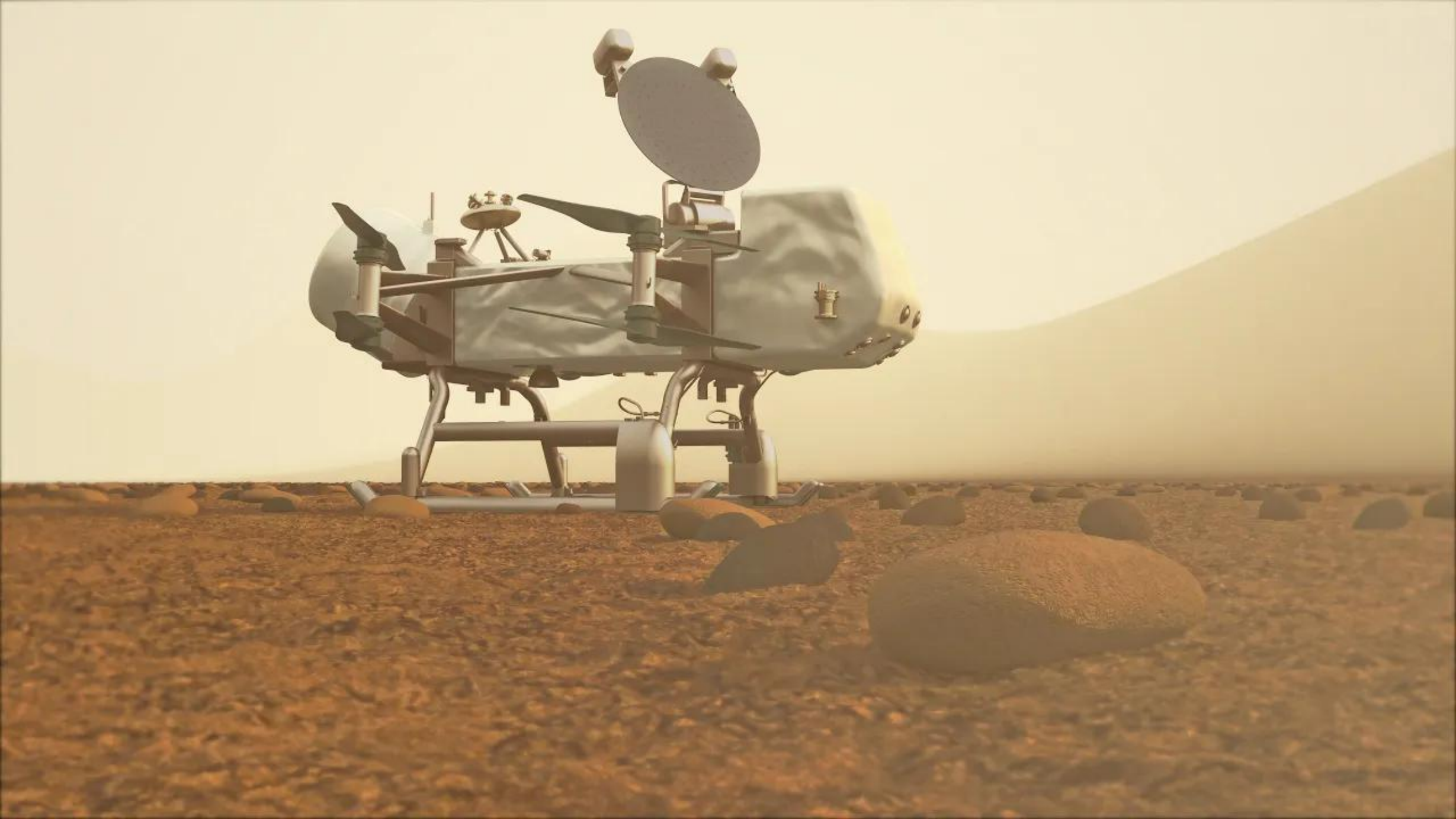

1
00:00:05,910 --> 00:00:03,350
saturn's largest moon titan has a thick

2
00:00:07,829 --> 00:00:05,920
atmosphere and a frozen surface rich in

3
00:00:10,950 --> 00:00:07,839
organic molecules

4
00:00:12,870 --> 00:00:10,960
in 2034 a nasa mission called dragonfly

5
00:00:14,230 --> 00:00:12,880
will arrive at titan and study its

6
00:00:16,870 --> 00:00:14,240
chemical makeup

7
00:00:19,109 --> 00:00:16,880
dragonfly is a rotorcraft designed to

8
00:00:22,230 --> 00:00:19,119
visit multiple sites across the moon's

9
00:00:26,950 --> 00:00:24,230
at each new landing site on titan's

10
00:00:29,509 --> 00:00:26,960
surface dragonfly uses a pulsed neutron

11
00:00:31,910 --> 00:00:29,519
generator and onboard gamma-ray sensor

12
00:00:34,470 --> 00:00:31,920
to detect key elements such as carbon

13
00:00:36,630 --> 00:00:34,480

and hydrogen in organic materials or

14
00:00:38,389 --> 00:00:36,640
oxygen in water ice

15
00:00:40,630 --> 00:00:38,399
dragonfly determines if there are

16
00:00:42,470 --> 00:00:40,640
well-defined layers of these materials

17
00:00:45,029 --> 00:00:42,480
just below the lander

18
00:00:47,270 --> 00:00:45,039
for a closer inspection dragonfly uses

19
00:00:50,150 --> 00:00:47,280
its drill to generate tailings from

20
00:00:51,830 --> 00:00:50,160
titan's hard frozen surface

21
00:00:53,910 --> 00:00:51,840
these surface samples can then be

22
00:00:55,990 --> 00:00:53,920
ingested through the pneumatic system

23
00:00:58,229 --> 00:00:56,000
carried with titan air into the chilled

24
00:00:59,830 --> 00:00:58,239
sample lines into the sample collection

25
00:01:03,910 --> 00:00:59,840
carousel

26
00:01:05,990 --> 00:01:03,920
placed in a pneumatic port

27
00:01:08,149 --> 00:01:06,000
the cup captures the surface material

28
00:01:09,670 --> 00:01:08,159
