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## The Electric Airship Revolution Is Almost Here. Are We Ready?

Companies around the world, including one backed by Google co-founder Sergey Brin, are hoping to resurrect the airship as a green energy, cargo-hauling alternative, but a few obstacles still remain.



BY [DARREN ORF](#) PUBLISHED: AUG 2, 2023

The first age of airships ended in flames—the next one begins with an entire world on fire.

With a warming climate rapidly melting the ice caps, animals blinking out of existence, and once-in-a-lifetime weather events regularly filling seven-day forecasts, scientists, governments, engineers, activists, and basically

anyone who likes planet Earth are rushing to figure out ways to ditch fossil fuels for green energy.

Some changes are obvious. Replace internal combustion engines with EVs. Duh. Retire CO<sub>2</sub>-spewing power plants and invest in wind, solar, and nuclear. No brainer. But there's a big elephant in the room—one that comes with two turbo-prop engines, not enough legroom, and an insatiable hunger for jet fuel.

Jet airliners are notorious for spewing carbon monoxide, carbon dioxide, sulfur oxides, and nitrogen oxides—basically all the bad oxides. Although valiant efforts to develop sustainable jet fuels or even fully electrified alternatives have produced some promising results, airplanes simply require too much energy to sustainably keep 100,000 pounds of metal aloft.

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But what if your aircraft could be *lighter* than air?

“The First World War is what gave planes their first boost, and the Second World War pushed them to jet engines... but the new war is the war against carbon emissions,” Barry Prentice, director of the Transport Institute at the University of Manitoba and co-founder of Buoyant Aircraft Systems International (BASI), tells *Popular Mechanics*. “Climate change... is changing how we look at technology and also the airship itself.”

Resurrected from the graveyard of aviation, airships have become the engineering obsession of companies around the world. In California, LTA Research, backed by Google co-founder Sergey Brin, is preparing for test flights of its Pathfinder 1 rigid airship. The France- and Canada-based company Flying Whales, which received hundreds of millions of dollars in funding (including some from the French government), is currently testing its 650-foot-long LCA60T dirigible. And after a decade of development, Hybrid Air Vehicle in the U.K. is readying production of its Airlander 10 blimp.

Lots of people (with lots of money) say there's a future in airships, but what does that look like exactly?

## Old Name, New Tech

Airships are some of the oldest aircraft in human history. In the 18th century, they carried the Montgolfier brothers over the palace of Versailles, and nearly a century later, the U.S. military established its first ever aviation unit during the Civil War called the balloon corps.



A Civil War observation balloon. Thaddeus Lowe's *Intrepid* near Gaines Mill, Virginia, circa 1865.

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### The Civil War Balloonist Who Invented Aerial Recon

Because of this long lineage, airships sometimes feel like technology frozen in the past. But comparing today's electric airships to the grand Zeppelins of the interwar years is kind of like saying a Douglas DC-3 is just like an Airbus A320. Sure, they're both planes, but that's basically where the similarities end.

"The big old airships had cow intestines pasted on linen sheets to create the gas bags," Prentice says. "Today no one is going to fly in an airship that hasn't flown in a computer first. The tools have gotten a lot better and so have the materials—you're not going to use cow intestines anymore." Instead, you're going to use advanced materials to maximize every ounce of lift generated by an airship's helium (or hydrogen) gas bags.

Arguably the Rolls-Royce of this new generation of airships is LTA Research's Pathfinder 1. Founded in 2015 and backed by Google co-founder Sergey Brin, the company has been tight-lipped about its airship efforts, but in May 2023, *Bloomberg* finally got a peek under the hood. Dotting the Pathfinder 1's spec sheet are words like "Kevlar," "carbon fiber," "ripstop nylon," and "hydrogen fuel cells"—all technologies completely unimaginable to airship engineers a century ago.

In other words, this ain't your granddaddy's airship.

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## Anatomy of a Modern Airship



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“Just one example of the novel engineering found in Pathfinder 1 is a tool using lidar, which measures helium volume in gas cells in real time. It's an airship tool that never existed before and an LTA invention that increases the safety of our next-generation airships,” LTA Research CEO Alan Weston told *Popular Mechanics* in an email. “LTA intends to increase the capabilities of Pathfinder airships, with the possibility of solar or hydrogen fuel cells to power our electric propulsion system.”

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LTA Research sees the role of its airship as more of a cargo hauler and less of a people mover. While airships can deliver tonnage more sustainably than air cargo (which is often performed by the oldest, and therefore least efficient, planes), airships will likely never beat airplanes in terms of pure speed.

