



1
00:00:10,070 --> 00:00:06,470
the radiation belt storm probes

2
00:00:12,470 --> 00:00:10,080
presented by science at nasa

3
00:00:14,629 --> 00:00:12,480
since the dawn of the space age mission

4
00:00:16,630 --> 00:00:14,639
planners have tried to follow one simple

5
00:00:19,189 --> 00:00:16,640
but important rule

6
00:00:21,109 --> 00:00:19,199
stay out of the van allen belts

7
00:00:23,910 --> 00:00:21,119
the two donut shaped regions around

8
00:00:26,310 --> 00:00:23,920
earth are filled with killer electrons

9
00:00:28,390 --> 00:00:26,320
plasma waves and electrical currents

10
00:00:31,589 --> 00:00:28,400
dangerous to human space travelers in

11
00:00:33,510 --> 00:00:31,599
their spacecraft lingering there is not

12
00:00:35,510 --> 00:00:33,520
a good idea

13
00:00:37,430 --> 00:00:35,520

so much for the old rules

14

00:00:39,750 --> 00:00:37,440

nasa has launched two spacecraft

15

00:00:42,709 --> 00:00:39,760

directly into the radiation belts and

16

00:00:45,029 --> 00:00:42,719

this time they plan to stay a while

17

00:00:47,029 --> 00:00:45,039

nasa's radiation belt storm probes have

18

00:00:49,029 --> 00:00:47,039

blasted off from cape canaveral

19

00:00:51,270 --> 00:00:49,039

bristling with sensors the heavily

20

00:00:52,950 --> 00:00:51,280

shielded spacecraft are on a two-year

21

00:00:55,430 --> 00:00:52,960

mission to discover what makes the

22

00:00:57,830 --> 00:00:55,440

radiation belt so dangerous and so

23

00:00:59,670 --> 00:00:57,840

devilishly unpredictable

24

00:01:01,830 --> 00:00:59,680

we've known about the van allen belts

25

00:01:04,630 --> 00:01:01,840

for decades yet they continue to

26

00:01:07,109 --> 00:01:04,640

surprise us with unexpected storms of

27

00:01:09,830 --> 00:01:07,119

killer electrons and other phenomena

28

00:01:11,990 --> 00:01:09,840

says mission scientist david cybeck the

29

00:01:13,990 --> 00:01:12,000

storm probes will help us understand

30

00:01:15,670 --> 00:01:14,000

what's going on out there

31

00:01:19,429 --> 00:01:15,680

when the radiation belts were discovered

32

00:01:21,190 --> 00:01:19,439

in 1958 they upended orthodox ideas

33

00:01:22,630 --> 00:01:21,200

most people assumed the space around

34

00:01:25,190 --> 00:01:22,640

earth was empty

35

00:01:26,789 --> 00:01:25,200

america's first satellite explorer 1

36

00:01:28,950 --> 00:01:26,799

proved otherwise

37

00:01:30,870 --> 00:01:28,960

the tiny spacecraft was equipped with a

38

00:01:33,190 --> 00:01:30,880

geiger tube for counting energetic

39

00:01:36,310 --> 00:01:33,200

protons and electrons

40

00:01:37,990 --> 00:01:36,320

circling earth explorer 1 found so many

41

00:01:41,030 --> 00:01:38,000

charged particles that the counter

42

00:01:43,270 --> 00:01:41,040

registered off scale most of the time

43

00:01:45,749 --> 00:01:43,280

back in the 1950s the radiation belts

44

00:01:47,910 --> 00:01:45,759

had little effect on ordinary people

45

00:01:49,830 --> 00:01:47,920

today they are utterly crucial to our

46

00:01:51,429 --> 00:01:49,840

high-tech society

47

00:01:53,190 --> 00:01:51,439

hundreds of satellites used for

48

00:01:55,910 --> 00:01:53,200

everything from weather prediction to

49

00:01:58,389 --> 00:01:55,920

gps to television routinely skim the

50

00:02:00,630 --> 00:01:58,399

belts subjecting themselves to energetic

51
00:02:03,270 --> 00:02:00,640
particles that can damage solar panels

52
00:02:05,670 --> 00:02:03,280
and short-circuit sensitive electronics

53
00:02:08,070 --> 00:02:05,680
during geomagnetic storms when the belts

54
00:02:09,990 --> 00:02:08,080
are swollen by solar activity whole

55
00:02:11,670 --> 00:02:10,000
fleets of satellites can be engulfed

56
00:02:13,430 --> 00:02:11,680
imperiling the technological

57
00:02:15,670 --> 00:02:13,440
