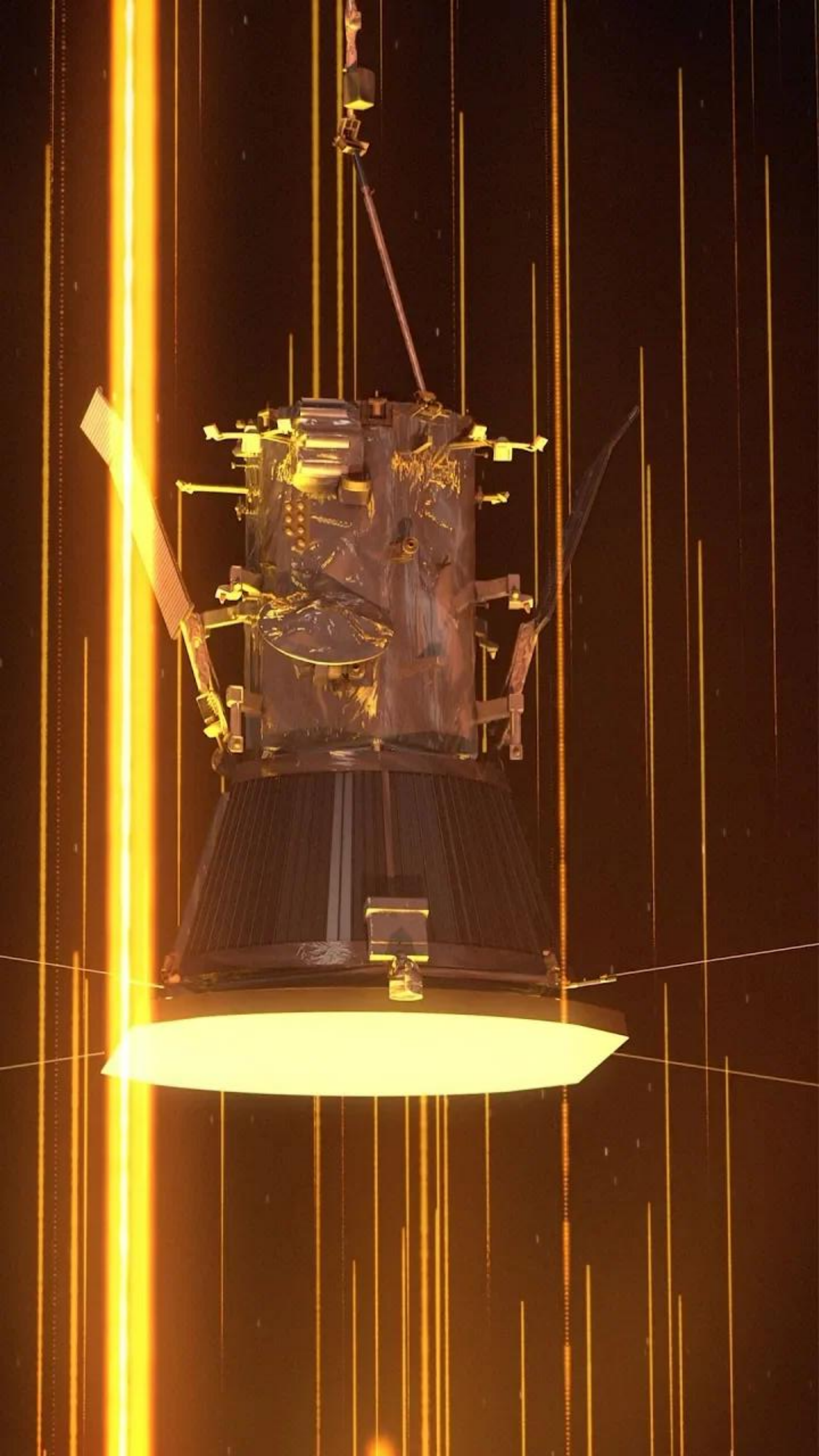

1
00:00:00,000 --> 00:00:03,560
music

2
00:00:03,560 --> 00:00:08,000
Narrator: NASA's Parker Solar Probe is a mission to explore the Sun. How can it do that?

3
00:00:08,020 --> 00:00:11,380
Why won’t the spacecraft melt? Excellent questions.

