
LANDER LEG DEPLOYMENT

1
00:00:08,480 --> 00:00:04,700
welcome to the Phoenix spacecraft entry

2
00:00:10,640 --> 00:00:08,490
descent and landing simulation computer

3
00:00:15,650 --> 00:00:10,650
simulation of what we think will happen

4
00:00:17,390 --> 00:00:15,660
on Sunday May twenty-fifth 2008 a May

5
00:00:20,359 --> 00:00:17,400
twenty-fifth Phoenix will land near the

6
00:00:22,730 --> 00:00:20,369
North Pole of Mars Phoenix enters the

7
00:00:25,460 --> 00:00:22,740
atmosphere going over 12,000 miles per

8
00:00:28,910 --> 00:00:25,470
hour at a very grazing angle about 13

9
00:00:30,919 --> 00:00:28,920
degrees the very shallow angle allow us

10
00:00:32,840 --> 00:00:30,929
to take advantage of the very thin

11
00:00:34,430 --> 00:00:32,850
atmosphere of Mars to slow us down as

12
00:00:37,970 --> 00:00:34,440
much as we can before our parachute

13
00:00:40,040 --> 00:00:37,980

opens up this robotic vehicle is

14
00:00:42,680 --> 00:00:40,050
controlled by itself it has its own

15
00:00:43,940 --> 00:00:42,690
computer on board that controls all of

16
00:00:47,840 --> 00:00:43,950
the events that you see that take place

17
00:00:49,850 --> 00:00:47,850
in the simulation as the vehicle hits

18
00:00:52,729 --> 00:00:49,860
the top of the atmosphere it will start

19
00:00:54,680 --> 00:00:52,739
to warm the heat shield which protects

20
00:00:56,810 --> 00:00:54,690
the vehicle from this heat is an ablator

21
00:00:59,029 --> 00:00:56,820
an ablator is a heat shield that

22
00:01:01,279 --> 00:00:59,039
actually has material that leaves the

23
00:01:03,160 --> 00:01:01,289
heat shield that takes the heat away as

24
00:01:06,080 --> 00:01:03,170
the vehicle goes through the atmosphere

25
00:01:09,410 --> 00:01:06,090
without this ablator the vehicle would

26
00:01:11,000 --> 00:01:09,420
burn up in the atmosphere instead while

27
00:01:13,280 --> 00:01:11,010
the heat shield will get over a thousand

28
00:01:15,140 --> 00:01:13,290
degrees Celsius the inside of the

29
00:01:21,289 --> 00:01:15,150
vehicle never gets above room

30
00:01:24,170 --> 00:01:21,299
temperature as the vehicle enters the

31
00:01:26,330 --> 00:01:24,180
atmosphere the vehicle is transmitting

32
00:01:28,940 --> 00:01:26,340
what it's doing and where it is and what

33
00:01:31,490 --> 00:01:28,950
its orientation is to our orbiting

34
00:01:34,310 --> 00:01:31,500
spacecraft Mars Reconnaissance Orbiter

35
00:01:39,780 --> 00:01:34,320
and Mars Odyssey these vehicles have

36
00:01:43,720 --> 00:01:42,280
unfortunately all this hot gas that

37
00:01:45,760 --> 00:01:43,730
surrounds the vehicle prevents the

38
00:01:48,190 --> 00:01:45,770

signal from making it to our orbiters

39
00:01:50,110 --> 00:01:48,200
it's not until it slows down later on

40
00:01:52,270 --> 00:01:50,120
that the signal will actually make it

41
00:01:57,520 --> 00:01:52,280
out to the vehicles to let us know how

42
00:01:59,350 --> 00:01:57,530
it went as you can see on the displayed

43
00:02:02,170 --> 00:01:59,360
on the lower left there is a horizontal

44
00:02:04,960 --> 00:02:02,180
velocity indicator as well as a vertical

45
00:02:07,030 --> 00:02:04,970
velocity indicator on the left there is

46
00:02:09,060 --> 00:02:07,040
an altimeter tells you how high this

47
00:02:11,800 --> 00:02:09,070
vehicle is above the surface of Mars on

48
00:02:13,330 --> 00:02:11,810
the bottom is a profile of the

49
00:02:15,340 --> 00:02:13,340
trajectory the vehicles taking through

50
00:02:17,410 --> 00:02:15,350
the atmosphere of Mars on the lower

51
00:02:21,730 --> 00:02:17,420
right is our landing site you can see it

52
00:02:23,500 --> 00:02:21,740
its in green on the lower right there is

53
00:02:26,470 --> 00:02:23,510
a clock that tells us how many seconds

54
00:02:30,480 --> 00:02:26,480
to the next event in this case the next

55
00:02:59,220 --> 00:02:35,260
on the upper right is it the number of

56
00:03:04,770 --> 00:03:01,470
now that the plasma blackout has ended

57
00:03:06,530 --> 00:03:04,780
the signal can be more clearly seen from

58
00:03:09,300 --> 00:03:06,540
our vehicles that are flying overhead in

59
00:03:11,520 --> 00:03:09,310
the case of Odyssey Odyssey is taking

60
00:03:14,130 --> 00:03:11,530
these radio signals and relay them back

61
00:03:15,869 --> 00:03:14,140
to earth where 15 minutes later the

62
00:03:18,390 --> 00:03:15,879
signal arrived at the Deep Space Network

63
00:03:21,059 --> 00:03:18,400

and be interpreted by our team in the

