
LUCY
FIRST TO THE TROJANS
SWRI • NASA • LM

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00:00:00,000 --> 00:00:03,604
The Lucy Mission is going to
fly past seven asteroids in

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00:00:03,604 --> 00:00:06,773
twelve years with one
spacecraft. We are going to an

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00:00:06,773 --> 00:00:11,578
amazing variety of objects with
this mission, and it’s really

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00:00:11,578 --> 00:00:15,949
almost pure luck that allowed us
to get as many rich targets as

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00:00:15,949 --> 00:00:20,921
we are. Literally, the planets
were aligning to allow us to do

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00:00:20,921 --> 00:00:25,192
this mission. The Lucy Mission
is named after the Lucy fossil,

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00:00:25,192 --> 00:00:28,862
the Australopithecus fossil,
that was discovered in the 1970s

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00:00:28,862 --> 00:00:32,699
in Ethiopia. And just like the
Lucy fossil transformed our

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00:00:32,699 --> 00:00:36,169
understanding of hominid
evolution, the Lucy Mission will

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00:00:36,169 --> 00:00:39,907
transform our understanding of
Solar System evolution. Trojan

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00:00:39,907 --> 00:00:43,477
Asteroids are an interesting
population of small bodies that

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00:00:43,477 --> 00:00:48,148
are left over from the formation
of the planets. And they lead or

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00:00:48,148 --> 00:00:53,020
follow Jupiter in its orbit by
roughly sixty degrees. If you

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00:00:53,020 --> 00:00:56,456
just look at the gravitational
attraction of the Sun and

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00:00:56,456 --> 00:00:59,126
Jupiter and put something
exactly sixty degrees in front

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00:00:59,126 --> 00:01:03,897
of Jupiter, it’s stable forever.
So, as a result these objects

17
00:01:03,897 --> 00:01:07,401
are really the leftovers of
planet formation. The stuff that

18
00:01:07,401 --> 00:01:12,906
went into growing Jupiter and
Saturn are now trapped in these

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00:01:12,906 --> 00:01:16,109
locations. The very first
asteroid we get to is a main

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00:01:16,109 --> 00:01:19,413
belt asteroid named
DonaldJohanson. We named that

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00:01:19,413 --> 00:01:23,150
asteroid in honor of the
researcher who found the Lucy

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00:01:23,150 --> 00:01:27,120
fossil. We're going to use that
asteroid to do a rehearsal on

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00:01:27,120 --> 00:01:29,623
our spacecraft to make sure that
everything is working properly

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00:01:29,623 --> 00:01:32,426
so that when we get to the
Trojan asteroids, we're ready to

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00:01:32,426 --> 00:01:36,330
go. We're visiting both of the
Trojan swarms. In the first

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00:01:36,330 --> 00:01:39,266
orbit, we're going into the
leading swarm and we're going to

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00:01:39,266 --> 00:01:44,237
encounter four Trojan targets:
Eurybates, Polymele, Leucus, and

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00:01:44,237 --> 00:01:47,441
Orus. And from this, we're going
to sample the diversity in

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00:01:47,441 --> 00:01:52,546
sizes, colors, and compositions.
The first two flybys happen just

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00:01:52,546 --> 00:01:55,949
about thirty days apart, so it's
going to be a pretty busy

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00:01:55,949 --> 00:02:00,053
kickoff to the season of
exploring the asteroids in the

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00:02:00,053 --> 00:02:04,124
L4 swarm. And then, we'll fly
past Earth again and out to the

33
00:02:04,124 --> 00:02:08,095
L5 swarm. The final object we're
visiting, which I must admit is

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00:02:08,095 --> 00:02:12,366
my favorite, is a binary object.
So, that's two Trojans that

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00:02:12,366 --> 00:02:16,036
orbit a common center of mass,
it's called Patroclus and

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00:02:16,036 --> 00:02:19,840
Menoetius. These objects are
nearly identical in size that

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00:02:19,840 --> 00:02:23,610
orbit one another. From the Lucy
Mission we're going to study the

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00:02:23,610 --> 00:02:26,613
diversity of our targets because
that tells us something about

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00:02:26,613 --> 00:02:29,516
their origin and where they came
from. The interesting thing

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00:02:29,516 --> 00:02:33,120
about small bodies in general is
that they are the leftovers of

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00:02:33,120 --> 00:02:36,356
planet formation. If you look at
the eight planets that we know

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00:02:36,356 --> 00:02:39,192
about, for example, they are
highly processed because of

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00:02:39,192 --> 00:02:43,663
internal processing. These
asteroids are objects that

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00:02:43,663 --> 00:02:47,601
really haven't changed much from
when the planets assembled

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00:02:47,601 --> 00:02:52,372
themselves. As a result, by
studying them we can figure out

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00:02:52,372 --> 00:02:56,443
the physical conditions of the
early Solar System as well as

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00:02:56,443 --> 00:03:01,148
how the planets grew and how
they moved around early on. All

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00:03:01,148 --> 00:03:05,252
of that will help us form a
detailed picture of what these

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00:03:05,252 --> 00:03:09,523
objects really look like because
right now our best images are

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00:03:09,523 --> 00:03:14,227
just a point of light. Even
using the Hubble Space Telescope

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00:03:14,227 --> 00:03:17,864
or adaptive optics on large,
ground-based telescopes, we

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00:03:17,864 --> 00:03:21,401
can’t see surface details. And
it’s going to take the Lucy