1
00:00:59,469 --> 00:00:16,310
[Music]

2
00:01:00,520 --> 00:00:59,479
Phoenix is the first March down it's the

3
00:01:02,049 --> 00:01:00,530
first mission that's going to try to

4
00:01:03,369 --> 00:01:02,059
land near the North Pole of Mars and

5
00:01:05,049 --> 00:01:03,379
it's the first mission that's actually

6
00:01:06,399 --> 00:01:05,059
going to go try and reach out and touch

7
00:01:09,639 --> 00:01:06,409
water on the surface of another planet

8
00:01:12,040 --> 00:01:09,649
where there tends to be water at least

9
00:01:14,410 --> 00:01:12,050
on earth there tends to be life and so

10
00:01:16,899 --> 00:01:14,420
it's potentially a place where life

11
00:01:21,030 --> 00:01:16,909
could have existed on the planet in the

12
00:01:26,980 --> 00:01:23,320
main purpose of UDL is to take a

13
00:01:29,260 --> 00:01:26,990

spacecraft that is traveling at 12,500

14
00:01:32,440 --> 00:01:29,270
miles now and bring it to a screeching

15
00:01:36,400 --> 00:01:32,450
halt in a soft way in a very short

16
00:01:38,350 --> 00:01:36,410
amount we enter the Martian atmosphere

17
00:01:40,359 --> 00:01:38,360
where 70 miles above the surface of Mars

18
00:01:42,190 --> 00:01:40,369
and our Lander is safely tucked inside

19
00:01:43,210 --> 00:01:42,200
what we call an arrow show looks kind of

20
00:01:44,920 --> 00:01:43,220
like an ice-cream cone

21
00:01:46,780 --> 00:01:44,930
more or less and on the front of it is

22
00:01:48,790 --> 00:01:46,790
this heat shield this saucer looking

23
00:01:50,260 --> 00:01:48,800
thing that has about a half inch of

24
00:01:52,000 --> 00:01:50,270
essentially what's cork on the front of

25
00:01:54,340 --> 00:01:52,010
it which is our heat shield now this is

26
00:01:55,840 --> 00:01:54,350
really special cork and this clerk is

27
00:01:57,730 --> 00:01:55,850
what's going to protect us from the

28
00:02:00,880 --> 00:01:57,740
violent atmospheric entry that we're

29
00:02:02,469 --> 00:02:00,890
about to experience friction really

30
00:02:05,020 --> 00:02:02,479
starts to build up on the spacecraft and

31
00:02:06,340 --> 00:02:05,030
we use the friction when it is flying

32
00:02:09,040 --> 00:02:06,350
through the atmosphere to our advantage

33
00:02:11,770 --> 00:02:09,050
to slow us down from this point we're

34
00:02:15,460 --> 00:02:11,780
going to decelerate from 12,500 miles an

35
00:02:17,050 --> 00:02:15,470
hour down to 900 miles an hour the

36
00:02:18,729 --> 00:02:17,060
outside can get almost as hot as the

37
00:02:20,500 --> 00:02:18,739
surface of the Sun a temperature the

38
00:02:24,460 --> 00:02:20,510

heat shield to reach 2,600 degrees

39
00:02:26,830 --> 00:02:24,470
Fahrenheit but the inside doesn't get

40
00:02:30,070 --> 00:02:26,840
very hot it probably gets about room

41
00:02:32,380 --> 00:02:30,080
temperature hits this window of

42
00:02:35,289 --> 00:02:32,390
opportunity in within which we can

43
00:02:37,570 --> 00:02:35,299
deploy the parachute we fire the shoot

44
00:02:39,610 --> 00:02:37,580
to earlie the parachute itself could

45
00:02:42,240 --> 00:02:39,620
fail fabric in the stitching the cool

46
00:02:46,860 --> 00:02:45,570
that would be better in the first 15

47
00:02:49,290 --> 00:02:46,870
seconds after we deploy the parachute

48
00:02:53,340 --> 00:02:49,300
will decelerate from 900 miles an hour

