

Drone delivery



Future or fad?



ail delivery by drones? That idea will never fly. Or will it?

The idea of tiny, pilotless helicopters taking letters or packages to postal customers sounds like a futuristic fantasy. But we live in a world where other previously science-fiction ideas are becoming real—think e-mail, cell phones and self-driving cars. Will drone delivery join them soon?

The U.S. Postal Service has no immediate plans to adopt a drone delivery system, according to Postmaster General Megan Brennan. At a February hearing before the House Oversight and Government Reform Committee, Brennan testified that the Postal Service is looking at drone technology, but its capacity to invest in drones is limited.

“Currently, our engineering group is researching [drones] and we’re probably on the peripheral of this advanced technology,” Brennan said. “We’re exploring and recognizing what’s happening in the industry. Right now we’re not an early adopter, but we’re certainly aware of what’s happening.

“Whether it’s drone exploration or any other type of new technology,” Brennan added, “we need the capital monies to invest.”

Public expectations and fears

A recent national survey by the USPS Office of the Inspector General (OIG) points to public expectation that drones will soon bring packages to Americans’ doors—but notes that many people are wary of the idea.

In the survey, 75 percent of respondents said they think drone delivery will occur within the next five years. But only 44 percent like the idea, 34 percent don’t want drone delivery, and the rest are ambivalent.

A third of all respondents said they thought drones would be unsafe. Many respondents expressed concerns that drones could malfunction and injure people or damage property.

Young people and frequent e-commerce customers were the most enthusiastic about drone delivery, with 65 percent of Millennials (those born between 1982 and 2004) liking the idea, versus only 24 percent of Baby Boomers (those born between 1946 and 1964). The respondents ranked delivery speed and the ability to deliver emergency supplies as the top benefits of using drones.

One intriguing result: Many respondents said they would have a less positive opinion of any company that introduced drone service, including Amazon—which is aggressively working to launch drone delivery in the U.S.—and the U.S. Postal Service. Still, the survey showed that the public would view the Postal Service as more “innovative” if it tried drones.

Respondents said they trusted Amazon the most to deliver by drone, with USPS ranked a distant second, ahead of Google and FedEx.

The OIG’s report is based on a phone survey of 1,207 people conducted in June. The whole report can be read online at www.uspsoig.gov/document/public-perception-drone-delivery-united-states.



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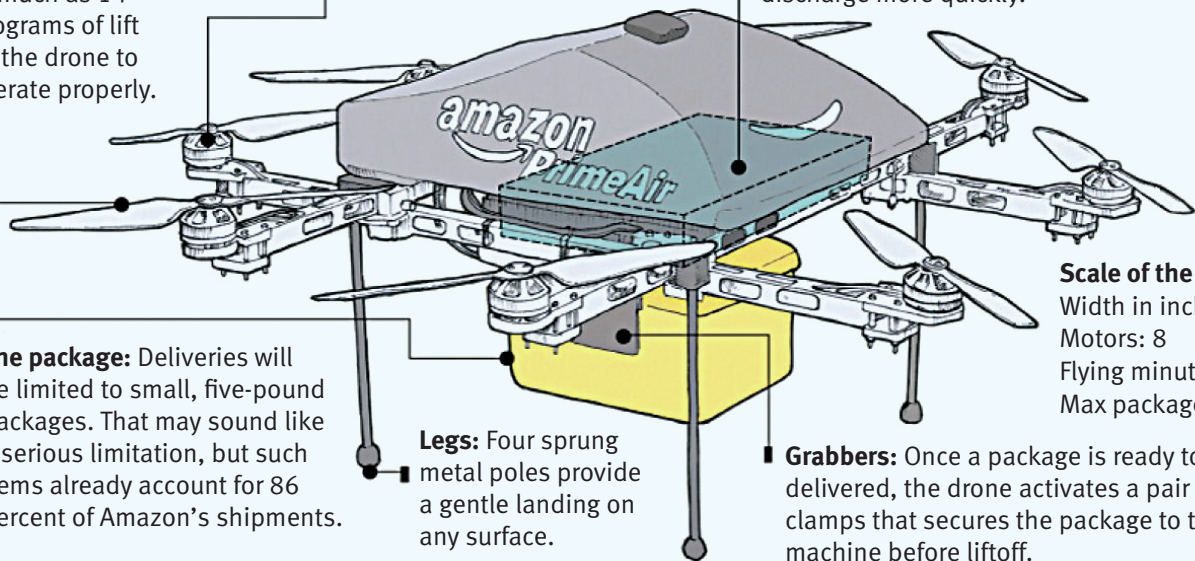
**-Postmaster General
Megan Brennan**

