Google’s Future Air Force

Before the Internet giant starts flying delivery drones, it has to solve another problem: cheap position tracking.

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Google’s drone delivery service is still in the testing stage. (Google)

Here’s a Google search for you: Find a way to keep a fleet of drones from crashing into one another—and the rest of us.

Private pilots are about to get a little help from someone they didn’t know was a friend: Google. The Internet search giant announced last March that it plans to develop very, very, very cheap ADS-B transceivers, little avionics boxes that tweet “I am here!” The Federal Aviation Administration has decreed that ADS-B squawkers (the acronym stands for automatic dependent surveillance-broadcast) must be installed in all U.S. aircraft by 2020. (Well, all aircraft flying in controlled airspace.) Those position squawkers enable air traffic controllers and other aircraft with receivers to know an airplane’s location with a GPS-based precision that radar can’t match. But because of its high purchase and installation costs—estimates range from $4,000 to $7,000—many private aircraft owners are resisting adopting the technology as long as possible. Google plans to squeeze that cost way down.

Why is Google bothering with ADS-B hardware? Drones. Lots of drones.

The company wants to go head-to-head with Amazon to create armadas of UAS devices that can autonomously deliver purchases weighing under five pounds within 30 minutes of placing an order. A study by the Consumer Electronics Association estimates that in 20 years, commercial drones may make as many as a million flights a day. In order for any unmanned delivery system to work, the delivery vehicle—and Google—will have to know where the device is at all times. Under current regs, drones have to be in sight of their operators, a restriction that keeps them from going very far. ADS-B could be the technology that extends the range far enough to make delivery-by-drone practical.

"It's a great concept," says Jim Davis, the director of business development at Sagetech, an avionics manufacturing company near Seattle that has already created an ADS-B device for drones under 55 pounds. Many companies and the FAA are considering ADS-B as the basis for the detect-and-avoid capability that a skyful of drones would require. "But detect-and-avoid using ADS-B works only if everybody has ADS-B," says Davis. "I've actually talked to other people in the GPS world who said that the key to successful ADS-B would be cheap equipment to make it easy for everybody to have something, even if you had to give them out for free."

But there's a hitch. Even with cheap ADS-B, says Davis, "you may not be able to get everybody to equip. There may be a guy out there" without the ADS-B transponder, something known in avionics parlance as an "uncooperative target"—"and he's flying legally, and you have to account for that somehow."

Make that two hitches: ADS-B on thousands of additional flights a day—forget a million—would overwhelm the aviation-specific frequencies.

"For very low altitude, the FAA is encouraging people not to use ADS-B," says Davis. "The big fear of the FAA is the 1090 megahertz spectrum. A lot of people use it. Military transponders use it, civilian transponders. It's used for ADS-B. And the more people who use it, the less effective it becomes."

If the spectrum is crowded, the traffic collision-avoidance system radar—TCAS, another FAA-mandated system for aircraft weighing more than 12,800 pounds and traveling faster than 250 knots (about 288 mph)—gets drowned out. The FAA wants the collision-avoidance radar to be able to detect traffic out to about 14 miles, but with noise in the area, the signal being sought is visible within only, say, six miles. (The signal has to have enough strength to be seen above the noise, and signal strength deteriorates with distance.) Too close, says the safety-conscious and conservative FAA.

"This has a lot of people scratching their heads," says Davis. Those people, including the Radio Technical Commission for Aeronautics (RTCA), are looking at a number of solutions to the crowded-spectrum problem. Maybe the UAS industry will agree on specific air corridors for deliveries. Maybe slower-moving air vehicles will transmit at a lower power over a limited range.

"The first goal is to make [transponders] small enough and lightweight enough where you can actually make it sensible to put one of these things into a UAV weighing less than 55

pounds," Davis says. "We're all about miniaturization, but that's not easy and it's also not cheap at this point."

Google has already tested a prototype delivery system in Australia, a country which, incidentally, already requires all aircraft to use ADS-B technology. Test results: Back to the drawing board. Google, which has a reputation for not saying much about its future projects, did not respond to a request for an interview.

How was Google's announcement received by U.S. avionics makers? According to Ric Peri of the Aircraft Electronics Association, ADS-B manufacturers in his association didn't pay much attention. "I hate to say this, but we don't get that excited about the mystique that you normally would have by a Google, mostly because ADS-B for certified airplane is so defined by the FAA that there's not a lot a room for Google-like technology advances in the process." And then there is market size. "If every aircraft with an N registry...every aircraft...could use the same exact ADS-B solution, the entire market is less than one-fifth of Apple's first day sales of the iPad," says Peri.

He adds that the ADS-B installation for drones will be nothing like what is required for certified aircraft, and that an ADS-B device for a Cessna C172 is very different from one aboard a Boeing 747. There are a lot more instruments on a 747 that the ADS-B device must interact with.

Sagetech's Davis sees a big advantage for Google in the two projects that by themselves would generate a need for tens of thousands of ADS-B devices: the drone-delivery project and Project Loon, a planned network of high-altitude balloons that would supply Internet connections to people in rural and remote areas. The expensive engineering required to make the ADS-B devices small, lightweight, and compliant with whatever operating standards are defined by the RTCA will be possible only if a lot of sales are guaranteed—or if a wealthy company is willing to spend the money on it. Google seems well placed to turn drones into safe delivery vans.