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The Martian

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I guess I should explain how Mars missions work, for any layman who may be reading this. We got to Earth orbit the normal way, through an ordinary ship to *Hermes*. All the Ares missions use *Hermes* to get to and from Mars. It's really big and cost a lot so NASA built only one.

Once we got to *Hermes*, four additional unmanned missions brought us fuel and supplies while we prepared for our trip. Once everything was a go, we set out for Mars. But not very fast. Gone are the days of heavy chemical fuel burns and trans-Mars injection orbits.

Hermes is powered by ion engines. They throw argon out the back of the ship really fast to get a tiny amount of acceleration. The thing is, it doesn't take much reactant mass, so a little argon (and a nuclear reactor to power things) let us accelerate constantly the whole way there. You'd be amazed at how fast you can get going with a tiny acceleration over a long time.

I could regale you with tales of how we had great fun on the trip, but I won't. I don't feel like reliving it right now. Suffice it to say we got to Mars 124 days later without strangling each other.

From there, we took the MDV (Mars descent vehicle) to the surface. The MDV is basically a big can with some light thrusters and parachutes attached. Its sole purpose is to get six humans from Mars orbit to the surface without killing any of them.

And now we come to the real trick of Mars exploration: having all of our shit there in advance.

A total of fourteen unmanned missions deposited everything we would need for surface operations. They tried their best to land all the supply vessels in the same general area, and did a reasonably good job. Supplies aren't nearly so fragile as humans and can hit the ground really hard. But they tend to bounce around a lot.

Naturally, they didn't send us to Mars until they'd confirmed that all the supplies had made it to the surface and their containers weren't breached. Start to finish, including supply missions, a Mars mission takes about three years. In fact, there were Ares 3 supplies en route to Mars while the Ares 2 crew were on their way home.

The most important piece of the advance supplies, of course, was the MAV. The Mars ascent vehicle. That was how we would get back to *Hermes* after surface operations were complete. The MAV was soft-landed (as opposed to the balloon bounce-fest the other supplies had). Of course, it was in constant communication with Houston, and if there had been any

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