,430 --> 00:03:39,680
is something that we can exploit right away.

61
00:03:40,730 --> 00:03:44,710
[Rich Vondrak] The second big resource on the moon, may be water ice.

62
00:03:44,730 --> 00:03:48,750
There's evidence from early missions, that in dark places at the

63
00:03:48,760 --> 00:03:52,750

poles, there may be water at the surface or below.

64
00:03:52,760 --> 00:03:55,950
the surface in the form of ice crystals.

65
00:03:55,960 --> 00:03:59,110
If it is abundant, astronauts could use

66
00:03:59,130 --> 00:04:02,180
this for both human consumption

67
00:04:02,200 --> 00:04:05,210
and as a source of rocket fuel.

68
00:04:08,430 --> 00:04:12,580
LRO will measure for the first time, this very energetic component

69
00:04:12,600 --> 00:04:16,680
of the space radiation environment, in order to see whether it

70
00:04:16,700 --> 00:04:18,880
is going to be a problems or not.

71
00:04:18,900 --> 00:04:23,910
[Craig Tooley] It was one thing to go for a handful of days in Apollo, and go when

72
00:04:23,930 --> 00:04:27,080
we knew that the Sun was quiet, or you hope the Sun stayed quiet,

73
00:04:27,100 --> 00:04:31,210
and you took the risk, you calculated the risk of cancer and

74
00:04:31,230 --> 00:04:35,310
such and you made a short mission. If you're going to live there longer, you need to

75
00:04:35,330 --> 00:04:39,410
understand it enough to go, "Here's what I need to do to protect myself."

76
00:04:39,430 --> 00:04:43,480
[Cathy Peddie] One of the things that we're looking for in the LRO mission is

77
00:04:43,500 --> 00:04:47,550
how the high radiation environment effects

78
00:04:47,560 --> 00:04:51,610
our ability to explore. So if we bring cameras or

79
00:04:51,630 --> 00:04:55,780
communication devices, you know, how will they be impacted by

80
00:04:55,800 --> 00:05:00,810
the cosmic radiation? We need to protect our equipment as well as ourselves.

81
00:05:05,830 --> 00:05:07,910
[music ramps up]

82
00:05:07,930 --> 00:05:12,059
[Craig Tooley] When we look back at what we did in LRO and

83
00:05:12,060 --> 00:05:15,059
we look at what followed, I think we'll see a profound impact. We'll see

84
00:05:15,060 --> 00:05:18,280
this as really being the small first step

85
00:05:18,300 --> 00:05:22,510
where we have human beings permanently off this planet.

86
00:05:22,530 --> 00:05:25,710
Beginning to the move out of the solar system, starting with the moon, as that pans out

87
00:05:25,730 --> 00:05:28,850
I think we'll be a small part of a profound

88
00:05:28,860 --> 00:05:32,910

development that when history looks back they'll say, "This time we went back to the moon. This time

89
00:05:32,930 --> 00:05:37,059
we stayed, and then we moved on from there."