



## General Aviation Pilots Get Their GAARD Up with New App

MITRE software engineers have a new way to boost the Federal Aviation Administration's efforts to improve general aviation safety. It's a free app for pilots to contribute their flight data to a national database for safety trend monitoring.

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**Although safety of U.S. commercial air travel** has improved significantly in recent years, the overall safety of general aviation (GA) hasn't improved appreciably in several decades. A big reason for that disparity may be attributable to the limited availability of digital flight data to perform safety analysis.

Commercial aviation safety has improved in part because of the collection and analysis of data from commercial airlines, which are used to identify and address potential safety issues. However, such an archive does not yet exist for GA flights. The Federal Aviation Administration is looking to change that.

"Most GA aircraft are not equipped to record digital flight data," says MITRE group leader Matt Pollack. "And it would be prohibitively expensive for general aircraft owners to purchase that equipment. Without some way to collect data, it's challenging for the GA community and FAA to identify and address safety issues that affect general aviation."

Then MITRE's researchers realized the answer might be right in the pilots' hands. Enter the General Aviation Airborne Recording Device app—known as GAARD for short.

### Searching for a Low-Cost Solution

In the fall of 2012, the FAA asked MITRE to research low-cost ways to collect crucial GA flight data. "We began by trying to figure out how we might use smartphones and tablets to collect the sort of

data that would help the FAA better understand GA operations,” Pollack says.

Pollack and his collaborators—human-centered engineers Mitch Serber and Kevin Long and software applications developer Jeff Stein—understood they could take advantage of the GPS sensors onboard these mobile computing devices to track an aircraft’s movements. They also knew that better sensors and firmware existed in the form of an Attitude Heading Reference System (AHRS). The AHRS is an onboard sensor system that determines the aircraft’s position in space through measures of location, pitch, roll, and yaw. If an AHRS is not part of the avionics suite, a portable AHRS can be added for \$600–\$1500.

“We first started looking at what we could do with just the phone or tablet, and then what we could do with a phone or tablet in concert with a portable AHRS,” Pollack explains.

The app they developed, GAARD, allows pilots to record flight information when activated. “At a minimum, the app records GPS position—latitude, longitude, and altitude—as well as the direction of travel and the aircraft’s speed,” he says. “If the user also has an AHRS, the app can wirelessly connect to that device to collect the three axes of attitude information at a high update rate.”

Likewise, if the aircraft is equipped with Automatic Dependent Surveillance–Broadcast

(ADS-B)—an onboard sensor system capable of broadcasting and/or receiving aircraft position information—the app can collect data from that device as well.

“As an added incentive to use GAARD, we also built in a few features for the pilot,” Pollack says. “These include graphing and mapping capabilities pilots can use to review their flights, either alone or with an instructor, to get a better idea of how the flights went.”

### Collecting Data for an Important Safety Initiative

The app is also easy to use. During the initial set-up, pilots enter brief profile information about themselves and their aircraft to help the FAA better understand the GA market segment. Prior to any given flight, pilots provide basic information about the flight. That might include information such as the flight’s intended destination and whether it’s for training or non-training purposes.

“And then the pilot hits a record button,” Pollack says. “When the flight is done, he or she stops recording. Later on, when users have access to the Internet, they can hit a button to upload the data—with identifying information removed—to a repository called the National General Aviation Flight Information Database [NGAFID], which then provides the data securely to MITRE. The NGAFID also directly provides the pilots with

several additional flight analysis features.”

At that point, the data becomes part of Aviation Safety Information Analysis and Sharing (ASIAS). ASIAS is a joint FAA/aviation community data sharing collaboration that fuses and analyzes data from a wide variety of sources to proactively identify aviation safety issues. One of MITRE’s key roles in that program is to house and safeguard the proprietary data ASIAS members supply. MITRE also performs analyses to identify safety issues and trends.

“More than 40 airlines participate in ASIAS, so we have a lot of airline flight data,” Pollack notes, “but we have far less GA data. With GAARD we hope to change that.”

### Small Beginnings Can Lead to Major Safety Improvements

At the FAA’s request, MITRE released GAARD through the app stores in mid-October, and more than 200 users have already downloaded it. “At this stage, we have around 200 hours of data collected,” Pollack says. “That’s not a lot, but it’s the beginning of what we hope is going to be a rich data source.”

“Right now we don’t know what, if anything, the data will reveal,” adds Jeff Stein. “We have to collect enough data to do an initial analysis.”

“The same was true when ASIAS started,” Pollack says. “The idea was that if we collected a lot

of data from air carriers, aircraft manufacturers, the FAA, and other ASIAs members, we might be able to find safety-related problems they could work together to resolve. It turned out we could. Now we're hoping to do the same thing with general aviation data."

Although the data GAARD collects is less comprehensive than the ASIAs data collected on commercial airline flights, the developers believe it will ultimately gain the critical mass necessary to provide clues to safety issues.

"For instance," Stein says, "maybe the data will show that most of the GA flights going into a particular airport have a steeper

descent than they ought to. Once we identify a trend like that, we can look at why it's occurring."

### **Extending GAARD to a Larger Community**

While MITRE and the FAA originally targeted GAARD for small GA operators, we have identified another potential large, untapped, safety-conscious GA segment: corporate/business operators.

The majority of the current corporate/business fleet isn't equipped to collect flight data since many aircraft are older models. A handful of corporate/business operators with newer aircraft currently collect flight data and are contributing

members of ASIAs; however, many more would like to join ASIAs if they had a method of collecting the flight data.

In response to this interest, MITRE is now developing a new version of GAARD, called fleet-GAARD. This version would enable the data collection to expand to a much larger portion of the corporate/business community.

"This is just one more way we are working to make it easy for the general aviation community to participate in keeping the National Airspace System safe for everyone," Pollack says.

—by *Marlis McCollum*

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