



Better Data
Makes Better
Airports

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By Mike Jones

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Les Goldsmith is a man who loves numbers. Hard numbers. Crunchy, crisp, precise numbers, not estimates or approximations. He likes speeds, heights, weights, highs and lows, presence or absence, openings and closings. Numbers that can be tabulated and analyzed. Useful and exact numbers which spot behaviors and define trends, and when analyzed turn into facts and information.

A hearty Australian entrepreneur with a background in rotary aircraft and laser-sharp mind, Goldsmith has been building automated “sensor systems” for the U.S. government for decades. Not the humdrum mundanities of the I.R.S. or Social Security, mind you, but the eye-popping wizardry of counterespionage. Spooky.

“It’s a world where data really matters,” Goldsmith said, “and accuracy is prized. Just like aviation.”

His work has been so profound and so effective that the U.S. government uprooted him from his home — someplace in the barren, snake-filled Australian outback no doubt — to the more tranquil plains of snake-filled

Florida. From there he plied his dark and mysterious trade with great success and, presumably, great satisfaction. Until...

Until one day he was hanging out at Paige Field in southern Florida. Staring at the traffic display in the FBO's lobby, he noticed missing data. Airplanes were landing that were not on the FlightAware tracking system. Flights he knew were in the air were not showing on the monitor. Like Hamlet, he suspected "something was rotten in Denmark." Like most successful entrepreneurs, he knew he could do better.

A Better Mousetrap

"I had a team of people, developers mostly, that I called to discuss it," he told me. "They found a better way."

That was four years ago, and today "the better way" is known as the VirTower automated aircraft tracking system. In the U.S., VirTower is the undisputed leader in airport traffic tracking, with more than 400 locations using their system, which is about one-in-ten of all the NPIAS airports in the U.S. They have state-wide contracts with Utah, Florida, North Carolina, Indiana, Kentucky and Texas. Yep, that sounds like a better mousetrap.

Because they did so much right, today VirTower is a little bit swamped with demand. "We're 'suffering' from continued growth, organic growth," Goldsmith laughed. "We don't market anymore, people come to us. We'll have 30% of the market within the next two years."

The key to the VirTower success is their single-minded focus on collecting the data needed to protect and improve airports. Most G.A. airports do not collect traffic data systematically; they have neither the staff nor the motivation to note each flight and all the little operational details. Don't even think about the quality of the data involving night operations. Even air traffic control experts — and your intrepid reporter was one, decades ago — know that

monitoring the number of operations in the FAA's antiquated systems is a manual process, a low priority and only performed when time permits. Not exactly a recipe for laser-sharp data. The FAA and State Aeronautical Departments are never going to loosen their purse-strings for operational claims unsupported by crisp, well-measured statistics.



Photo 1: Unlike other airplane tracking systems, VirTower installs a small but powerful ground system on the premises of each customer airport (the two white antennae). These are linked to the internet and a giant cloud computing system which makes real-time tracking possible, and the analysis of the collected data quick, easy and reliable. All the airport needs to provide is a bit of electricity and a tall rooftop.

“Our data is all about the preservation and improvement of airports,” Goldsmith reiterated. “We’ve had nearly \$2 billion in capital projects funded and approved, using our data as part of the justification.” These include the addition of full-length taxiways at airports that lacked them; the addition of

fuel farms, the resurfacing runways and taxiways, and the building control towers. VirTower data has even saved some cross-wind runways, because hard data makes a big difference to the decision-makers.

The Secret Sauce

The big advantage of the VirTower system is the granularity of the data it collects. Goldsmith and his team spent two years attending meetings with airports and prospective users before writing a single line of code. They attended more than twenty different planning meetings, hearing ideas, testing mock-ups, and revising inputs, and then they coded what the customer said they wanted.

The system starts with the VirTower experts building a detailed “geofence” of the airport. This includes the runways, the airport traffic pattern, the taxiways, and even obstacles or attractions, such as nearby hospitals with helipads; whatever factors the airport wants to manage. Each geofence includes dozens of “trigger points” which tag an aircraft as it moves above an airport.

This rich detail allows for nuanced analysis and decision-making. Goldsmith’s integrated hardware and software doesn’t stop with simply counting the number of times your Cessna’s tires whack into the tarmac. It can identify the turn-offs you used, the taxiway you it trundled along, and the hours (or days) your plane sat on the ramp before departing again. It can even assess which hangars which are being used for self-storage instead of aeronautical purposes.

When airport engineers develop a Master Plan for an airport, they model the requirements based on the traffic data for the “critical airplane” which is an exemplar from each particular “aircraft design group.” Design groups are an FAA-defined cluster of specific aircraft types which impose similar demands upon their airports. For example, a single-engine Cessna is in one of the smallest design groups with the needs most easily satiated. A Citation jet is in a

mid-size design group, and a long-legged Gulfstream is in the heaviest G.A. design group. One might guess that design groups are based on max gross weight, which would be logical but wrong. Design groups are based on wingspan, tail height, and approach speed, and are defined in FAA Advisory Circular 150/5300-13.

“The best use of our software is to track the airplane design groups that use your airport,” Goldsmith explained. “We can be the justification for adding new airport features or capabilities for every 500 operations from a design group that’s heavier than expected.” It all comes down to having the data to justify the upgrades your airport needs.