underpinnings of daily life on the

58
00:02:17,750 --> 00:02:15,680
planet below the radiation belt storm

59
00:02:19,830 --> 00:02:17,760
probes directly address these down to

60
00:02:22,070 --> 00:02:19,840
earth problems says lika gujaratha

61
00:02:24,229 --> 00:02:22,080
courta the lead program scientist of

62
00:02:26,150 --> 00:02:24,239
nasa's living with the star program

63
00:02:29,589 --> 00:02:26,160

which manages the mission

64

00:02:31,589 --> 00:02:29,599

rbsp is a unique mix of pure science and

65

00:02:33,190 --> 00:02:31,599

practical application

66

00:02:35,509 --> 00:02:33,200

one of the biggest mysteries of the

67

00:02:38,070 --> 00:02:35,519

radiation belts is the crazy way they

68

00:02:41,030 --> 00:02:38,080

react to solar storms almost anything

69

00:02:43,190 --> 00:02:41,040

can happen says cybec when a storm cloud

70

00:02:45,670 --> 00:02:43,200

from the sun hits the radiation belts

71

00:02:46,630 --> 00:02:45,680

they often respond in counter-intuitive

72

00:02:48,630 --> 00:02:46,640

ways

73

00:02:50,790 --> 00:02:48,640

one possible outcome is that the

74

00:02:53,030 --> 00:02:50,800

radiation belts fill with energetic

75

00:02:55,509 --> 00:02:53,040

particles such as the potent killer

76

00:02:58,070 --> 00:02:55,519

electrons that worry mission planners

77

00:02:59,030 --> 00:02:58,080

however just as often the opposite

78

00:03:01,430 --> 00:02:59,040

happens

79

00:03:03,750 --> 00:03:01,440

a solar storm can cause the belts to

80

00:03:05,670 --> 00:03:03,760

lose their killer particles temporarily

81

00:03:08,710 --> 00:03:05,680

making them a safer place

82

00:03:11,589 --> 00:03:08,720

and sometimes nothing happens the belts

83

00:03:14,470 --> 00:03:11,599

remain completely unchanged

84

00:03:16,470 --> 00:03:14,480

the problem is there is no unified idea

85

00:03:18,869 --> 00:03:16,480

of what phenomena are most important

86

00:03:20,790 --> 00:03:18,879

inside the belt says cybec

87

00:03:22,949 --> 00:03:20,800

he describes attending scientific

88

00:03:25,110 --> 00:03:22,959

conferences on the subject if there are

89

00:03:28,070 --> 00:03:25,120

100 people at a meeting there will be

90

00:03:31,110 --> 00:03:28,080

100 different answers for every question

91

00:03:33,990 --> 00:03:31,120

how are killer electrons energized

92

00:03:35,670 --> 00:03:34,000

some say plasma waves do it others point

93

00:03:37,589 --> 00:03:35,680

to solar wind shocks

94

00:03:40,390 --> 00:03:37,599

others favor diffusion

95

00:03:42,630 --> 00:03:40,400

the list goes on and on

96

00:03:44,149 --> 00:03:42,640

researchers hope rbsp will narrow the

97

00:03:46,390 --> 00:03:44,159

possibilities

98

00:03:48,550 --> 00:03:46,400

during storms the probes can sample

99

00:03:50,869 --> 00:03:48,560

electric and magnetic fields

100

00:03:52,869 --> 00:03:50,879

count the number of energetic particles

101
00:03:54,630 --> 00:03:52,879
and detect plasma waves of many

102
00:03:56,309 --> 00:03:54,640
frequencies

103
00:03:58,470 --> 00:03:56,319
the inner workings of the van allen

104
00:04:01,110 --> 00:03:58,480
belts will be an open book to the two

105
00:04:03,190 --> 00:04:01,120
spacecraft providing data for predictive

106
00:04:05,270 --> 00:04:03,200
models that tell forecasters when it's

107
00:04:07,589 --> 00:04:05,280
safe to enter the belts perform

108
00:04:10,149 --> 00:04:07,599
spacewalks and operate sensitive

109
00:04:13,670 --> 00:04:10,159
electronics the van allen belts are part

110
00:04:15,830 --> 00:04:13,680
of our home in space as gujaratha corta

111
00:04:17,430 --> 00:04:15,840
rbsp will help us learn how to live

112
00:04:20,390 --> 00:04:17,440
there

113
00:04:22,550 --> 00:04:20,400

so much for the old rules indeed

114

00:04:23,510 --> 00:04:22,560

for more news about dangerous places in