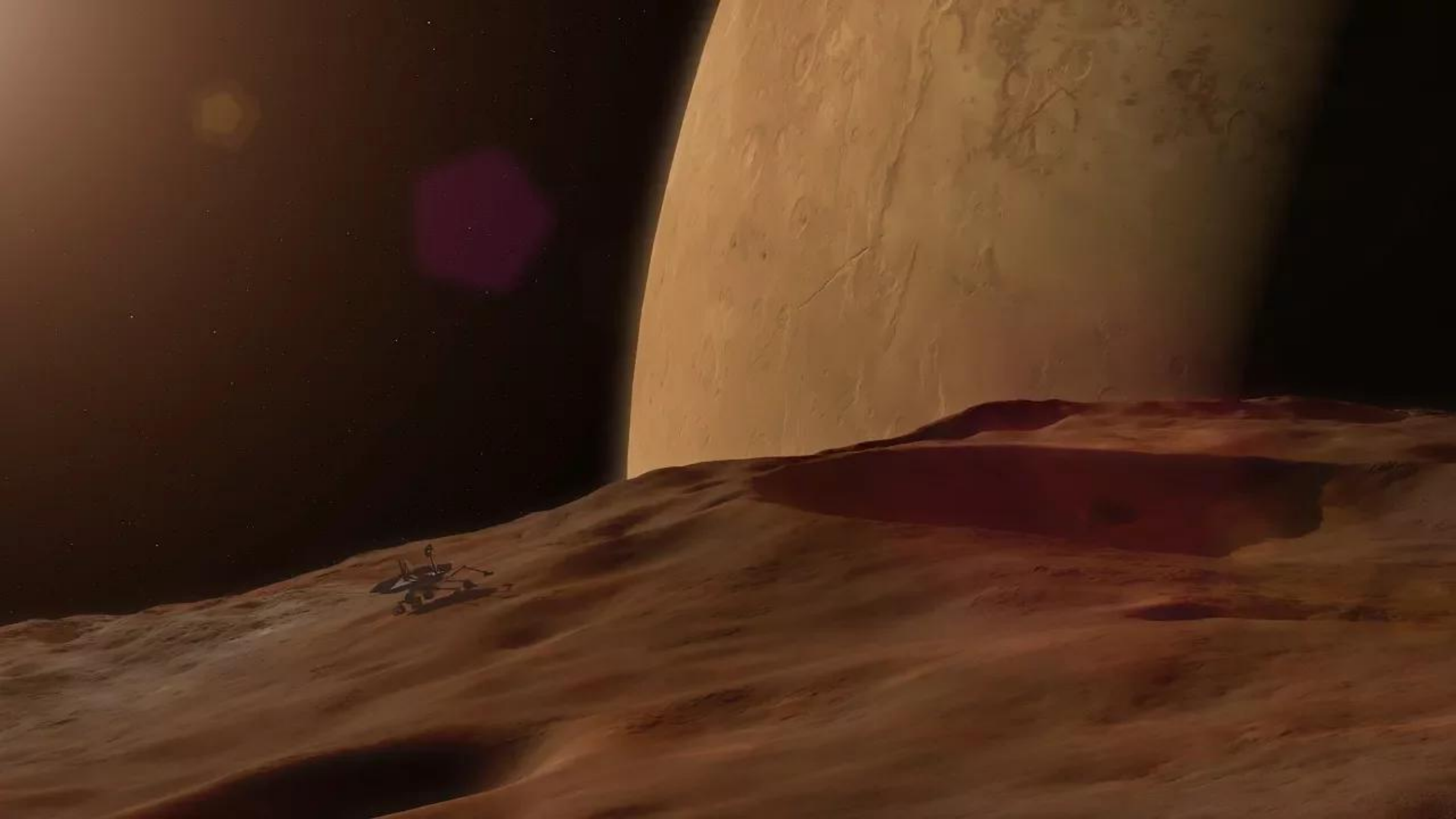

1
00:00:01,235 --> 00:00:04,037
Mars has two moons,
Phobos and Deimos.

2
00:00:04,037 --> 00:00:07,708
Both are small, airless
bodies with irregular shapes.

3
00:00:07,708 --> 00:00:10,911
To better understand these
moons, scientists at NASA's

4
00:00:10,911 --> 00:00:13,647
Goddard Space Flight
Center simulated the solar wind

5
00:00:13,647 --> 00:00:15,716
environment at Phobos.

6
00:00:15,716 --> 00:00:18,919
Phobos orbits incredibly
close to Mars, only thirty-seven

7
00:00:18,919 --> 00:00:21,021
hundred miles above the surface.

8
00:00:21,021 --> 00:00:24,791
In fact, it whips around the
planet in less than eight hours!

9
00:00:24,791 --> 00:00:28,295
Because it has no atmosphere
or magnetosphere, Phobos plows

10
00:00:28,295 --> 00:00:31,331
directly into the solar
wind for part of its orbit.

11
00:00:31,331 --> 00:00:34,835

The solar wind consists of
negatively charged electrons,

12
00:00:34,835 --> 00:00:39,072
which are light, and positively
charged ions, which are heavy.

13
00:00:39,072 --> 00:00:42,576
Normally they exist in equal
numbers, so the solar wind is

14
00:00:42,576 --> 00:00:44,144
electrically neutral.

15
00:00:44,144 --> 00:00:47,247
Phobos, however, absorbs the
solar wind on its dayside,

16
00:00:47,247 --> 00:00:50,050
leaving a void
over its night side.

17
00:00:50,050 --> 00:00:53,153
Because the electrons are
lighter than the ions, they rush

18
00:00:53,153 --> 00:00:54,655
in to fill the void.

19
00:00:54,655 --> 00:00:58,358
This creates a field of negative
electric potential over Phobos

20
00:00:58,358 --> 00:01:00,928
and statically
charges its night side.

21
00:01:00,928 --> 00:01:03,964
The ions are attracted to the
field and pulled in farther

22
00:01:03,964 --> 00:01:07,401
downstream, restoring the
solar wind's density and neutral

23
00:01:07,401 --> 00:01:08,902
charge.

24
00:01:08,902 --> 00:01:12,773
The simulation also looked at a
massive crater called Stickney.

25
00:01:12,773 --> 00:01:15,509
It showed that when Stickney
falls into shadow, electrons

26
00:01:15,509 --> 00:01:18,445
initially move into the crater,
and the associated electric

27
00:01:18,445 --> 00:01:21,148
potential forces
the ions to keep up.

28
00:01:21,148 --> 00:01:23,984
On the smaller scale, this
electrically charges the crater

29
00:01:23,984 --> 00:01:27,020
interior through the same
process that charges the larger

30
00:01:27,020 --> 00:01:28,655
night side.

31
00:01:28,655 --> 00:01:31,725
Phobos is often cited as a
target for future exploration,

32

00:01:31,725 --> 00:01:34,695
but roving around on the
night side, or within shadowed

33
00:01:34,695 --> 00:01:37,931
craters, could build up
static electric charge, possibly

34
00:01:37,931 --> 00:01:39,933
affecting sensitive equipment.

35
00:01:39,933 --> 00:01:42,836
Mission planners will have to
face this challenge as they set

36
00:01:42,836 --> 00:01:44,972
their sights on
the moons of Mars.