



1  
00:00:52,070 --> 00:00:49,640  
this experience of spirit is something

2  
00:00:53,630 --> 00:00:52,080  
that I really kind of integrated into my

3  
00:00:55,490 --> 00:00:53,640  
whole identity you know this has become

4  
00:00:57,140 --> 00:00:55,500  
part of what I do and it looked at the

5  
00:00:58,610 --> 00:00:57,150  
very beginning of the mission like this

6  
00:01:00,590 --> 00:00:58,620  
was going to be something that I got to

7  
00:01:03,020 --> 00:01:00,600  
do for very brief time for three months

8  
00:01:04,010 --> 00:01:03,030  
and that was terrific and it was meeting

9  
00:01:06,590 --> 00:01:04,020  
with special I was really looking

10  
00:01:07,850 --> 00:01:06,600  
forward to it and I never in my wildest

11  
00:01:11,240 --> 00:01:07,860  
imagination believed it was going to go

12  
00:01:13,760 --> 00:01:11,250  
on for five years spirit really has had

13  
00:01:15,980 --> 00:01:13,770

to have a lot of spirit to to keep going

14

00:01:18,050 --> 00:01:15,990

it's been the little Rover that could in

15

00:01:22,070 --> 00:01:18,060

a way it's had to work very hard for all

16

00:01:24,710 --> 00:01:22,080

of its discoveries shortly after spirit

17

00:01:27,320 --> 00:01:24,720

landed we had a problem we lost contact

18

00:01:30,139 --> 00:01:27,330

with the rover for a couple of days this

19

00:01:32,030 --> 00:01:30,149

was a particularly scary time because

20

00:01:33,859 --> 00:01:32,040

not only had we lost contact with one of

21

00:01:35,060 --> 00:01:33,869

the Rovers and we didn't know why we had

22

00:01:37,310 --> 00:01:35,070

another Rover coming in for a landing

23

00:01:38,870 --> 00:01:37,320

harden her heels and we didn't know if

24

00:01:40,730 --> 00:01:38,880

whatever it happened the first Rover was

25

00:01:43,370 --> 00:01:40,740

going to happen to the second one it

26  
00:01:46,160 --> 00:01:43,380  
turned out that we were able to regain

27  
00:01:47,870 --> 00:01:46,170  
control of spirit she had filled up her

28  
00:01:49,700 --> 00:01:47,880  
own memory system or the equivalent of

29  
00:01:51,529 --> 00:01:49,710  
her hard disk and she couldn't boot up

30  
00:01:53,480 --> 00:01:51,539  
and she started booting up and said oh

31  
00:01:55,969 --> 00:01:53,490  
look my hard disk is full I can't boot

32  
00:01:57,230 --> 00:01:55,979  
up let me try rebooting and so she was

33  
00:01:59,960 --> 00:01:57,240  
basically just sitting there on Mars

34  
00:02:01,310 --> 00:01:59,970  
punching her own reboot button until we

35  
00:02:02,600 --> 00:02:01,320  
finally came along and figured out what

36  
00:02:06,230 --> 00:02:02,610  
was going on were able to get her to

37  
00:02:09,080 --> 00:02:06,240  
stop one of spirits very dramatic

38  
00:02:11,449 --> 00:02:09,090

challenges was when she was racing the

39

00:02:12,770 --> 00:02:11,459

clock for her first trying to get to her

40

00:02:13,970 --> 00:02:12,780

first winter haven to try to get to a

41

00:02:15,350 --> 00:02:13,980

hill where she could point her solar

42

00:02:17,569 --> 00:02:15,360

panels directly toward the Sun and

43

00:02:19,340 --> 00:02:17,579

survive for the winter and she was

44

00:02:21,410 --> 00:02:19,350

already behind a little bit behind

45

00:02:24,259 --> 00:02:21,420

schedule and she was racing across these

46

00:02:26,990 --> 00:02:24,269

Plains toward the hill and as she was on

47

00:02:28,370 --> 00:02:27,000

her way her right front wheel which have

48

00:02:31,250 --> 00:02:28,380

been giving us some trouble finally

49

00:02:33,979 --> 00:02:31,260

stopped working and so now instead of

50

00:02:35,509 --> 00:02:33,989

having a six-wheeled rover we had a

51  
00:02:37,460 --> 00:02:35,519  
rover with five wheels and an anchor

52  
00:02:38,750 --> 00:02:37,470  
we've ended up having to drive backwards

53  
00:02:39,540 --> 00:02:38,760  
because it's a lot easier to pull an

54  
00:02:42,870 --> 00:02:39,550  
anchor than two

55  
00:02:44,700 --> 00:02:42,880  
one but naturally since it's it's built

56  
00:02:46,440 --> 00:02:44,710  
to have very good traction it basically

57  
00:02:49,020 --> 00:02:46,450  
is digging into the ground and digging

58  
00:02:51,510 --> 00:02:49,030  
this trench behind us and as we did this

59  
00:02:53,460 --> 00:02:51,520  
trench we're able to see things that are

60  
00:02:55,440 --> 00:02:53,470  
normally invisible things that are under

61  
00:02:57,630 --> 00:02:55,450  
the surface one thing that we seem to be

62  
00:03:00,600 --> 00:02:57,640  
finding almost anywhere we're digging

63  
00:03:03,120 --> 00:03:00,610

this trench are these widespread

64

00:03:05,070 --> 00:03:03,130

deposits of various kinds of salts and

65

00:03:07,890 --> 00:03:05,080

minerals they look this brilliant white

66

00:03:09,810 --> 00:03:07,900