amazon Prime Air

Blades: A 10-inch propeller spinning at 10,000 revolutions per minute provides 1.6 kilograms of lift. A typical Amazon package might need as much as 14 kilograms of lift for the drone to operate properly.

Motors: The drone's propellers are driven by eight motors. The motors are designed to be redundant so that even if one fails, the copter can stay aloft.

Batteries: Experts estimate that the Amazon drone draws power from a 10,000-mAh lithium ion polymer battery composed of six or 10 cells. These types of batteries operate like those in laptops and smartphones but discharge more quickly.



The package: Deliveries will be limited to small, five-pound packages. That may sound like a serious limitation, but such items already account for 86 percent of Amazon's shipments.

Legs: Four sprung metal poles provide a gentle landing on any surface.

Grabbers: Once a package is ready to be delivered, the drone activates a pair of clamps that secures the package to the machine before liftoff.

Scale of the drone
Width in inches: 36
Motors: 8
Flying minutes: 30
Max package: 5 lbs.



Competitors moving forward

Even if most Americans aren't sure they want drone delivery, private delivery companies in the United States and foreign postal services are quickly moving forward with the notion.

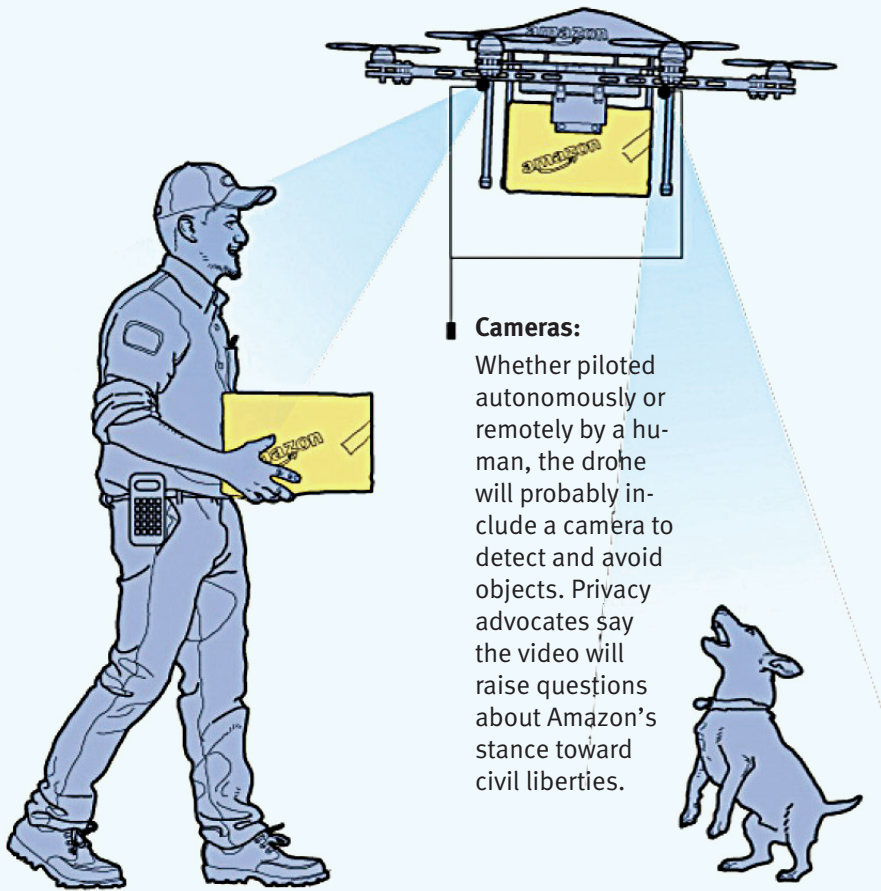
Amazon brought the idea of drone delivery into the public's imagi-

nation in 2013 when it announced it was working on a drone system as part of its overall push to handle delivery in-house instead of relying on outside shippers such as USPS and FedEx. The concept of autonomous drone delivery was derided as pie-in-the-sky then,

and some thought it was a joke. But the e-commerce giant has since developed a drone system and is testing the concept—called Amazon Prime Air—in the United Kingdom, Canada and the Netherlands. Other companies also are flirting with the idea.

