



360°

1
00:00:05,990 --> 00:00:04,309
this is bennu one of earth's closest

2
00:00:07,829 --> 00:00:06,000
planetary neighbors

3
00:00:09,270 --> 00:00:07,839
an asteroid roughly the height of a

4
00:00:10,950 --> 00:00:09,280
skyscraper

5
00:00:13,270 --> 00:00:10,960
a remnant from the dawn of the solar

6
00:00:14,549 --> 00:00:13,280
system made of carbon-rich rocks and

7
00:00:16,870 --> 00:00:14,559
boulders

8
00:00:19,109 --> 00:00:16,880
and since late 2018 the place that

9
00:00:20,390 --> 00:00:19,119
nasa's osiris-rex mission has called

10
00:00:22,630 --> 00:00:20,400
home

11
00:00:24,630 --> 00:00:22,640
when osiris-rex arrived it began

12
00:00:26,950 --> 00:00:24,640
wrapping bennu in a complex web of

13
00:00:31,269 --> 00:00:26,960

observations starting with a preliminary

14

00:00:33,590 --> 00:00:31,279

survey of its size shape mass and spin

15

00:00:35,750 --> 00:00:33,600

on new year's eve osiris-rex was

16

00:00:37,910 --> 00:00:35,760

captured into orbit by bennu's minuscule

17

00:00:40,549 --> 00:00:37,920

gravity making it the smallest world

18

00:00:43,430 --> 00:00:40,559

ever to be orbited by a spacecraft

19

00:00:46,229 --> 00:00:43,440

in early 2019 it broke orbit to conduct

20

00:00:48,470 --> 00:00:46,239

a detailed survey a series of sweeping

21

00:00:50,229 --> 00:00:48,480

passes allowed osiris-rex to study

22

00:00:52,630 --> 00:00:50,239

geological features at different

23

00:00:54,790 --> 00:00:52,640

latitudes and times of day enabling

24

00:00:56,389 --> 00:00:54,800

stereo imaging and landmark-based

25

00:00:58,950 --> 00:00:56,399

navigation

26
00:01:00,869 --> 00:00:58,960
during the detailed survey osiris-rex

27
00:01:02,950 --> 00:01:00,879
globally mapped bennu at only five

28
00:01:05,350 --> 00:01:02,960
centimeters per pixel the highest

29
00:01:07,670 --> 00:01:05,360
resolution of any planetary body

30
00:01:09,830 --> 00:01:07,680
including earth

31
00:01:12,630 --> 00:01:09,840
on june 12th the spacecraft entered a

32
00:01:15,030 --> 00:01:12,640
new orbit at an altitude of just 680

33
00:01:16,789 --> 00:01:15,040
meters setting another record and

34
00:01:19,749 --> 00:01:16,799
establishing a home orbit for the

35
00:01:22,149 --> 00:01:19,759
remainder of the mission

36
00:01:24,230 --> 00:01:22,159
in september it began reconnaissance on

37
00:01:26,310 --> 00:01:24,240
four candidate sample collection sites

38
00:01:28,070 --> 00:01:26,320

potential locations on bennu to touch

39

00:01:29,510 --> 00:01:28,080

down and collect a sample later in the

40

00:01:31,670 --> 00:01:29,520

mission

41

00:01:33,590 --> 00:01:31,680

osiris-rex concluded its first year at

42

00:01:35,749 --> 00:01:33,600

bennu back in orbit circling the

43

00:01:37,350 --> 00:01:35,759

asteroid's terminator or boundary

44

00:01:39,429 --> 00:01:37,360

between day and night

45

00:01:41,670 --> 00:01:39,439

here outside forces acting on the

46

00:01:44,630 --> 00:01:41,680

spacecraft are balanced allowing it to

47

00:01:46,950 --> 00:01:44,640

orbit within the same plane over time

48

00:01:48,950 --> 00:01:46,960

reconnaissance resumed in early 2020

49

00:01:51,030 --> 00:01:48,960

with close flyovers of the primary

50

00:01:53,350 --> 00:01:51,040

sample collection site nightingale and

51
00:01:55,910 --> 00:01:53,360
the backup site osprey

52
00:01:58,069 --> 00:01:55,920
