Electric propulsion to inject satellites into orbit

By 2022, one-fourth of all satellites could well be "all electric". Electric propulsion offers higher efficiency and is better adapted to space exploration than conventional chemical propulsion systems, paving the way for a new era in space.
GPS and satellites

"In 500 meters, turn left...". The monotone woman's voice lulls the passengers in the Wissard's family car. But Matty, just 10, suddenly wakes up, asking, Dad, how does the GPS know where we are? It all happens up in the skies over our heads. Satellites transmit signals that allow the GPS system to know exactly where we are! You'd be surprised at all the ways satellites are used: from TV broadcasting to Internet access to mapping the Earth, studying our climate, forecasting weather, and much more.

Two propulsion methods

Matty is insatiable when it comes to space:

Successful Ariane 5 launches in a row
Airbus Safran Launchers supplies 474 metric tons of solid propellant for each Ariane 5 launch.

The solid booster motors developed by Safran provide 90% of the liftoff thrust for Ariane 5.

And how do satellites propel themselves? Do they use hyperpropulsion, like on Star Wars?

His dad answers with a smile:

That's a good question. First, it has to be placed into an initial orbit, using a rocket. Then it has to use its own systems to reach its final orbit and stay in the same place.
The budding astronaut continues his interrogation,
So it must have a big engine, right?
In fact, answers his dad, there are two types of satellite propulsion: one using chemical reactions and the other electrical power. Both expel gases that propel the satellite. The difference is that a chemical propulsion system has to carry a lot of fuel, representing nearly two-thirds of the satellite's total weight. But satellites with electric propulsion use electrical energy from their own solar panels to eject gases at very high speeds, according to the same principle by which the same poles on two magnets repel each other. It's all about positive ions in an electrical field, but I'll explain more when you're older.

Lighter satellites, to go even further

So electric satellites are lighter?
Exactly, replies Mr. Wissard. For a given satellite, one with chemical propulsion will weigh six tons, but an electric version only four tons. Of course, it will take longer to get to its final orbit, but in space it's better to be a tortoise than a hare. Take Safran’s first electric thruster for instance, the PPS®1350: it was the main propulsion system for a lunar probe, launched in 2003 with just 80 kilos of xenon gas as its fuel. It reached the Moon in 2006 after operating for nearly 5,000 hours. And as we speak, there’s a satellite in orbit called Alphasat that stays ‘on station’ using its electric thrusters. You know what Matty? When it finishes its mission, you’ll be 25 years old. Just imagine, all that time in space with just a few dozen kilos of gas.

Looking skyward through the car’s windows, the boy begins to dream of stars and galaxies. With electric propulsion for satellites, space exploration is headed for some very exciting discoveries.