49
00:02:54,600 --> 00:02:53,350
to a relatively slow 250 miles now we no

50
00:02:56,520 --> 00:02:54,610
longer need the heat shield to protect

51
00:02:58,949 --> 00:02:56,530
us from the force of atmospheric entry

52
00:03:00,360 --> 00:02:58,959
so we jettison making shield exposing

53
00:03:02,490 --> 00:03:00,370
for the first time our Lander to the

54
00:03:04,740 --> 00:03:02,500
atmosphere of Mars after the heat shield

55
00:03:07,290 --> 00:03:04,750
has been jettison and the legs are

56
00:03:10,500 --> 00:03:07,300
deployed the next step is to have the

57
00:03:12,870 --> 00:03:10,510
radar system begin to detect how far

58
00:03:15,900 --> 00:03:12,880
Phoenix really is from the ground

59
00:03:18,870 --> 00:03:15,910
we've lost 99% of our entry philosophy

60
00:03:21,360 --> 00:03:18,880
so we're 99% of the way to where we want

61
00:03:22,710 --> 00:03:21,370
to be but that last 1% as it always

62
00:03:24,660 --> 00:03:22,720
seems to be is the tricky part

63
00:03:26,970 --> 00:03:24,670

now the spacecraft actually has to

64
00:03:28,500 --> 00:03:26,980
decide when it's going to get rid of its

65
00:03:30,660 --> 00:03:28,510
parachute we separate from the lander

66
00:03:32,970 --> 00:03:30,670
going 125 miles an hour at roughly a

67
00:03:35,070 --> 00:03:32,980
kilometer above the surface of Mars 3200

68
00:03:36,360 --> 00:03:35,080
feet that's like taking two Empire State

69
00:03:37,080 --> 00:03:36,370
buildings and stacking them on top of

70
00:03:38,400 --> 00:03:37,090
one another

71
00:03:43,290 --> 00:03:38,410
that's when we separate from the

72
00:03:44,970 --> 00:03:43,300
backshell and we're now in freefall it's

73
00:03:49,590 --> 00:03:44,980
a very scary moment a lot has to happen

74
00:03:52,199 --> 00:03:49,600
in a very short amount of time so it's

75
00:03:55,050 --> 00:03:52,209
in a freefall but it's also trying to

76
00:03:57,060 --> 00:03:55,060
use all of its actuators to make sure

77
00:04:00,320 --> 00:03:57,070
that it's in the right position to land

78
00:04:02,820 --> 00:04:00,330
and then it has to light up its engines

79
00:04:05,220 --> 00:04:02,830
right itself and then stand then slowly

80
00:04:11,790 --> 00:04:05,230
slow itself down and touch down on the

81
00:04:16,240 --> 00:04:14,020
Earth and Mars are so far apart that it

82
00:04:18,909 --> 00:04:16,250
take over ten minutes for a signal from

83
00:04:20,949 --> 00:04:18,919
Mars to get to earth and EDL itself is

84
00:04:22,480 --> 00:04:20,959
all over in a matter of seven minutes so

85
00:04:24,340 --> 00:04:22,490
by the time we even hear from the lander

86
00:04:26,290 --> 00:04:24,350
that EDL is started it'll already be oh

87
00:04:28,210 --> 00:04:26,300
we have to build large amounts of

88
00:04:31,210 --> 00:04:28,220

autonomy into the spacecraft so that it

89
00:04:33,129 --> 00:04:31,220
can land itself safely EDL is this

90
00:04:34,780 --> 00:04:33,139
immense technically challenging problems

91
00:04:36,430 --> 00:04:34,790
about getting a spacecraft it's hurtling

92
00:04:38,110 --> 00:04:36,440
through deep space and using all this

93
00:04:39,520 --> 00:04:38,120
bag of tricks to somehow figure out how

94
00:04:41,650 --> 00:04:39,530
to get it down to the surface of Mars at

95
00:04:53,020 --> 00:04:41,660
zero miles now it's just immensely