How Orbital Rings Work

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2021

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Intro

My fictional universe makes extensive use of orbital rings: giant rings that circle around planets. Unfortunately, they haven't gotten much attention so I'll explain what they are, how they work, and how they're used in my stories.

Basic Concept

Note: if you don't care how the orbital ring works, skip to Applications

The concept of an orbital ring was created by Nikola Tesla. As he explains on page 36 of *MY INVENTIONS*:

> Another one of my projects was to construct a ring around the equator which would, of course, float freely and could be arrested in its spinning motion by reactionary forces, thus enabling travel at a rate of about one thousand miles an hour, impracticable by rail.

Huh? A spinning ring around the equator? How could this be used for fast travel? I'll explain.
Let's say you want to build a ring around the equator 80 km above the ground that you can climb up to and down from using a ladder from your house, also on the equator. Why is irrelevant. We can do this without any new physics or materials; here's how:

First, let's imagine a ring of small satellites orbiting the Earth 80 km above the equator. These satellites are not moving relative to each other; they're all in the same orbit going at the same speed. As a result, we could string them all together with a wire without causing any issues. In fact, we don't even need the satellites; they're just there to help us visualize this. We can just have a giant spinning ring of wire in orbit.

Now that we have a ring orbiting the Earth, let's try to get to it. If we attached a ladder to the ring, it would move at many kilometers each second, missing your house. Instead, we can put a gondola going the opposite direction of the ring's rotation at orbital speed. The gondola's speed would cancel out the ring's and it would be effectively sitting still 80 km above the ground. All that has to be done now is to lower an 80 km ladder to your house and you can climb to space.

Engineering Issues

This is the basic concept, but you may have noticed some engineering problems with this ring. First off, the wheels of the gondola would be destroyed by friction. This can be solved by making the wire magnetic and using a maglev train instead of a gondola. Since the maglev train hovers, there's no more friction.

Another problem is that a normal ladder would snap under its own weight. This can be solved by using a very strong material, such as Kevlar or possibly carbon nanotubes. We can also have an elevator going up this ladder, or even entire trains if scaled up enough.

There are other, more minor, engineering issues with the orbital ring, but those are covered in Isaac Arthur's video.

Applications

In the last 2 sections, we designed a ring around the planet with maglev trains on it. These trains are connected to the ground with elevators or train tracks. So what?

One thing that would make this useful is that those train tracks can be run at angles so that they can run straight to cities. We can also add other rings at different orbits, which would allow anywhere on Earth to connect to one. In addition, we can add maglev trains that move relative to the ground. These additions make the orbital ring(s) extremely useful.

Just as Tesla envisioned, these rings can be used for rapid transportation by running vacuum trains on them. Using a system of these, you would be able to go anywhere over Earth in around 1 hour!

Another application is sending rockets off orbital rings; the ring can be used to speed up so that the rocket doesn't need to carry any fuel for getting into orbit. This can also be done in reverse to slow down incoming ships.

In my stories, orbital rings are used for quick transport around Earth and for space travel on Earth and around other planets. I hope this article clears up some confusion. If you want to learn even more, see the links in Works Cited.

Works Cited

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