1
00:00:00,000 --> 00:00:02,870
What do you think would be the
craziest shape you could imagine

2
00:00:02,870 --> 00:00:04,538
the asteroid being?

3
00:00:04,538 --> 00:00:09,877
[logo music]

4
00:00:09,877 --> 00:00:13,046
Hello space fans, I'm Katrina
Jackson with the Office of

5
00:00:13,046 --> 00:00:16,316
Communications at NASA's Goddard
Space Flight Center. Two years

6
00:00:16,316 --> 00:00:19,453
ago, in September 2016,
OSIRIS-REx launched...

7
00:00:19,453 --> 00:00:20,587
[rocket engine burn]
>>ANNOUNCER'S VOICE:

8
00:00:20,587 --> 00:00:24,291
And liftoff of OSIRIS-REx!
[cheering] Oh my gosh! Woo!

9
00:00:24,291 --> 00:00:26,660
...NASA's first mission
to go collect a sample from an

10
00:00:26,660 --> 00:00:30,898
asteroid and return it to Earth.
Now it's August of 2018, and

11
00:00:30,898 --> 00:00:33,934

OSIRIS-REx is finally
approaching its target, asteroid

12
00:00:33,934 --> 00:00:37,237
Bennu. So I found a couple
people who can explain what the

13
00:00:37,237 --> 00:00:40,574
spacecraft is doing during this
approach phase and why it’s so

14
00:00:40,574 --> 00:00:43,377
exciting to get to this point in
the mission. [music starts]

15
00:00:43,377 --> 00:00:47,080
What is the approach phase of
the OSIRIS-REx mission? The

16
00:00:47,080 --> 00:00:52,886
approach phase is when we reach
about two million kilometers

17
00:00:52,886 --> 00:00:56,957
from the asteroid Bennu. You
know we’ve been approaching

18
00:00:56,957 --> 00:00:59,726
Bennu ever since we launched,
but once we reach this period

19
00:00:59,726 --> 00:01:03,196
where we’re about two million
kilomters away, that’s when our

20
00:01:03,196 --> 00:01:06,900
cameras can start to pick up
Bennu and see it as a single

21
00:01:06,900 --> 00:01:10,604

pixel in the image. So what will you be doing throughout this

22
00:01:10,604 --> 00:01:12,940
approach phase? Sure, so I'm part of the flight dynamics

23
00:01:12,940 --> 00:01:15,342
team, and that basically means that I work with a team of

24
00:01:15,342 --> 00:01:18,278
highly skilled engineers, from Kinetix Aerospace and Goddard

25
00:01:18,278 --> 00:01:21,014
Space Flight Center, and we're responsible for navigating the

26
00:01:21,014 --> 00:01:24,351
spacecraft. During the approach phase, so we'll take those

27
00:01:24,351 --> 00:01:27,487
images, we'll process them, we'll figure out very precisely

28
00:01:27,487 --> 00:01:31,391
where Bennu is in the image, and we'll take that data and feed it

29
00:01:31,391 --> 00:01:35,062
into our software, along with some tracking data from the DSN,

30
00:01:35,062 --> 00:01:37,831
range and doppler measurements, and we'll figure out our best

31
00:01:37,831 --> 00:01:41,101

estimate of where the spacecraft is relative to the asteroid and

32
00:01:41,101 --> 00:01:43,203
also where the asteroid is relative to the rest of the

33
00:01:43,203 --> 00:01:46,707
solar system. And during this phase, will you be looking out

34
00:01:46,707 --> 00:01:49,543
for any sort of hazards around the asteroid, like little moons

35
00:01:49,543 --> 00:01:52,713
or dust? Yeah absolutely. We have specific science

36
00:01:52,713 --> 00:01:55,215
observation campaigns where they'll be looking for small

37
00:01:55,215 --> 00:01:58,385
satellite possibilities or activity on the asteroid. We

38
00:01:58,385 --> 00:02:01,321
don't expect any of that but we'll have to look out for it

39
00:02:01,321 --> 00:02:05,058
just in case. So Lori, I know your background is planetary

40
00:02:05,058 --> 00:02:08,628
science. As a planetary scientist, how excited are you

41
00:02:08,628 --> 00:02:11,832

about the OSIRIS-REx mission and
about bringing a sample of an

42
00:02:11,832 --> 00:02:15,335
asteroid back for the first time
for NASA? This is incredibly

43
00:02:15,335 --> 00:02:18,338
exciting. The asteroids are the
building blocks of the solar

44
00:02:18,338 --> 00:02:21,742
system, that's what built and
made up our planets. They

45
00:02:21,742 --> 00:02:25,545
possibly carry the building
blocks, the molecules that could

46
00:02:25,545 --> 00:02:29,383
lead to life. But even more than
that, most of our missions we

47
00:02:29,383 --> 00:02:33,253
send a satellite to go orbit a
planet or maybe a lander to go

48
00:02:33,253 --> 00:02:36,623
land on the surface. But they
stay there and do their science

49
00:02:36,623 --> 00:02:40,727
at that location. OSIRIS-REx is
going to grab a sample and bring