Amazon completed its first Prime Air delivery in a test in December. A drone delivered an item to a customer near Cambridge, England, just 13 minutes after it was ordered.

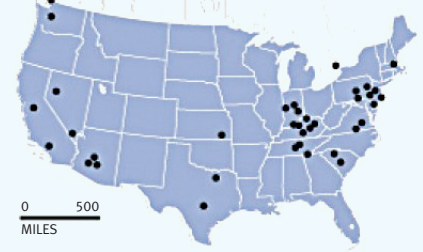
Since the drone fulfillment center in England is separate from the rest of Amazon's existing warehouses, the order choices are limited to what is stocked there. When an order comes in, an employee finds the item and loads it onto a drone. After a safety check, the drone is released to find its way, on its own, to the customer, and then back to the fulfillment center



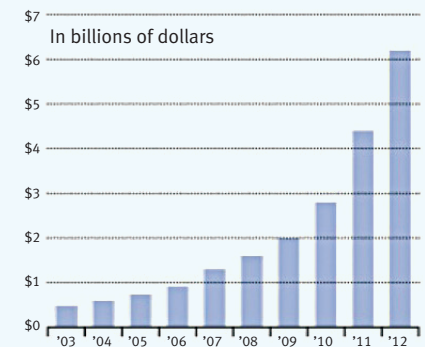
Amazon's 'fulfillment'

In 2012, Amazon spent more than \$6 billion on moving and replacing the goods in its considerable inventory. Fulfillment covers not only shipments of Amazon products but also items sold by third-party retailers.

Fulfillment centers in the U.S.



Annual fulfillment costs



Source: *The Washington Post*

for a battery recharge and another package.

“It looks like science fiction, but it’s real,” Amazon boasts on its website. “One day, seeing Prime Air vehicles will be as normal as seeing mail trucks on the road.”

But Americans won’t see Prime Air vehicles any time soon because U.S. aviation regulations don’t allow self-piloted aircraft. Aside from special permission for testing, drones in U.S. airspace must be under the control of a human operator. While it tests the system in other countries, Amazon is betting that the United States soon will change its regulations to allow Prime Air to operate here.

The primary goal of Prime Air isn’t to replace truck delivery, but to give Amazon customers an option to get packages faster. According to Amazon,

a package delivered with Prime Air might even come by drone faster than it would take for the customer to go to a brick-and-mortar store to buy it.

Prime Air’s goal is delivery within 30 minutes. Customers could order and accept delivery of a light-weight, high-value item such as a new cell phone or watch in the time it takes to order and receive a pizza. (In fact, in a test in November, Domino’s Pizza in New Zealand successfully delivered a pair of pies—reportedly still hot when they arrived—to a customer after just five minutes in the air.

For now, drone deliveries won’t work with heavy items, of course, but Amazon says the current drones should be capable of lifting up to five pounds, which accounts for 86 percent of current Amazon shipments. Using a drone might not justify the cost of delivery



Domino's Pizza delivered the first pizza by drone in New Zealand in August of last year.



for low-value packages, either, at least not until more widespread service is up and running. But if it is as fast and reliable as Amazon hopes it will be, Amazon Prime Air could create a new market for super-fast delivery that doesn't exist now.

Flying around obstacles

Flying a drone with a human controlling it remotely to shoot aerial videos and then post them on YouTube—the most common way drones are used today—is easy. A hobbyist can buy an inexpensive drone with a camera and have it flying the same day. They are little more than toys.