“The jet engine is a fabulous invention and I certainly don’t want to give them up,” Prentice says, “But there’s not justification for a cargo jet because freight doesn’t complain... I think people will look back and, if anything, they’re going to pick out and say ‘what the hell were they thinking,’ it’s going to be cargo jets.”

But even in a supporting cargo role, airships can take a huge bite out of global carbon emissions while also reaching parts of the world that airplanes and helicopters simply can’t reach or supply efficiently.

With the urgency of climate change adding fuel to the fire, Prentice thinks the single largest market for airships is to ferry goods across oceans. But one question remains: can they even make the journey?

## Picturing the Solar-Powered Dream

Christoph Pflaum is *not* an airship engineer. Instead, he lives in a world of simulations. An expert in leveraging numerical computations to answer complex problems, Pflaum is a mathematician at Friedrich-Alexander-Universität Erlangen-Nürnberg who figures out the nitty-gritty realities of how things work, including optical simulations of thin-film solar cells.

“I became interested in how we use solar cells... but there was one area where we have difficulty using only renewable energy and that’s transport of goods over the Atlantic,” Pflaum told *Popular Mechanics*. “Then I saw the airship from Zeppelin NT... and I thought ‘okay, this is the place where we need to put thin-film solar cells.’”

Using his expertise in simulation analysis, Pflaum and his team calculated all the nuances of weather, solar availability, and materials to figure out the optimal route solar airships should take across the Atlantic and if they can hang tough with their gas-guzzling competition. The results of his work were published in the *International Journal of Sustainable Energy* this past March.

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And the answer? Hell yeah they can.

“To find the optimal route is really a hard problem from a computer science point of view because there are so many directions you can go,” Pflaum says. So his team designed digital “towns” and “streets” across the Atlantic by creating a grid system for their theoretical solar airship to travel through between London and New York. The team then created “highways” across the ocean using wind data and solar availability to further influence the airship’s journey.



Inside the Pathfinder 1 gondola.

LTA Research

Pflaum's simulations created routes that snaked into the North Atlantic in the summer and plummeted toward the equator in the winter—all in search of the optimum amount of solar energy during transit. The final results showed that solar airships, designed with a rigid construction to withstand winds, could drastically reduce the emissions of cargo transport to as little as one percent compared to a conventional airliner.

“Solar airships are undeniably environmentally friendly since they are outfitted with exceptionally light and immensely efficient thin-film solar cells that recharge continuously throughout the flight,” Plaum said in a press release back in March. “Consequently, no combustion-related discharges are produced during the airship's operation.”