in mid-april osiris-rex performed the

53
00:02:00,069 --> 00:01:58,079
first of two rehearsals prior to sample

54
00:02:03,109 --> 00:02:00,079
collection it navigated to a

55
00:02:05,190 --> 00:02:03,119
predetermined checkpoint about 125

56
00:02:09,990 --> 00:02:05,200
meters above bennu then descendant

57
00:02:14,070 --> 00:02:11,589
after the checkpoint rehearsal

58
00:02:16,869 --> 00:02:14,080
osiris-rex flew one final reconnaissance

59
00:02:18,869 --> 00:02:16,879
sortie over sight osprey then it made a

60
00:02:20,869 --> 00:02:18,879
series of high-altitude maneuvers while

61
00:02:22,710 --> 00:02:20,879
rebooting its on-board processor and

62
00:02:27,110 --> 00:02:22,720
preparing for its second rehearsal of

63
00:02:31,990 --> 00:02:29,830

on august 11th osiris-rex departed its

64

00:02:34,630 --> 00:02:32,000

home orbit and made a four-hour traverse

65

00:02:37,190 --> 00:02:34,640

to bennu's northern hemisphere retracing

66

00:02:38,869 --> 00:02:37,200

its earlier path after performing the

67

00:02:40,949 --> 00:02:38,879

checkpoint engine burn to begin its

68

00:02:42,949 --> 00:02:40,959

descent it made a second engine burn

69

00:02:45,190 --> 00:02:42,959

called match point to match bennu's

70

00:02:48,630 --> 00:02:45,200

rotation before backing away at an

71

00:02:50,550 --> 00:02:48,640

altitude of approximately 40 meters

72

00:02:53,190 --> 00:02:50,560

now the most crucial moment of the

73

00:02:56,630 --> 00:02:53,200

mission had arrived

74

00:02:59,270 --> 00:02:56,640

on october 20th 2020 at approximately 11

75

00:03:00,790 --> 00:02:59,280

30 a.m mountain time the spacecraft

76

00:03:02,949 --> 00:03:00,800

departed orbit

77

00:03:04,790 --> 00:03:02,959

a few hours before mission controllers

78

00:03:06,869 --> 00:03:04,800

on earth had sent the commands for the

79

00:03:08,149 --> 00:03:06,879

touch and go sample collection maneuver

80

00:03:10,070 --> 00:03:08,159

or tag

81

00:03:12,470 --> 00:03:10,080

as they watched with anticipation

82

00:03:14,630 --> 00:03:12,480

osiris-rex steered itself to sample site

83

00:03:17,750 --> 00:03:14,640

nightingale maneuvering toward the small

84

00:03:20,229 --> 00:03:17,760

crater at the walking pace of a spider

85

00:03:23,190 --> 00:03:20,239

at 4 11 pm the mission received

86

00:03:25,509 --> 00:03:23,200

confirmation osiris-rex had touched down

87

00:03:27,750 --> 00:03:25,519

and collected its sample

88

00:03:30,390 --> 00:03:27,760

following tag the spacecraft drifted to

89

00:03:32,149 --> 00:03:30,400

a safe distance away from bennu by the

90

00:03:34,149 --> 00:03:32,159

end of october mission controllers

91

00:03:36,470 --> 00:03:34,159

determined that it had exceeded its goal

92

00:03:38,789 --> 00:03:36,480

of collecting 60 grams of asteroid

93

00:03:40,710 --> 00:03:38,799

material they directed it to stow the

94

00:03:41,509 --> 00:03:40,720

sample in preparation for return to

95

00:03:43,830 --> 00:03:41,519

earth

96

00:03:47,030 --> 00:03:43,840

before departing venue osiris-rex was

97

00:03:48,949 --> 00:03:47,040

given one final task on april 7th it

98

00:03:50,630 --> 00:03:48,959

flew over site nightingale to observe

99

00:03:52,390 --> 00:03:50,640

how the sample collection event had

100

00:03:55,030 --> 00:03:52,400

changed the surface

101

00:03:57,110 --> 00:03:55,040

and with that osiris-rex had recorded