Facebook's Aquila drone completes first test flight

Jessica Guynn, **USA TODAY** *9:08 p.m. EDT July 21, 2016*

(Photo: Facebook)

Corrections & clarifications: An earlier version of this story misstated Stanford University professor Andrea Goldsmith's name.

As the summer sun rose over the Arizona desert, Facebook chief executive Mark Zuckerberg and his team watched the Aquila lift off the runway at a military installation near the California border, the first time the unmanned solar-powered aircraft had taken to the skies.

Aquila, with the wingspan of a Boeing 737, remained aloft at low altitudes for 96 minutes, more than three times longer than Facebook originally planned. Facebook had been testing a much smaller scale version of Aquila for several months, but this flight a month ago was the first true test of the aircraft.

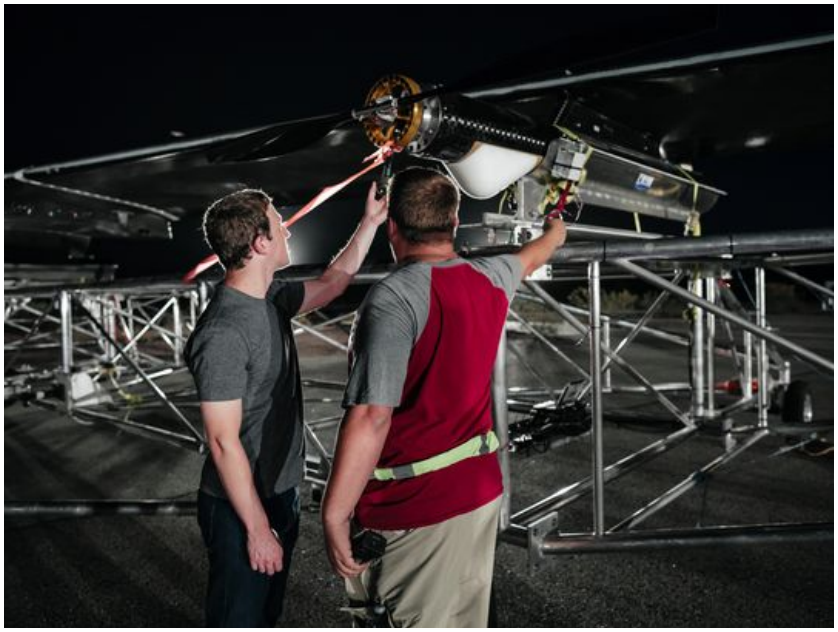
Hoots and high fives accompanied the successful launch, a milestone in Facebook's mission to beam the Internet to people who don't have it.

Facebook CEO Mark Zuckerberg (left) was on hand for the first full-scale flight of Aquila. *(Photo: Facebook)*

The concept: Circling a region, the aircraft will use new laser-beam technology to deliver fast Internet to people in a 60-mile radius. Aquila will transmit a signal that can be received by the antennas of small towers and dishes on the ground. The antennas will convert the signal into Wi-Fi or 4G networks.

Facebook will have to solve some tough engineering problems — collecting enough energy during daylight hours to operate around the clock and designing high-energy, dense batteries that can efficiently store enough energy — before Aquila can complete its mission: to fly miles above the earth — 60,000 feet or more — for up to three months at a time. The current record for solar-powered unmanned flight is two weeks.

"We have a lot of work ahead of us," says Facebook's vice president of engineering Jay Parikh.



Aquila's mission: to fly miles above the earth — 60,000 feet or more — for up to three months at a time. The current record for solar-powered unmanned flight is two weeks. *(Photo: Facebook)*

Facebook is not the only company racing to bring affordable Internet to hundreds of millions of people in hard-to-reach stretches of the globe. In fact, the pace of innovation from technology giants and start-ups is ushering in an important new era of experimentation, says Kerri Cahoy, an associate professor in MIT's aeronautics and astronautics department.

Google parent company Alphabet is backing Project Loon, which uses high-altitude, wind-propelled balloons. Loon beams the Internet from balloons circling the earth at altitudes twice as high as commercial aircraft, helping mobile operators extend wireless networks into more sparsely populated or remote terrains without running fiber optic cable or building cell towers.

OneWeb Satellites, a joint venture between start-up OneWeb and Airbus Defense and Space, aims to build a new generation of small yet advanced satellites to offer Internet service, in part targeting developing regions. Elon Musk's Space X, too, aspires to use satellites to blanket the globe with Internet connectivity.

"It's great to see this push," Cahoy says. "I sure hope these technologies are groundbreaking enough to make it possible or make big steps toward making it possible."