4
00:00:12,200 --> 00:00:16,200
You can’t face off with the sun without packing the right gear.

5
00:00:16,210 --> 00:00:20,200
This is why Solar Probe is equipped with a white shield that reflects heat off the front and keeps things cool in t

6
00:00:20,220 --> 00:00:24,200
Betsy Congdon: The heat shield is made of a couple of different materials.

7
00:00:24,220 --> 00:00:28,210
One is of carbon carbon which is a lot like the graphite epoxy

8
00:00:28,220 --> 00:00:32,000
you might see in your golf clubs or tennis rackets, but it’s been super heated.

9
00:00:32,000 --> 00:00:36,200
The inside is a carbon foam which is another form of carbon which

10
00:00:36,220 --> 00:00:39,640
is about 97% air. It's a very light weight way of making

11
00:00:39,640 --> 00:00:41,620
a very strong structure.

12
00:00:41,620 --> 00:00:48,400
Narrator: Nobody likes a needy explorer. Solar Probe can take care of itself, thank you very much,

13
00:00:48,420 --> 00:00:52,400

and that’s because it has autonomy software that will keep its instruments safe and cool behind the heat shield

14
00:00:54,280 --> 00:00:56,420
We are too far away to joystick it into place,

15
00:00:56,440 --> 00:01:00,430
so it basically has to always be sensing whether

16
00:01:00,450 --> 00:01:04,430
or not the heat shield is in the right position and correct itself

17
00:01:04,450 --> 00:01:08,450
if it isn’t. There are these things called solar limb sensors,

18
00:01:08,470 --> 00:01:12,460
just poking out at the very edge of the shadow. If those get illuminated,

19
00:01:12,480 --> 00:01:16,470
the spacecraft knows, “Oh, I’m going the wrong direction,” and can actually right itself.

20
00:01:16,490 --> 00:01:20,480
Narrator: It’s important to stay hydrated in the Sun, even for a spacecraft!

21
00:01:20,500 --> 00:01:24,480
Solar Probe circulates water to keep the solar cells

22
00:01:24,500 --> 00:01:27,860
from overheating. It stays cool and keeps power.

23
00:01:27,860 --> 00:01:32,480
Betsy: Basically water flows behind the solar arrays and into the radiators,

24
00:01:32,510 --> 00:01:36,510
so the water warms up behind the solar cells and then cools

25
00:01:36,520 --> 00:01:40,340
down at the radiator that heat transfer is happening a lot like

26
00:01:40,340 --> 00:01:41,740
the veins in your body

27
00:01:43,920 --> 00:01:48,520
Narrator: Yes, you read right: Heat is not the same as temperature. Temperature is a measurement, but heat is

28
00:01:48,540 --> 00:01:52,520
This matters because Solar Probe will be

29
00:01:52,540 --> 00:01:56,530
visiting the sun’s outer layer, the corona. Like all stars,

30
00:01:56,550 --> 00:02:00,540
the Sun is made of plasma. How tightly packed that plasma is

31
00:02:00,560 --> 00:02:04,740
depends on the layer. While the Sun’s corona has a very high temperature

32
00:02:04,760 --> 00:02:08,740
the plasma particles are fairly spread out, so even though the temperature

33
00:02:08,760 --> 00:02:10,960
in the corona is 2- to 3-million degrees Fahrenheit,

34
00:02:10,960 --> 00:02:13,960
the heat around the spacecraft is manageable.

35
00:02:13,960 --> 00:02:19,660
Betsy: The corona and where we are going is actually not that dense at all, there’s only a couple particles.

36
00:02:19,720 --> 00:02:24,740
Those are very hot, but we aren’t touching a lot of them.

37
00:02:24,770 --> 00:02:28,760
So, it’s kind of like when you put your hand into an oven. The oven might be at 400 degrees Fahrenheit,

38
00:02:28,780 --> 00:02:32,240

but your hand isn’t going to be at 400 degrees Fahrenheit.

39
00:02:32,240 --> 00:02:37,160
Narrator: Thanks to its design and destination, this cool, confident spacecraft is all set to explore.

40
00:02:37,160 --> 00:02:41,300
We can just sit back and chill, as Parker Solar Probe takes the heat.

41
00:02:41,300 --> 00:02:44,860
music

42
00:02:44,880 --> 00:02:48,880
tone