



Why Won't

Parker Solar Probe

Melt?

1
00:00:00,010 --> 00:00:04,000
music

2
00:00:04,020 --> 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 --> 00:00:12,180
Why won't the spacecraft melt? Excellent questions.

4
00:00:12,200 --> 00:00:16,190
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
00:00:28,230 --> 00:00:32,210
you might see in your golf clubs or tennis rackets, but it's been super heated.

9
00:00:32,230 --> 00:00:36,210
The inside is a carbon foam which is another form of carbon which

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00:00:36,230 --> 00:00:40,210
is about 97% air. It's a very light weight way of making

11
00:00:40,230 --> 00:00:44,210
a very strong structure.

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00:00:44,230 --> 00:00:48,400
Narrator: Nobody likes a needy explorer. Solar Probe can take care of itself, thank you very much,

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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

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00:00:52,420 --> 00:00:56,420

We are too far away to joystick it into place,

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00:00:56,440 --> 00:01:00,430

so it basically has to always be sensing whether

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00:01:00,450 --> 00:01:04,430

or not the heat shield is in the right position and correct itself

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00:01:04,450 --> 00:01:08,450

if it isn't. There are these things called solar limb sensors,

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00:01:08,470 --> 00:01:12,460

just poking out at the very edge of the shadow. If those get illuminated,

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00:01:12,480 --> 00:01:16,470

the spacecraft knows, "Oh, I'm going the wrong direction," and can actually right itself.

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00:01:16,490 --> 00:01:20,480

Narrator: It's important to stay hydrated in the Sun, even for a spacecraft!

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00:01:20,500 --> 00:01:24,480

Solar Probe circulates water to keep the solar cells

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00:01:24,500 --> 00:01:28,490

from overheating. It stays cool and keeps power.

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00:01:28,510 --> 00:01:32,490

Betsy: Basically water flows behind the solar arrays and into the radiators,

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00:01:32,510 --> 00:01:36,510

so the water warms up behind the solar cells and then cools

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00:01:36,530 --> 00:01:40,510

down at the radiator that heat transfer is happening a lot like

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00:01:40,530 --> 00:01:44,510

the veins in your body

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00:01:44,530 --> 00:01:48,520

Narrator: Yes, you read right: Heat is not the same as temperature. Temperature is a measurement, but heat is

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00:01:48,540 --> 00:01:52,520

This matters because Solar Probe will be

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00:01:52,540 --> 00:01:56,530

visiting the sun's outer layer, the corona. Like all stars,

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00:01:56,550 --> 00:02:00,540

the Sun is made of plasma. How tightly packed that plasma is

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00:02:00,560 --> 00:02:04,740

depends on the layer. While the Sun's corona has a very high temperature

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00:02:04,760 --> 00:02:08,740

the plasma particles are fairly spread out, so even though the temperature

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00:02:08,760 --> 00:02:12,740

in the corona is 1,000,000 Fahrenheit,

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00:02:12,760 --> 00:02:16,750

the heat around the spacecraft is manageable.

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00:02:16,770 --> 00:02:20,750

Betsy: The corona and where we are going is actually not that dense at all, there's only a couple particles.

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00:02:20,770 --> 00:02:24,750

Those are very hot, but we aren't touching a lot of them.

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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,

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00:02:28,780 --> 00:02:32,770

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

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00:02:32,790 --> 00:02:36,850

Narrator: Thanks to its design and destination, this cool, confident spacecraft is all set to explore.

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00:02:36,870 --> 00:02:40,850

We can just sit back and chill, as Parker Solar Probe takes the heat.

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00:02:40,870 --> 00:02:44,860

music

42

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

tone