## EYES ON THE SKIES



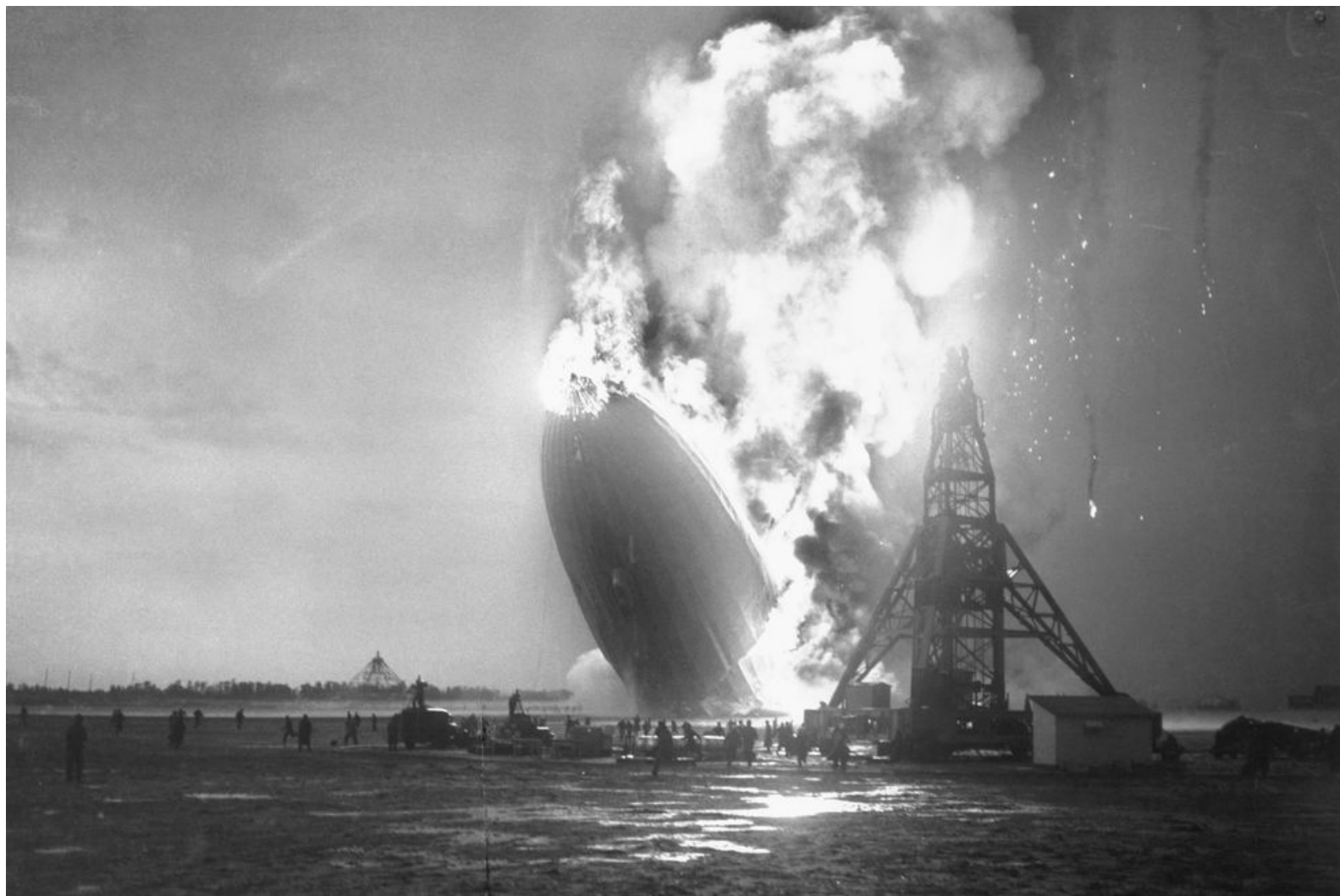
Pflaum’s vision of this solar-powered airship future is still a ways off. Both LTA Research and Hybrid Air Vehicles, for example, are initially using diesel to power their electric engines but plan to transition to renewables as the technology develops.

But for that future to ever reach fruition, airships need to first overcome their absolute biggest challenge: public perception.

## A Bad Case of “Hindenburg Syndrome”

The word “airship” likely conjures up grainy black-and-white footage of military blimps soaring in the air—or perilously crashing into the ground. The fiery destruction of the German-made Zeppelin LZ 129 *Hindenburg* on May 6, 1937 essentially closed the curtain on the first generation of airships, and it’s a bad bit of PR that’s been particularly difficult to shake.

“We call it ‘Hindenburg Syndrome,’” Gennadiy Verba, president of the Israel-based Atlas LTA airship company, told *Popular Mechanics*. Verba previously worked on Google’s Project Loon, which sought to bring internet to remote areas using stratospheric balloons. “Nobody can overcome this psychological problem to use hydrogen again, but we have several methods to make hydrogen much safer.”



The famous German Zeppelin, LZ 129 *Hindenburg*, goes up in flames as it attempts to land in Lakehurst, New Jersey. It's believed that static electricity and a leaking gas cell caused the fire.

Bettmann // Getty Images

Airships like Pathfinder 1 and LCA60T use helium as a lifting gas, but helium is extremely hard to come by and is essential for various scientific experiments and medical equipment like MRI machines. Not only is hydrogen *much easier to source*, it's lighter and also a more efficient lifting gas. But the U.S. Congress banned the use of hydrogen in military aircraft in 1922, and that law remains on the books. Experts like Prentice think the century-old ban needs a rethink.

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“In 1930, there was no way to detect [hydrogen]—it was a tasteless, odorless, invisible gas,” Prentice says, noting that today you can buy handheld detectors on Amazon that are capable of sensing hydrogen in parts per million. “Hydrogen will not burn at anything less than four parts per hundred, so long before you get to any risk of a fire with hydrogen, you can ventilate the area... Hydrogen is much harder to burn than people think.”

There are signs that things are changing. In 2022, the European Aviation Safety Agency updated regulations allowing for any lifting gas, stipulating that “adequate measures must be taken in design and operation to ensure the safety of the occupants and people on the ground in all envisaged ground and flight conditions including

emergency conditions.”

If the FAA follows suit, then a new age of airships could really take off.