from the cold air stream and transfers

29
00:01:11,190 --> 00:01:09,680
it to the chemical laboratory for

30
00:01:13,270 --> 00:01:11,200
measurement

31
00:01:14,870 --> 00:01:13,280
pulses from a laser release large

32
00:01:16,710 --> 00:01:14,880
organic molecules from the surface

33
00:01:18,149 --> 00:01:16,720
sample for analysis in the mass

34
00:01:22,950 --> 00:01:18,159
spectrometer

35
00:01:24,710 --> 00:01:22,960
mass and measures diagnostic fragments

36
00:01:26,390 --> 00:01:24,720
that tell dragonfly the kinds of

37
00:01:27,990 --> 00:01:26,400
chemical components that are present in

38
00:01:30,950 --> 00:01:28,000

the surface and whether there are

39
00:01:33,510 --> 00:01:30,960
molecules of prebiotic interest

40
00:01:35,670 --> 00:01:33,520
for those potential prebiotic samples a

41
00:01:37,830 --> 00:01:35,680
new cup is placed into an oven and

42
00:01:39,830 --> 00:01:37,840
heated to release molecules into a gas

43
00:01:41,830 --> 00:01:39,840
chromatograph where they are sorted for

44
00:01:43,109 --> 00:01:41,840
size and type before entering the mass

45
00:01:45,270 --> 00:01:43,119
spectrometer

46
00:01:47,910 --> 00:01:45,280
this advanced separation of organic

47
00:01:49,670 --> 00:01:47,920
components includes isolating molecules

48
00:01:52,230 --> 00:01:49,680
with the same formula but different

49
00:01:54,149 --> 00:01:52,240
chiral arrangements or handedness

50
00:01:56,630 --> 00:01:54,159
having a preference for one-handedness

51
00:01:58,149 --> 00:01:56,640
over another is a key biosignature for

52
00:02:00,230 --> 00:01:58,159
life on earth

53
00:02:02,389 --> 00:02:00,240
when the chemical analysis is complete

54
00:02:05,109 --> 00:02:02,399
dragonfly may choose to take another

55
00:02:08,279 --> 00:02:05,119
surface sample or find a new location on