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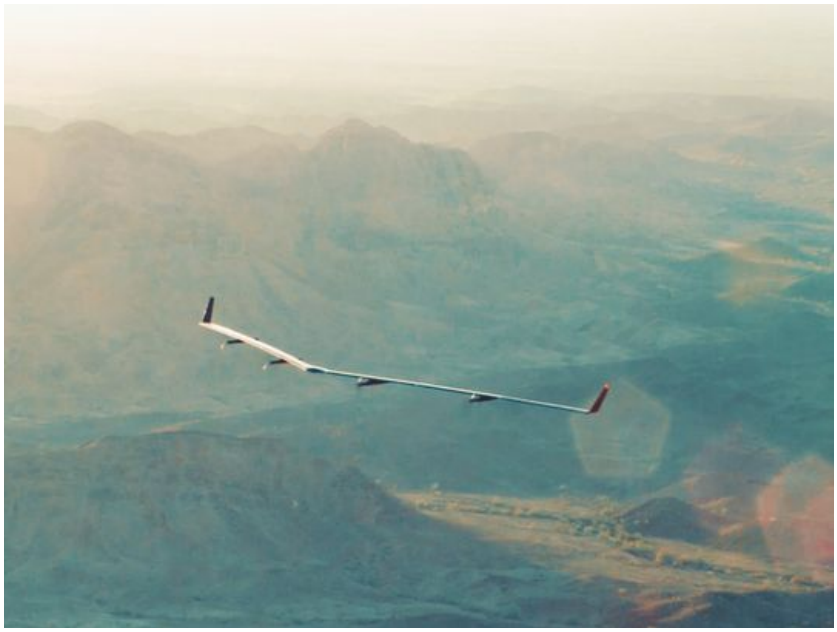
Facebook's Parikh: Why we needed to design an aircraft

(http://www.usatoday.com/story/tech/columnist/2016/07/21/facebooks-parikh-why-we-needed-design-aircraft/87390310/)



Facebook says Aquila remained in the air at low altitudes for 96 minutes, more than three times longer than Facebook originally planned. *(Photo: Facebook)*

Using solar-powered aircraft to broadcast high-speed Internet is not new, says Christopher Lum, a research assistant professor in University of Washington's department of aeronautics and astronautics. Efforts like Aquila have been undertaken before, by the military and by NASA with its solar-powered Helios.

Stanford University professor Andrea Goldsmith, who has researched wireless communication since the 1980s, says Facebook and Google face significant challenges in building "infrastructure in the air."

"It's never as efficient when the communication network isn't on the ground. That's why all of our wireless communications, or at least the ones we use dominantly such as cell phones and Wi-Fi, are all terrestrially based," Goldsmith says.

Plus, Facebook and Google are trying to do it "in a relatively low cost manner while supporting sufficient performance to make it compelling," she says.

Duke University professor Mary "Missy" Cummings says Facebook is finding out what others before them did.

"It's a hard problem to put things in the air and provide services at a cost-effective break point," says Cummings, a former Navy fighter pilot who runs Duke's humans and autonomy lab. "Sure, you can launch these things and they can fly. But is the business case there?"

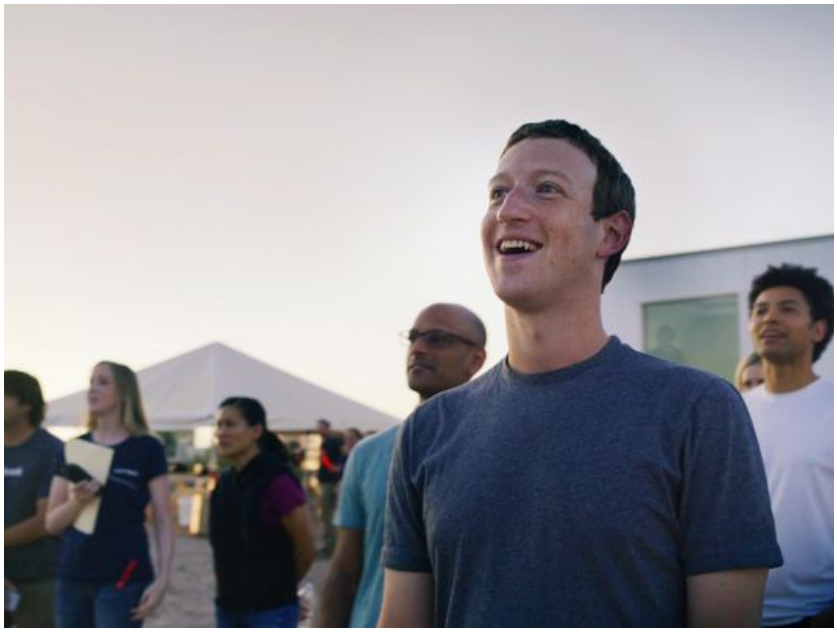
USA TODAY

Facebook reveals plans for drone-based Internet in the sky

(http://www.usatoday.com/story/tech/2015/07/30/facebook-drone-aquila-internet-solar-powered/30890057/)

Facebook and Google have more incentive than most to spread the Internet as far and as wide as they can. Their business models depend on overseas growth and they are determined to reach every single person on the planet. Facebook's goal: to make Internet access "radically cheaper," says Facebook's chief technology officer Michael Schroepfer.

"The challenge is huge. More than half the world is not online," Schroepfer told USA TODAY in April.