or yellow and the color images and

67

00:03:13,530 --> 00:03:09,820

that's because they're either sulphur or

68

00:03:14,850 --> 00:03:13,540

silica or salts of various kinds and the

69

00:03:17,760 --> 00:03:14,860

really important thing about these

70

00:03:21,030 --> 00:03:17,770

minerals and salts in particular is that

71

00:03:22,890 --> 00:03:21,040

the only way they form is with water so

72

00:03:25,320 --> 00:03:22,900

the fact that we're finding these salt

73

00:03:29,130 --> 00:03:25,330

is real evidence that there was hot

74

00:03:31,200 --> 00:03:29,140

water over a very widespread area where

75

00:03:33,420 --> 00:03:31,210

Spirit is exploring right now not just a

76

00:03:34,800 --> 00:03:33,430

little isolated pockets Mars really

77

00:03:37,380 --> 00:03:34,810

could have been a place at supported

78

00:03:40,110 --> 00:03:37,390

life and without these Rovers driving

79

00:03:42,210 --> 00:03:40,120

over these vast distances far beyond

80

00:03:44,940 --> 00:03:42,220

their expectations we would never have

81

00:03:46,650 --> 00:03:44,950

known that even on Mars life can give

82

00:03:49,530 --> 00:03:46,660

you lemons but you make lemonade out of

83

00:03:51,449 --> 00:03:49,540

that in spirits case you know she turned

84

00:03:54,750 --> 00:03:51,459

dragging that right front wheel into a

85

00:03:56,970 --> 00:03:54,760

great scientific discovery winter is a

86

00:03:59,430 --> 00:03:56,980

harsher time for spirit she's up on the

87

00:04:01,080 --> 00:03:59,440

top of home plate and we were scooting

88

00:04:02,520 --> 00:04:01,090

across the top of home plate as fast as

89

00:04:03,960 --> 00:04:02,530

we could toward the north face so we

90

00:04:06,270 --> 00:04:03,970

could tilt our solar panels as directly

91

00:04:07,560 --> 00:04:06,280

as possible toward the Sun and as we

92

00:04:11,580 --> 00:04:07,570

were doing that she went over a little

93

00:04:14,040 --> 00:04:11,590

rise and down into a pit which we now

94

00:04:17,159 --> 00:04:14,050

call Tartarus in this case not only was

95

00:04:18,720 --> 00:04:17,169

she figuratively on the edge she was

96

00:04:20,789 --> 00:04:18,730

also literally on the edge because the

97

00:04:22,530 --> 00:04:20,799

only way to escape from that pit was to

98

00:04:23,970 --> 00:04:22,540

drive right up along the edge of home

99

00:04:26,280 --> 00:04:23,980

plate with absolutely no margin for

100

00:04:29,280 --> 00:04:26,290

error whatsoever and kind of drive up

101  
00:04:30,990 --> 00:04:29,290  
and around this feature and then off to

102  
00:04:33,540 --> 00:04:31,000  
where she was trying to get to and where

103  
00:04:35,379 --> 00:04:33,550  
she could be safe for the winter

104  
00:04:37,800 --> 00:04:35,389  
certainly the the biggest thing that

105  
00:04:40,950 --> 00:04:37,810  
stands out and spirits whole mission is

106  
00:04:43,270 --> 00:04:40,960  
her view from the top of husband Hill

107  
00:04:45,219 --> 00:04:43,280  
this little rover that wasn't ever

108  
00:04:47,710 --> 00:04:45,229  
really designed to climb over anything

109  
00:04:49,750 --> 00:04:47,720  
bigger than her own wheels had now

110  
00:04:52,180 --> 00:04:49,760  
climbed a hill the height of the Statue

111  
00:04:54,430 --> 00:04:52,190  
of Liberty and was standing there at the

112  
00:04:56,890 --> 00:04:54,440  
top of that hill and took this beautiful

113  
00:04:59,409 --> 00:04:56,900

360 degree panorama and just saw the

114

00:05:03,219 --> 00:04:59,419

most beautiful striking hilly landscape

115

00:05:06,219 --> 00:05:03,229

with this spectacular orange sky and the

116

00:05:09,159 --> 00:05:06,229

beautiful rust colored ground and it

117

00:05:10,960 --> 00:05:09,169

just sort of put the whole project in

118

00:05:12,879 --> 00:05:10,970

perspective for me this was what we were

119

00:05:15,520 --> 00:05:12,889

there for to explore and go out and see

120

00:05:18,670 --> 00:05:15,530

new places that have never been seen by

121

00:05:20,860 --> 00:05:18,680

human eyes Mars is pretty harsh place

122

00:05:23,980 --> 00:05:20,870

we've had dust storms before we have

123

00:05:27,700 --> 00:05:23,990

really low power situations in winter

124

00:05:30,909 --> 00:05:27,710

we've had other small glitches that have

125

00:05:32,860 --> 00:05:30,919

caused us some tense moments but spirit

126

00:05:36,370 --> 00:05:32,870

seems to always find a way of turning

127

00:05:40,540 --> 00:05:36,380

some kind of adversity into something

128

00:05:42,580 --> 00:05:40,550

positive it was only by outlasting her

129

00:05:44,950 --> 00:05:42,590

design specifications and never giving

130

00:05:47,550 --> 00:05:44,960

up and absolutely never you know letting

131

00:05:54,660 --> 00:05:47,560

Mars get her down that she ended up