Drones that automatically deliver packages come with a new set of challenges. The drone must have more power and hence more size to lift a package. It should be able to fly autonomously without a human piloting it through remote control. Using onboard cameras, its computer must see and avoid obstacles such as trees, power lines, cars and people and also adjust for wind. It must go to the precise spot for delivering a package on a porch or lawn and drop the package without damaging either the cargo, property or itself. It must find its way back to a battery-charging station frequently. And the technology must be inexpensive enough for its users to make a profit.

Details about Amazon's plans for drone service, and its plan to get around these obstacles, have become clearer as it tests Prime Air.

Amazon's drones span three feet. Eight motors drive 10-inch propellers spinning at 10,000 revolutions per minute using a battery similar to those used in laptops and smartphones. Such batteries allow for about 30 minutes of flying time before needing recharging, and the drone can stay aloft even if one of the eight motors failed.

A package recipient might need to position a landing pad—supplied in advance by Amazon—that the drone could target using GPS and cameras.

Beyond the technical challenges, drone delivery also faces a public-acceptance one. Many people see drones as annoyances, threats to privacy or even a potential new way for terrorists to wreak havoc. But the No. 1 fear, according to the OIG's survey, is a drone that malfunctions and causes property damage or injury.

Along with the challenges of navigating all the hazards—flights in populated areas, safe and accurate delivery of the cargo and public acceptance—drones also face regulatory hurdles. Federal Aviation Administration (FAA) regulations not only require drones to be piloted remotely by a person, but also limits or bans them in sensitive areas and requires that they have special permission to operate in “controlled” airspace—any place where aircraft are subject to air traffic control instructions, mostly near large airports. These regulatory limitations in the United States caused Amazon to start its drone tests in the U.K., where the rules are less strict.

The limits on drone use also feed the negative public perceptions, say drone industry leaders. The limits prevent positive uses of drones, leaving irresponsible hobbyists and harassers to set their image. Along with package delivery, drone-makers are dreaming up ways drones could help with construction, agriculture, search and rescue, firefighting, disaster relief and wildlife management, to a name a few examples.

Last year, Congress ordered the FAA to write new regulations by 2018 to make commercial and public-service drone use more practical. President Donald Trump's recent order to freeze federal rulemaking, however, could delay or stop those regulatory changes.

The technology is moving so fast

that the FAA can't keep up. The last time Amazon sought approval for testing, the FAA took so long to grant it that the test system was already obsolete and Amazon scrapped the U.S. test.

Park-and-fly

Amazon isn't the only U.S. company eyeing drones. In February, UPS tested a drone system that would launch a drone from a truck in a scheme similar to park and loop—call it “park and fly.” In the test, a drone successfully delivered a pack-

age from a truck to a home in Lithia, FL. The “HorseFly UAV” (unmanned aerial vehicle), an eight-rotor helicopter developed by Loveland, OH-based Workhorse Group, can carry up to 10 pounds.

In this system, a UPS driver would park his truck in a neighborhood, load a package into the drone and then continue on the her way to make another delivery to a closer address. The drone would find its way back to the truck and pick up another package—no need for the truck to sit idle. Once its flying time was up, the drone would recharge its batteries while docked on the truck on its route to prepare for more flights. UPS sees the drone system as especially useful in rural areas, where it could both speed delivery and substantially reduce truck miles traveled.



Drivers are the face of our company, and that won't change. What's exciting is the potential for drones to aid drivers at various points along their routes, helping them save time and deliver on increasing customer service needs that stem from the growth of e-commerce.

**—Mark Wallace,
UPS senior vice president of global engineering and sustainability**



Foreign posts in the air

Even if USPS isn't ready for robotic air mail, several foreign postal services are developing drone systems.

Australia Post



Unlike Amazon and UPS, which are focusing on drone delivery in urban areas, Australia Post sees drones as a way to serve its expansive rural zones.

Residents of remote areas in that country depend heavily on e-commerce—the average rural Aussie spends three times as much money on the internet for merchandise rather than city-dwellers. Also, some areas are so remote that there is no rural mail service beyond local post offices that can be many miles away. For them, drones would constitute Australia Post's only home delivery service. Australia Post's focus on rural drone delivery avoids the airspace regulation conflicts that make drone service more difficult in the United States, but it remains to be seen whether it will be cost-effective or technically feasible, given the short battery life and distance limitations. Australia Post's drones can fly only nine miles before needing recharging, and their maximum payload is two-and-a-half pounds.