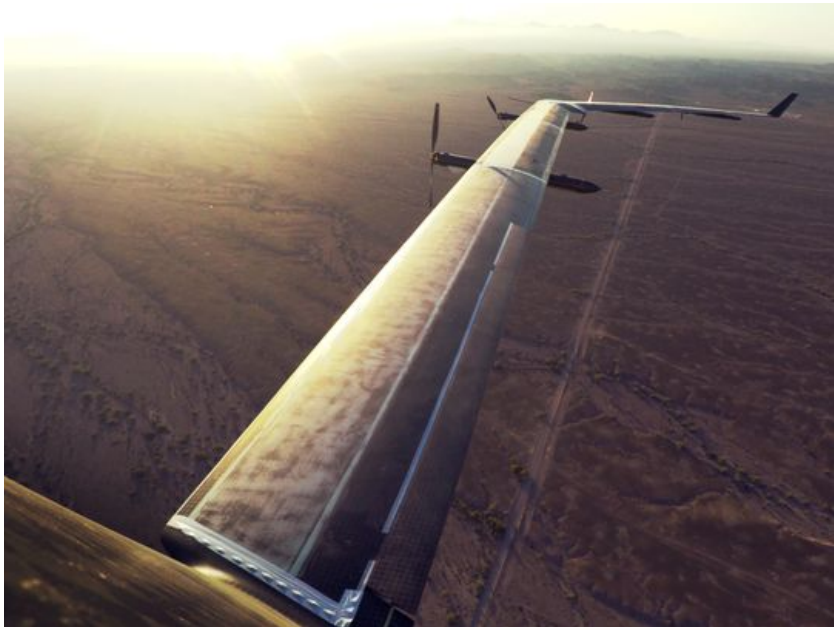


Facebook CEO Mark Zuckerberg is determined to connect the 1.6 billion people who do not yet have Internet access. *(Photo: Facebook)*

The June 28 flight brought Facebook closer to achieving its goal of digitally connecting every person on the planet. The Silicon Valley company has created a dedicated team, the Facebook Connectivity Lab, to incubate a range of new technologies including aircraft, satellites and wireless communications systems.

The Aquila is one of Facebook's most ambitious efforts. It weighs one third as much as a car. At cruising altitude, it consumes 5,000 watts of power, the equivalent of three hair dryers. During the test flight, Facebook says it gathered vital information on the design and operation of the aircraft, from its aerodynamic handling to its structural viability.

In coming years, Aquila will be put through a series of tests, during which it will be flown "faster, higher and longer," pushing the aircraft "to the brink," says Parikh. Facebook will also add more aircraft to the test fleet to experiment with size, weight and other factors.



The solar-powered aircraft has the wingspan of a Boeing 737 but weighs one third of a car. *(Photo: Facebook)*

USA TODAY

Facebook debuts terrestrial tech to deliver Internet

(http://www.usatoday.com/story/tech/news/2016/04/13/facebook-f8-internet-connectivity-terragraph-project-aries/82960840/)

As for which of today's technologies will prevail, Goldsmith says it's too soon to tell. Once promising concepts can flame out. "A lot of it depends on how certain technologies evolve," she says.

Take satellite phone company Iridium, which launched in 1998 and operated a network of dozens of satellites linked together to offer coverage anywhere on the planet to anyone with a satellite-compatible handset, basically cellular phone towers in the sky to compete with cellular networks.

"It wasn't clear at that time which of those two networks would end up being more dominant in terms of commercial wireless communications," Goldsmith says. "In the end, it's so much more expensive to do things in the air versus on the ground that the cellular networks won out."

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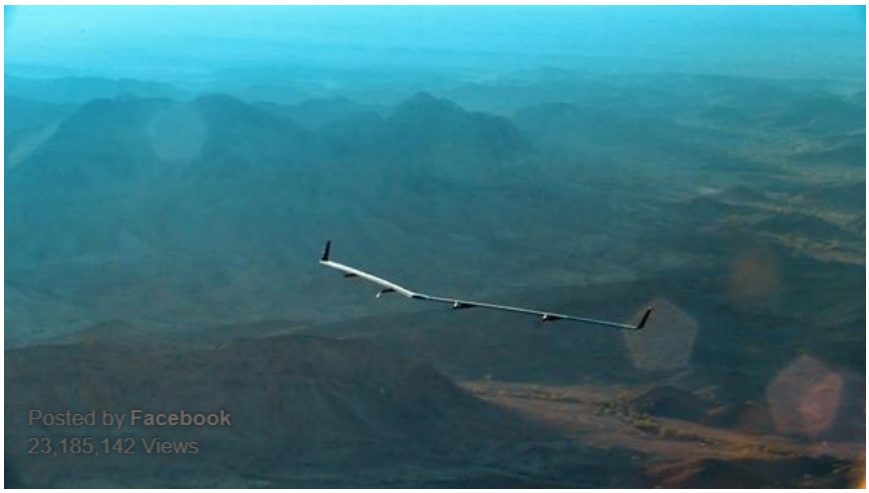

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