50
00:02:40,727 --> 00:02:44,831
it back to Earth. And that is
really special and unique. We

51
00:02:44,831 --> 00:02:49,403

can not only analyze that sample
today, but then we can save that

52
00:02:49,403 --> 00:02:52,272
sample and as our knowledge
grows in the future and as our

53
00:02:52,272 --> 00:02:55,809
laboratory capabilities grow in
the future, we can go back and

54
00:02:55,809 --> 00:02:58,812
reanalyze that sample. It will
be there for us to keep learning

55
00:02:58,812 --> 00:03:02,883
from. So OSIRIS-REx launched two
years ago in 2016. It’s finally

56
00:03:02,883 --> 00:03:05,819
starting the approach phase. How
excited are you to get to this

57
00:03:05,819 --> 00:03:08,655
point in the mission? Oh very
exciting. Like you said it’s,

58
00:03:08,655 --> 00:03:11,858
we’ve been preparing for years
for this even before launch. And

59
00:03:11,858 --> 00:03:14,761
kind of planning and testing and
working out what we’re going to

60
00:03:14,761 --> 00:03:17,964
do when we get to the asteroid,
and kind of making assumptions

61
00:03:17,964 --> 00:03:20,967

of what the asteroid will look
like and how it will be. And we

62
00:03:20,967 --> 00:03:23,003
have some pretty good
ground-based estimates, but you

63
00:03:23,003 --> 00:03:25,338
know we won't know until we
actually get there. And this is

64
00:03:25,338 --> 00:03:28,241
the first time we get to see it
and it's sort of starting the

65
00:03:28,241 --> 00:03:31,244
proximity operations phase where
we'll be working in the vicinity

66
00:03:31,244 --> 00:03:34,214
of the asteroid for two years or
more. What do you think would be

67
00:03:34,214 --> 00:03:37,818
the craziest shape you could
imagine the asteroid being? So

68
00:03:37,818 --> 00:03:41,488
right now it's fairly a benign
shape, it's kind of bulged in

69
00:03:41,488 --> 00:03:45,459
the center. But if you look at
pictures of 67P

70
00:03:45,459 --> 00:03:47,961
Churyumov-Gerasimenko, the
comet, where it's kind of a

71
00:03:47,961 --> 00:03:50,430

rubber duck, I don’t think it’s
going to be that extreme, but

72
00:03:50,430 --> 00:03:53,266
you never know. I think probably
the worst case it will be really

73
00:03:53,266 --> 00:03:56,636
maybe kind of stretched out more
than we think more top shaped

74
00:03:56,636 --> 00:04:01,508
than spherical. Why would that
be worst case? So, worst case

75
00:04:01,508 --> 00:04:04,711
for us, ‘cause obviously
eventually we have to go down to

76
00:04:04,711 --> 00:04:08,281
the surface and touch it. So if
it’s irregularly shaped, or if

77
00:04:08,281 --> 00:04:11,885
it’s kind of rotating or
spinning a complex way, that we,

78
00:04:11,885 --> 00:04:14,921
it’s hard to characterize. You
know, a nice spherical shape

79
00:04:14,921 --> 00:04:17,390
would be nice for designing
trajectories down to the

80
00:04:17,390 --> 00:04:19,493
surface. And if it’s more
irregular that would be a little

81
00:04:19,493 --> 00:04:21,561

more challenging. Yeah, it would be nice if the asteroid is

82
00:04:21,561 --> 00:04:24,164
simple and makes it easy for you guys. Yes, it would, but we

83
00:04:24,164 --> 00:04:26,633
can't, you know as they say, you can't put requirements on the

84
00:04:26,633 --> 00:04:30,337
asteroid. So we'll have to kind of adapt our mission to whatever

85
00:04:30,337 --> 00:04:35,008
it gives us, and I think we're ready. As Kenny said, the

86
00:04:35,008 --> 00:04:37,711
OSIRIS-REx team is definitely ready to start this exciting

87
00:04:37,711 --> 00:04:40,914
next phase of the mission. OSIRIS-REx will arrive at Bennu

88
00:04:40,914 --> 00:04:44,484
in December of this year, 2018, and then it will spend the next

89
00:04:44,484 --> 00:04:47,754
year and a half studying the asteroid. In July of 2020,

90
00:04:47,754 --> 00:04:50,824
OSIRIS-REx will collect a sample from the surface of Bennu, and

91
00:04:50,824 --> 00:04:54,928

then it will deliver that sample
to Earth in 2023. So stay tuned

92
00:04:54,928 --> 00:04:57,364
over the next several months and
years to learn about the

93
00:04:57,364 --> 00:05:00,433
spacecraft’s progress in helping
us unveil the mysteries of our

94
00:05:00,433 --> 00:05:02,068
solar system’s formation.

95
00:05:02,068 --> 00:05:09,309
[music fades out]

96
00:05:09,309 --> 00:05:12,913
[OSIRIS- REx logo]

97
00:05:12,913 --> 00:05:16,183
[satellite swooshes by,
beep beep, beep beep, beep beep]