

THERE'S LIGHT AT THE END OF THE RUNWAY

*Using Data and Technology
to Improve Runway Safety*

TOM HOFFMANN



I have fond memories of my first airline flight. It was aboard an Eastern Airlines DC-9 on my way to a family vacation in Florida. My parents knew my passion for planes, so they made sure their inquisitive eight-year-old son was strapped in at a window seat. (Although now I suspect that may just have been a sneaky way to keep me quiet during the ride.)

We departed in the evening, so my eyes were immediately transfixed on the sea of sparkling blue, green, and amber lights that lit up JFK airport's sprawling expanse of taxiways and runways. It was quite a sight. I recall being equally impressed with how our pilot effortlessly twisted and turned his way to the runway, guided only by a series of strange-looking markers, signs, and beacons. Incidentally, I was so inspired by the whole flight experience that I even asked for the captain's autograph — who does *that* anymore! I recall it was a really cool pilot name too, but I digress.

Fast forward ten years. I have since gained a whole new appreciation for the vast array of colored lights and signs that guided my first flight safely to the runway. During my private pilot training, the once confusing world of airport markings and signs quickly made sense. Of course, there was the occasional unfamiliar light or sign that my instructor might stump me with, but that was always promptly followed by a thorough post-flight scouring of the Aeronautical Information Manual (AIM) for the answer.

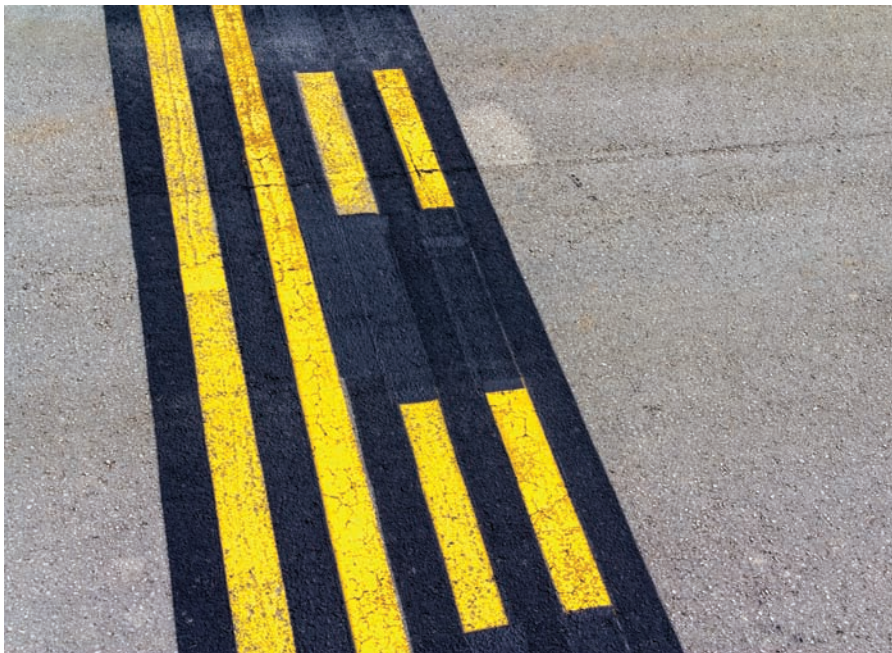
Now, fast forward another 20 years (after an unfortunately lengthy lapse in flying), and I have to admit that keeping that AIM nearby is still necessary, not just to refresh my memory on airport signage, but also to learn about some of the exciting new technologies now available. I'm not a big fan of the cliché, but I definitely believe it's "not your father's airport anymore."

Although the larger certificated (part 139) airports, like JFK, get a lion's share of attention with regard to advancements, there is an increasing focus on leveraging cost-efficient technology to improve safety at many smaller and predominantly general aviation airports. In fact, the FAA has enhanced airport markings, signs, and lights at more than 500 airports nationwide. So let's have a look at some of the more recent airport marking and lighting changes you might have noticed, as well as what the future might hold for advancing runway safety.

Hold Up!

By far one of the most critical markings on an airport is the runway holding position marking (four yellow stripes — two solid, two dashed). Cross it without the proper clearance from air traffic control and not only will you receive a terse call from the tower, but you may easily put yourself in grave danger with conflicting traffic. To help prevent this type of runway incursion, the FAA developed an enhanced taxiway centerline that helps alert pilots that they are approaching a runway. It consists of a series of staggered dashed lines on either side of the yellow taxiway centerline 150 feet from the runway holding position marking. You may also see surface painted holding position markings (red background and white inscription) that are designed to supplement those ever-important hold short lines. The enhanced taxiway centerlines are required at part 139 airports but are becoming a more common sight at many smaller GA airports.

We'll cover airport lighting later, but it's worth mentioning here that elevated runway guard lights (ERGLs), or "wig-wag" lights, are also used at many airports to help pilots identify a runway holding position. These lights can be elevated at either side of a taxiway or used as a series of in-pavement lights across the holding position marking.



A runway holding position marking is by far one of the most critical markings on an airport surface.

Sign Language

Through research and data collection, the FAA is constantly looking at ways to improve runway safety as well as promote consistent operations. In an effort to shore up standardization with regard to approach hold guidance procedures and signs and markings, the FAA's Office of Airports (ARP) is proposing a few changes in the near future that should alleviate confusion in these key areas.

For taxiways providing access to a runway, the FAA proposes using both the mandatory holding position sign for taxiway/runway intersections (red sign with white numbers) and the runway holding position marking. This was a problem at some airports that had taxiways going through the protected area and connecting to an in-line taxiway at the end of the runway. Some of those airports were using approach hold signage on those taxiways rather than mandatory holding position signs.

