The Future of Ion-Propelled Aircraft

By Rohan Suresh

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History

Electrical engineer Ethan Krauss has created the first self-contained, ion-powered aircraft. Inspired by the Seversky ionocraft, his version of the aircraft performed its first hop in 2006 and he is working to improve it.

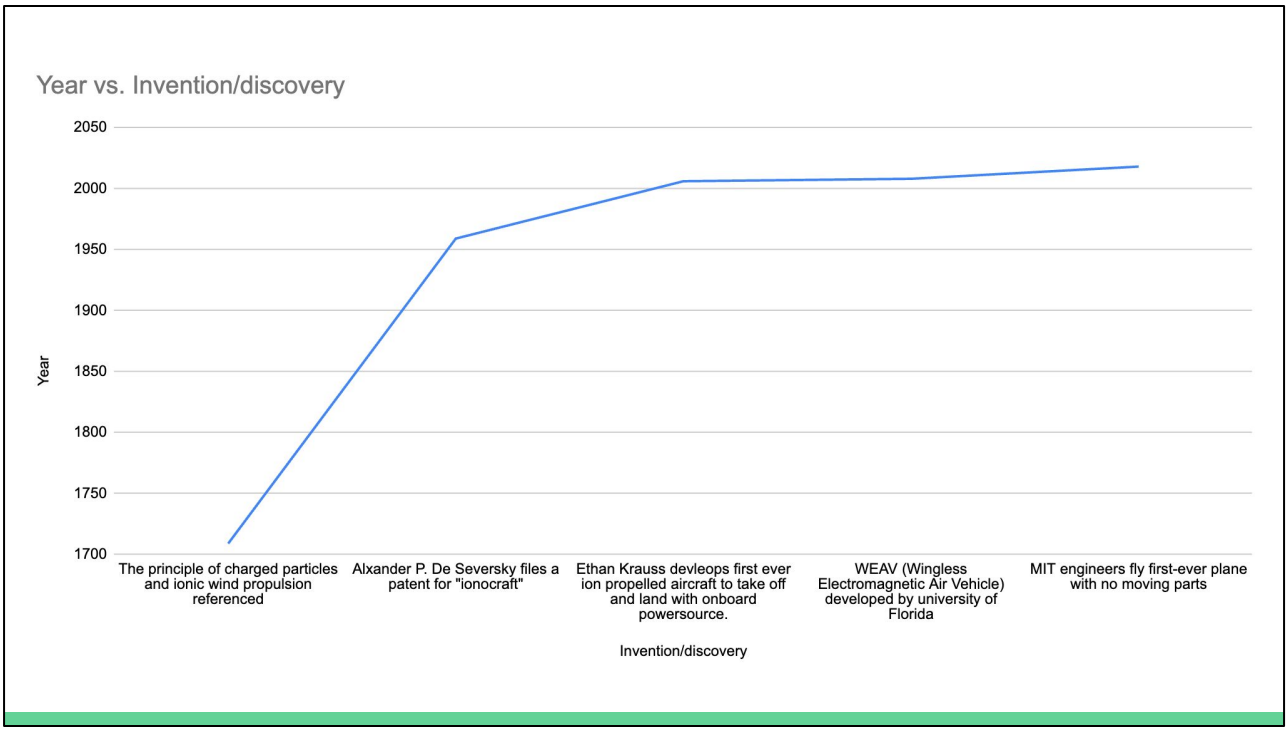
Fig 1. Alexander P. De Seversky

Electrical engineer Ethan Krauss has created the first self-contained, ion-powered aircraft. Inspired by the Seversky ionocraft (an aircraft that had a power source connected to the ground), Krauss set out to build his own version that could fly with its power supply onboard — and has spent nearly 21 years working on the project.

The aircraft, which achieved its first hop in 2006, now successfully flies for a couple of minutes at a time.

Made with thick boron filaments and silver-coated polymers, the aircraft utilizes the flow of electricity to fly. Electrons build up on the positive terminals, which causes negatively charged oxygen in the air to create a flow of particles downward that sends the craft up.

Moving forward, Krauss is working to improve stabilization and steering, as well as add solar film so that the vehicle can fly for as long as the sun is shining, even in a vacuum.


Year vs. Invention/discovery
2050
2000
1950
1900
1850
1800
1750
1700
Year
The principle of charged particles and ionic wind propulsion referenced
Alxander P. De Seversky files a patent for "ionocraft"
Ethan Krauss devleops first ever ion propelled aircraft to take off and land with onboard powersource.
WEAV (Wingless Electromagnetic Air Vehicle) developed by university of Florida
MIT engineers fly first-ever plane with no moving parts
Invention/discovery

Plan and Implementation

MIT researchers have developed and created an aircraft with no moving parts; completely propelled through “ion winds”.