Swiss Post

Switzerland's Swiss Post is testing drones for package delivery, especially for emergency supplies and medical deliveries. The government-owned corporation tested drones without payloads in 2015 and plans to begin service carrying medical samples to laboratories for rapid tests beginning this summer, with daily drone flights between hospitals up and running next year. The four-rotor drones can carry up to one kilogram (less than half a pound) for one kilometer (a little over half a mile) before needing recharging. Swiss Post's drones will follow pre-defined flight paths and will likely serve as couriers for a few customers who need many fast deliveries each day, such as the hospitals and labs, rather than fanning out to make many single deliveries.



As with Amazon, Workhorse has special FAA approval to test its drones under limited circumstances. The test worked, but not without kinks. In one flight, a drone lost its tracking signal and automatically returned to the truck with the package, only to be caught in the drone-bay doors—on the roof of the truck—that were still closing.

The Workhorse truck-based system

is an approach that would allow UPS to quickly integrate drones into its existing truck delivery scheme, unlike Amazon's plans to build entire fulfillment centers just for drone delivery. It also would reduce the time the drone needed to travel back to a battery-charging station. The need to constantly recharge and spend time and battery power just going back and forth to chargers is a major



DHL Deutsche Post

Since 2013, DHL Deutsche Post, Germany’s privatized postal system, has been developing a tilt-wing drone—a hybrid between an airplane and helicopter—dubbed the “Parcelcopter.” With wings and rotors tilted up, it takes off vertically, like a chopper, and then its wings tilt forward to fly like a plane.

The Parcelcopter will pick up its cargo from a “Skyport” that functions as an automated post office. Packages loaded into the Skyport, which is about the size of a large living room, are loaded automatically to a Parcelcopter, with no human help. The Skyport also functions as a charging station for the aircraft’s batteries. The Parcelcopter is designed to handle bad weather at high altitudes and, as with Switzerland’s system, could greatly speed up delivery in mountainous and remote areas.

Ukrposhta

Ukraine’s postal service, Ukrposhta, is working with an Israeli drone company to set up by 2020 a drone delivery system that would lower packages by rope to set delivery points, such as street corners, for customers to pick up.



Singapore Post

Singapore Post has tested a delivery drone that is integrated with a smart-phone app giving customers control over security and delivery place and time. Its carrying capacity is just over one pound.



limitation for drones. (UPS also has tested another company’s drone system for delivery of emergency medical supplies.)

Workhorse has pitched its technology to the Postal Service, but there’s been no word on the reception. Meanwhile, Mercedes-Benz is another manufacturer working on a truck-and-drone system, reportedly investing \$562 million in the project.

Still an infant technology

While ideas are emerging and tests are happening, drone delivery is far from being around the corner. Drone designers have a way to go before overcoming all the technical and regulatory challenges in a way that can result in profits for delivery services.

Drone on wheel/s



With all the technical challenges of automated air delivery, perhaps USPS or private shippers will opt to use the same self-guiding technology but

stay on the ground. Kobi Shikar, a student at Shenkar College of Engineering and Design in Israel, has sketched a design for “Transwheel,” a single-wheeled robotic vehicle that would carry packages short distances on roads or sidewalks. Shikar’s device would balance itself automatically, like a Segway, and could carry much heavier pack-

ages than a flying drone is able to—and a few of them working together could shoulder even bigger loads. Though it is only an idea, the Transwheel could take advantage of existing technology, and might work out of a delivery truck in a park-and-loop system similar to the Workhorse-UPS test.



Once they do, the big question remains: Will the public accept

drones?

As the USPS Inspector General’s survey revealed, the public is concerned about the safety of drone delivery. It remains unknown whether people will accept drones flying through their neighborhoods and over their roofs. There is also a concern about people vandalizing or destroying the drones.

Ultimately, winning over the public may be a greater challenge than tackling the technological or regulatory ones.

“It is far too early to say whether drone delivery will succeed, or how it will affect the Postal Service,” NALC President Fredric Rolando said. “NALC is keeping up with developments in this area and will continue to monitor the effects, both positive and negative, that drones could have on our members, the Postal Service and our customers.” **PR**