64
00:03:23,640 --> 00:03:21,069
mission-control area here at JPL the

65
00:03:25,199 --> 00:03:23,650
next event is parachute deployment this

66
00:03:27,420 --> 00:03:25,209
is where we launch a cannon that

67
00:03:32,100 --> 00:03:27,430
launches the parachute into the free

68
00:03:37,020 --> 00:03:32,110
stream behind it now this inflation

69
00:03:39,300 --> 00:03:37,030
happens very quickly but quickly the

70
00:03:46,800 --> 00:03:39,310
parachute slows us down to about 120

71
00:03:49,289 --> 00:03:46,810
miles per hour under the control of the

72
00:03:53,890 --> 00:03:49,299
computer the heat shield is released it

73
00:04:01,160 --> 00:03:56,540
seconds later the three lander legs are

74
00:04:04,910 --> 00:04:01,170
released preparing itself for landing on

75
00:04:07,310 --> 00:04:04,920
the surface of mars phoenix landing site

76
00:04:09,470 --> 00:04:07,320
although very far to the north is

77
00:04:12,260 --> 00:04:09,480
actually very low relative to mars

78
00:04:13,940 --> 00:04:12,270
atmosphere for this reason this part of

79
00:04:15,830 --> 00:04:13,950
the entry descent landing timeline is

80
00:04:19,039 --> 00:04:15,840
much longer than it was for the two

81
00:04:21,020 --> 00:04:19,049
Rovers that landed in 2004 we span over

82
00:04:24,320 --> 00:04:21,030
two minutes falling on the parachute at

83
00:04:26,330 --> 00:04:24,330
very high speeds right now we're still

84
00:04:46,950 --> 00:04:26,340
over 150 miles per hour as we're

85
00:04:51,659 --> 00:04:49,659
at this point the radar has been turned

86
00:04:54,999 --> 00:04:51,669
on by the computer and the radar is

87
00:04:56,710 --> 00:04:55,009
searching for the ground it's sending a

88
00:04:58,749 --> 00:04:56,720

pulse to the ground and back up to the

89
00:05:00,969 --> 00:04:58,759
vehicle and from that pulse the vehicle

90
00:05:02,439 --> 00:05:00,979
is able to figure out how fast it's

91
00:05:41,399 --> 00:05:02,449
moving respect to the ground and how

92
00:05:46,109 --> 00:05:43,649
the parachute used by the Phoenix is the

93
00:05:49,019 --> 00:05:46,119
same parachute design used to land both

94
00:05:51,229 --> 00:05:49,029
the Viking missions in the 1970s as well

95
00:05:53,310 --> 00:05:51,239
as the Mars Exploration Rover missions

96
00:06:30,340 --> 00:05:53,320
2004

97
00:06:35,300 --> 00:06:32,780
once the vehicle is low enough to the

98
00:06:37,820 --> 00:06:35,310
ground the on-board computer decides if

99
00:06:40,100 --> 00:06:37,830
it's time to release the lander and let

100
00:06:41,930 --> 00:06:40,110
it fall away from the back shelf as soon

101
00:06:44,780 --> 00:06:41,940
as it does that its engines will start

102
00:06:46,159 --> 00:06:44,790
there are 12 pulsed engines after

103
00:06:47,870 --> 00:06:46,169
writing itself the first thing the

104
00:06:49,220 --> 00:06:47,880
lander does is move away from the back

105
00:06:52,220 --> 00:06:49,230
from the parachute so it doesn't make

106
00:06:54,230 --> 00:06:52,230
recontact during the descent and then

107
00:06:56,330 --> 00:06:54,240
very short period of time the vehicle

108
00:07:02,320 --> 00:06:56,340
will slow itself down and land a little

109
00:07:07,340 --> 00:07:05,090
as soon as we land the helium that

110
00:07:09,620 --> 00:07:07,350
pressurized a propulsion system during

111
00:07:11,480 --> 00:07:09,630
landing is vented this keeps the

112
00:07:20,720 --> 00:07:11,490
hydrazine from potentially leaking onto

113
00:07:22,760 --> 00:07:20,730

the surface of Mars 20 minutes later the

114
00:07:24,710 --> 00:07:22,770
solar panels are deployed these solar

115
00:07:26,360 --> 00:07:24,720
panels will provide the lead electricity

116
00:07:28,640 --> 00:07:26,370
to operate the vehicle that rest of the

117
00:07:30,380 --> 00:07:28,650
mission a few minutes after the solar

118
00:07:32,320 --> 00:07:30,390
rays are deployed the vehicle puts

119
00:07:35,510 --> 00:07:32,330
itself to sleep for about half an hour

120
00:07:38,900 --> 00:07:35,520
once it wakes up again camera will be

121
00:07:40,550 --> 00:07:38,910
deployed the bio barrier that covers the

122
00:07:42,410 --> 00:07:40,560
robotic arm will be released and the

123
00:07:44,660 --> 00:07:42,420
vehicle will start taking pictures of

124
00:07:47,660 --> 00:07:44,670
the solar panels and of the bio barrier

125
00:07:49,130 --> 00:07:47,670
a few minutes after that an orbiter

126
00:07:50,900 --> 00:07:49,140
flies overhead which will allow us to