“This has potentially opened new and unexplored possibilities for aircraft which are quieter, mechanically simpler, and do not emit combustion emissions.” says Steven Barrett, associate professor of aeronautics and astronautics at MIT.

This new aircraft is extremely carbon efficient, and could be the future of air travel.

“This is the first-ever sustained flight of a plane with no moving parts in the propulsion system,” says Steven Barrett, associate professor of aeronautics and astronautics at MIT. “This has potentially opened new and unexplored possibilities for aircraft which are quieter, mechanically simpler, and do not emit combustion emissions.”

Since the first airplane took flight over 100 years ago, virtually every aircraft in the sky has flown with the help of moving parts such as propellers, turbine blades, or fans that produce a persistent, whining buzz.

Now MIT engineers have built and flown the first-ever plane with no moving parts. Instead of propellers or turbines, the light

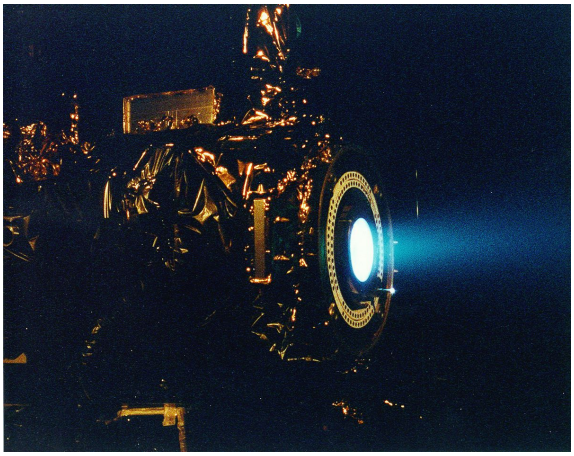
aircraft is powered by an “ionic wind” — a silent but mighty flow of ions that is produced aboard the plane, and that generates enough thrust to propel the plane over a sustained, steady flight.

Unlike turbine-powered planes, the aircraft does not depend on fossil fuels to fly. And unlike propeller-driven drones, the new design is completely silent.

Video on Ion Propulsion:

Upsides/Pros to the Advancement

- No carbon emissions
- Extremely efficient
- Can accelerate extremely quickly
- Completely silent



https://news.mit.edu/2018/first-ionic-wind-plane-no-moving-parts-1121

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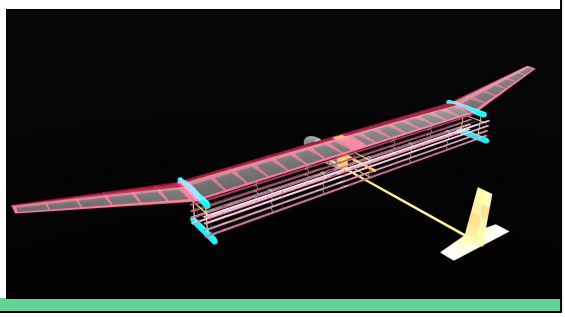
A key advantage of ion propulsion is efficiency. The exhaust from an ion engine travels up to 10 times faster than does the exhaust from a chemical engine, generating far more thrust per pound of propellant.

Downsides/Cons to the Advancement

- Very inefficient in terms of energy consumption
- Low acceleration when compared to chemical rockets
- Has quite low thrust
- Ion drives require an external energy source



Very low acceleration when compared to chemical rockets.

Low thrust prevents its use to launch from a planetary surface – its thrust is simply too small, the ship would not move at all (besides ion drives work only in a vacuum).

Unlike a chemical rocket (where the fuel is also the energy source), an ion drive also needs an external energy source.

Summary

I am very in favor of this newly emerging technology.

I see lots of environmental and global benefits that ion propelled aircraft can bring to the air travel industry.

While it is relatively small scale now, with ion drives only being able to produce small amounts of thrust, I believe that this can be great and revolutionize the aerospace industry as a whole.

Generating an ionic wind requires lots of energy, and the size and weight of the equipment necessary was believed to make it impractical for propelling aircraft of any size. However, hobbyists have been playing for years with small triangular "lifters" made of balsa wood and foil, which Barrett credits as one of his inspirations for exploring the technology (along with the spaceships in *Star Trek* and *Star Wars*). One of the MIT team's crucial breakthroughs: They built an innovative power converter capable of stepping up the battery's output to 40,000 volts that's much lighter than anything previously produced.

Why It Matters: The system as a whole works together to efficiently carry its own weight, with the added benefit of almost no carbon emission production.

References

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