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### Meet the New Generation of Airships



#### Pathfinder 1

**LTA Research** — Backed by Google co-founder Sergey Brin, Pathfinder 1 stretches some 400 feet and features a suite of next-gen technologies including lidar, Tedlar (an advanced polymer material), carbon fiber, and electric propulsion. The home of this gargantuan airship is Moffett Field in California, originally built for the U.S. Navy’s LTA (lighter-than-air) program in the 1930s. The company’s next airship, Pathfinder 3, will scale up to 600 feet long and will be built in Akron, Ohio, where Goodyear constructed U.S. Navy rigid airships a century ago.



#### Zeppelin NT

**Zeppelin Luftschifftechnik** — Zeppelin NT—which stands for “new technology” in German—is a 246-foot-long airship with a semi-rigid structure, meaning it contains a skeleton but also relies on internal pressure to maintain its shape. Goodyear blimps, for example, are actually Zeppelin NT airships in disguise. Unlike the other airships in this list, Zeppelin NTs have been dotting the skies for decades, and by leveraging new tech like aluminum and carbon-fiber construction, the Zeppelin NT has kept the airship flame alive in recent years.



#### LCA60T

**Flying Whales** — The largest airship on this list belongs to the French and Canadian aeronautics startup Flying Whales. At over 650 feet long, the LCA60T uses 1-megawatt Honeywell generators—the most powerful generators the company makes—to power its hybrid electric airship with sustainable aviation fuel. Some 14 gas cells filled with helium provide the airship’s lift, and the company plans for its first test flights in 2025.



#### Airlander 10

**Hybrid Air Vehicles** — Until the arrival of Pathfinder 1 in recent years, Hybrid Air Vehicles’ Airlander 10 has been the vanguard for this new era of airships. The only true non-rigid airship on this list, the Airlander 10 first took flight in 2012 and earned the nickname “the flying bum” due to its overall shape. The airship currently uses four diesel combustion engines, but still delivers a 75 percent reduction in carbon emissions compared to a typical airliner; the company also plans to create zero-emission ships in the future. In February 2023, the company announced that the Airlander 10 was finally ready for commercial production.



#### H2 Clipper

**H2 Clipper Inc.** — A relative newcomer to the airship game, the H2 Clipper is the only airship on this list that plans to use hydrogen, instead of the more scarce helium, as a lifting gas. That’s because the H2 Clipper will be a green hydrogen delivery service when its first prototype is built in 2025. The company, H2 Clipper Inc., is designing its airship to run exclusively on clean energy and will have a cargo area equivalent to 35 shipping containers.

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## Flying High or Run Aground?

Although using hydrogen would help, today's airships need *something* to become the iPhone of the industry—a shining example of success that shows the world the technology's promise. While there are a few lighter-than-air contenders, all eyes are on LTA Research's Pathfinder 1, which will begin test flights this year.

“We're wishing big success to anyone who will be the first,” Verba says. “Not if they succeed, but *when* they succeed, it'll be a very good day for all of us.”

A few obstacles still stand in the way of that “very good day” becoming a reality—both technological and political. Proving hydrogen's reliability and continuing to develop green technology such as thin-film solar cells as well as lithium-ion, battery-powered propulsion are big ones, but also perfecting the art of handling these massive airships on the ground is another herculean engineering effort. Where a heavy airplane simply sits idle at an airport terminal, airships are subject to changes in wind speed, direction, and pressure, and require more sophisticated ground-handling techniques—and that's not even considering the fact that their hulking bodies require lots of space for building and maintaining them.



Pathfinder 1 is moved into Hangar 2 at Moffett Field in California, for pre-flight testing. Video courtesy of LTA Research.

To address these issues, Prentice’s company, Buoyant Aircraft Systems International, has developed a turntable-style landing system that allows airships to move with the wind and also land in areas with little infrastructure—a perfect application for ferrying supplies to remote regions or disaster zones. Similarly, Pflaum’s research has designed a hexagonal parking construction to anchor a large number of airships in a relatively small area.

For decades, the age of airships has been just around the corner, but things are finally changing. Billionaire investors are getting behind the technology, and with the arrival of President Joe Biden’s climate bill, the government appears ready to put some serious money behind world-changing, green energy solutions. Whether airships are what the U.S. government has in mind remains to be seen.

“It’s the lack of public investment that’s really hurt the industry, but I think that is now changing,” Prentice says, “Because as Churchill\* once said of [America] during the Second World War, the U.S. will eventually do the right thing, after they’ve exhausted all other options.”

And when it comes to decarbonizing aviation, there aren’t many options left.

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*\*Editor’s note: This quote is frequently attributed to Churchill, though there is no evidence of him saying it.*

*Images and video courtesy of LTA Research.*

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