Goldsmith was racing out of town to an airport convention, so for a tour of the software he handed me off to Ron Mallard, another ebullient, gregarious soul with a lifetime in aviation. I was impressed with Mallard: he was a pilot, which of course I like. He had 36 years in airline flight ops, running an airline operational control center. He has been on the certification team for two national airlines. He ended up the COO of the Punta Gorda Airport Authority in Florida processing 1.6 million passengers each year. There’s not much going on at an airport that Mallard doesn’t know about.

“One of the key differences between VirTower and all the other tracking systems is that we have our own sensors, so we generate and collect all our own data at each airport,” Mallard explained. “We capture roughly 20% more traffic data than our competitors.” VirTower also is almost completely independent of the data feed from the FAA. In fact, the only FAA data VirTower uses is enroute data, which is entertaining but not terribly relevant in terms of airport improvements.

Another important difference is the mindset of the VirTower team. “Our customer is the airport itself,” Mallard told me. “Each airport owns its own data and uses it as they see fit.”

This focus on the airport is a powerful differentiator. Several years ago, when I was active in my local airport authority, we compared data from VirTower and several other flight-tracking vendors. Those other vendors were less expensive, sometimes surprisingly so. But their data always showed fewer operations than VirTower. The other vendors could neither explain nor justify the discrepancies. The answer, in retrospect, was simple: VirTower's sensors on the field are more accurate than guestimates from radar sites sixty or more miles away.

“We even track balloons and UFOs,” Mallard cracked, “but not Chinese balloons.”



Photo 2: While so much in the “virtual” world is smoke and mirrors, VirTower is the real deal. It is a complete and operational company with two control centers (shown), trucks and installers, and a small army of software experts. This means they have the resources to accommodate new customers, fix problems, and develop new capabilities simultaneously.

There's an App for That

Collecting and tabulating all the aircraft data is a big chore for VirTower but easy for an airport manager. From the operator's perspective it all happens seamlessly and mysteriously behind the green curtain. What's more powerful (and fun) is playing with the VirTower web-based app, diving deep into the swirling beehive of the pattern at your local 'drome.

The app has two modes: graphical and tabular. The graphical mode starts with a God's-eye view of the traffic pattern, similar to the traffic display on Foreflight but with far more information. There are seventeen different display "layers" the operator can select, including roads and terrain, an ATC "mimic" mode, and both VFR and IFR charts. All the data is updated every few seconds, so real-time aircraft tracking is easy. If you're interested in a specific tail-number, you can time-travel back in time and follow that aircraft's track on its last flight or even from one a couple of years ago. The system also included a database of aircraft based at each airport, provided by the airport, so the system differentiates between local traffic and transient flyers.

"Suppose there's a noise complaint from your airport," Mallard hypothesized. "The FAA data feed takes 24-hours to show the data. We show it within seconds, faster than a neighbor can dial their phone. We can track every aircraft in the pattern, where they were and when they were there. We know the speed they were flying and how high they were."

This could be troubling news for the unwary pilot. Some airports with heavy flight training regimes have used VirTower to identify which aircraft drifted off the runway and crushed expensive runway lights. One airport in North Carolina used VirTower to track accident locations. An odd event in Arkansas was documented using VirTower when a Learjet entered the pattern at 300 knots, touched down at 200 knots, and not surprisingly rolled through the over-run, stopping at the edge of a four-lane highway. Aircraft flight data

can even be exported to Google Earth so each flight can be reviewed in 3D detail.

Moving from graphical data to tabular forms, statistics are big, Big, BIG with VirTower. Mallard and I reviewed reports which compared the traffic from base customers versus transient flyers; operations by the hour of the day and day of the week; and even after-hour operations which usually are completely invisible to airport staff. The options and filters make for a powerful system but a dizzying demo.

Which brings up an interesting nuance: not all aircraft carry transponders. ADSB is not required in antique aircraft, on aircraft which don't fly in controlled airspace, nor on balloons or in sailplanes. Experimental aircraft are a particular problem. Depending upon the skill of the builder, some of the electrical systems on homebuilt aircraft might be described as "sketchy." If the transponder is on the same circuit as the aircraft's landing lights, the VirTower data might only show that aircraft when the aircraft's lights are on.

"It's crazy what we've seen," Mallard said. "Sometimes we only get data when the flaps are down, or when the gear is down, or even only when an antenna is aimed in the right direction." As a general rule, VirTower recommends adding 3% to overall traffic counts to include this missing traffic.

Inconsistent State Support

Despite the obvious benefits of better data, each of the fifty states is adopting different tactics for improved data collection. Many states are offering grant programs to NPIAS airports to subsidize the collection of better data. VirTower has contracts with Utah and Florida for every airport in those two states. Texas, Kentucky, Indiana and North Carolina offer grants to the hundreds of airports in those states. Some states, like California, simply don't fund anything which is a shame, to my mind, because VirTower is highly affordable at about \$500 a month for a typical G.A. airport.

Better data substantiates more carefully the usage and importance of the airport. It correlates directly to the total economic impact of the airport, which is the best barometer of an airport's contribution to the community it serves. And, it helps the airport do a better job. As Mallard said, "Everybody is looking for funding. We provide the airport with the data they need to prove the traffic on their field justifies safety improvements."

"It all comes down to the numbers," Goldsmith agrees. "Better data helps airports get more money."

About the Author



Dr. Mike Jones is a 4,000 general aviation pilot and retired businessman with a passion for things-with-wings. He has served on his local airport authority for the better part of a decade, and has now embarked on his fourth career. He's working with endangered small G.A. airports across the country, reversing the damage caused by ineffectual politicians, helping them to get grants, and protecting them from avaricious developers.