1
00:00:04,238 --> 00:00:06,740
The OSIRIS-REx mission is an
asteroid sample return mission

2
00:00:06,740 --> 00:00:10,844
and the main goal is to collect
60 grams of pristine sample from

3
00:00:10,844 --> 00:00:15,015
the surface of the near-Earth
asteroid Bennu. Bennu's rocky

4
00:00:15,015 --> 00:00:18,418
surface presented a challenge
for the original LIDAR-based

5
00:00:18,418 --> 00:00:22,623
approach to the Touch-and-Go
sample acquisition event. As an

6
00:00:22,623 --> 00:00:25,692
alternative, the project
developed an onboard, optical

7
00:00:25,692 --> 00:00:31,198
based approach called Natural
Feature Tracking. NFT requires

8
00:00:31,198 --> 00:00:34,735
detailed, 3-dimensional maps of
the surface of Bennu. In order

9
00:00:34,735 --> 00:00:37,504
to build those 3-dimensional
maps, we needed many many images

10
00:00:37,504 --> 00:00:41,408
of particular patches of the
surface on Bennu itself. So, all

11
00:00:41,408 --> 00:00:44,645
these surveys that we've done
throughout the mission have been

12
00:00:44,645 --> 00:00:47,080
at distances between several
kilometers from the asteroid,

13
00:00:47,080 --> 00:00:49,683
down to just a few hundred
meters from the surface. And

14
00:00:49,683 --> 00:00:51,618
based on those different
perspectives and what the

15
00:00:51,618 --> 00:00:55,122
shading of the terrain is, it is
possible to build a 3D model.

16
00:00:55,122 --> 00:00:58,058
Very similar to how we have two
eyes that allow us to have depth

17
00:00:58,058 --> 00:01:01,495
perception of what we see, NFT
requires multiple features

18
00:01:01,495 --> 00:01:06,133
across the field of view to have
a depth perception. The original

19
00:01:06,133 --> 00:01:09,970
TAG accuracy requirement was to
touch the surface within a

20
00:01:09,970 --> 00:01:13,507
50-meter diameter circle. Based
on Bennu's rough surface, our

21
00:01:13,507 --> 00:01:16,577
actual performance has to be
much better than that, at

22
00:01:16,577 --> 00:01:20,047
10-meters or less. And even
within that 10-meter area, there

23
00:01:20,047 --> 00:01:23,984
could be smaller, localized
hazards that may damage the

24
00:01:23,984 --> 00:01:26,920
spacecraft. Right now, we are
working on a flight software

25
00:01:26,920 --> 00:01:31,458
patch to help us avoid hazards
as we come in for our sample

26
00:01:31,458 --> 00:01:33,827
event. When we do Natural
Feature Tracking, that is all

27
00:01:33,827 --> 00:01:36,663
autonomous onboard the
spacecraft – where we load the

28
00:01:36,663 --> 00:01:39,733
features, or a catalog to the
spacecraft – so we are telling

29
00:01:39,733 --> 00:01:42,569
it where we expect these
features to be. So, as the

30
00:01:42,569 --> 00:01:45,539
spacecraft makes its progress
down to taking the sample, we’re

31
00:01:45,539 --> 00:01:48,241
recording images and then
locating those landmarks to make

32
00:01:48,241 --> 00:01:51,411
sure we’re on the right track.
And if there are any issues with

33
00:01:51,411 --> 00:01:54,614
the trajectory or we see
landmarks where we shouldn’t, we