For taxiways that *do not* provide access to a runway, a new sign in conjunction with Instrument Landing System/Microwave Landing System (ILS/MLS) Holding Position Marking, also known as the ladder marking or conditional hold marking, will be used. To remedy confusion occurring when an approach hold sign is used for protection with departing traffic at the other end of a runway, a newly developed sign will have information for both runways, (e.g., 15 APCH - 33 DEP). This change was designed to address pilot confusion about requiring ATC clearance when crossing a runway holding position marking in conjunction with an approach hold sign.

Is That Available in Construction Cone Orange?

Runway construction projects routinely present hazards to aircraft and ATC operations. To help mitigate these hazards, FAA's Airport Construction Advisory Council (ACAC) — a volunteer group of air traffic managers and representatives from Flight Standards, the Office of Airports, and the Runway Safety Group — came up with a creative way to increase awareness of closures and construction at various airports across the nation. They proposed using bright orange construction signs similar to what you would see on the side of a highway. JFK Tower Air Traffic Manager David Siewert, a founding member of ACAC, hatched the idea for the conspicuously colored signs after researching a construction area at JFK that was causing pilot confusion.

"We think the orange signs will break up the visual wallpaper," said Siewert. In addition to being noticeable, the new signs will also indicate to pilots how much of an affected runway is open for use.

The signs are currently being tested at Long Island MacArthur, O'Hare International, Portland International, and T.F. Green Airport in Providence R.I. The FAA expects to complete testing by year-end and will then determine whether or not to expand use of the signs.

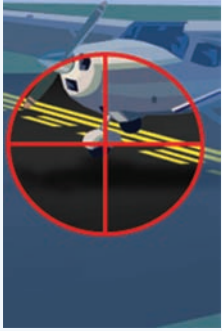
The ACAC has been involved with several other critical initiatives including the development and implementation of new controller phraseology and the creation of graphic construction Notices to Airmen (NOTAMs) for pilots and controllers. For more information on these and other runway construction safety initiatives, visit the FAA's website at www.faa.gov/go/runwayconstruction.

Lighting the Way

Another area that has helped advance runway safety in recent years is airport lighting. With the growing popularity of LED technology, it is not uncommon to see these cost-efficient, durable, and brighter lights being used on taxiways and runways, not to mention on aircraft lighting systems. The FAA continues to test LED technology and is looking at ways of expanding its use with approach lighting systems including Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) and Precision Approach Path Indicators (PAPI). Use of this technology has shown to significantly extend lamp life, reduce cost, and improve system reliability. An important consideration for this technology is its compatibility with Enhanced Flight Vision Systems (EFVS), which is discussed in more detail elsewhere in this issue.



A new orange construction sign at Long Island MacArthur International Airport in New York.



The FAA Taxi Test

This 60-minute video provides a comprehensive look at runway safety best practices including a review of signs and markings, scenario-based do's and don'ts, and clear explanations of why certain procedures are critical. Visit the site (<http://new.livestream.com/FAASTeamTV/events/2185859>) and test your skills today. Your surface safety knowledge and capabilities will markedly improve.

In addition to lighting advancements, there has also been a tremendous amount of progress made with airport pavement markings. Many of today's marking and paint applicators use materials that are sturdier, more environmentally resistant, and have greater retro-reflectivity — all benefits that can improve a pilot's situational awareness. In 2009, the FAA also approved use of preformed thermoplastic markings that are bright, clean, and easier to apply. See FAA Advisory Circular 150/5370-10E (go.usa.gov/WBKB) for more details.

A discussion about airport lighting enhancements would not be complete without mentioning runway status lights (RWSLs), which use surveillance data to illuminate and warn pilots it is unsafe to enter, cross, or takeoff on a runway. They're currently in use at seven larger air carrier airports with a total of 17 airports planned for deployment.

Among other ideas that have surfaced for protecting an active runway environment include electronic message boards as well as ADS-B driven technologies. And at some smaller airports, remote tower control solutions could someday provide an additional layer of safety by supplementing existing tower operations on demand, or by providing monitoring after a tower closes.

There Really Is an App for That


While the safety ideas discussed here are primarily “outside the cockpit,” there are a few that could literally wind up in a pilot's lap. The MITRE Corporation (a not-for-profit organization that manages federally funded research and development) developed an

iPhone app for GA pilots that captured hold short, cleared to cross, and departure runway instructions manually or via speech recognition. The app then tracked the aircraft's movements on the ground and provided reminders when it appeared a pilot was not going to comply. As a result of the FAA-sponsored research with MITRE, commercial vendors have developed runway safety apps, such as ForeFlight's Runway Proximity Advisor.

Another operator-controlled (and zero-cost) safety strategy is for pilots to keep their landing lights off when lined up and waiting for takeoff until a takeoff clearance is received. When the lights come on, it sends a signal to other pilots, ATC, and ground personnel that an aircraft is moving down the runway for takeoff. All exterior lights, including the landing lights, should also be turned on when crossing a runway at night or in low visibility conditions.

Centered on Safety

At the heart of FAA's efforts to keep taxiway and runway operations running smoothly and safely is none other than the Office of Runway Safety. As group manager for this team, Jim Krieger views his appointment as a tremendous opportunity to move runway safety to the next level. “Over the years, our team has had a positive impact on runway safety nationwide,” said Krieger. “However, I believe that it is time that we approach the problem in new and different ways.”

To that end, Jim is leading an effort to reach out and educate more stakeholders by developing mobile apps, interactive webinars, videos (see Taxi Test sidebar), and by employing various forms of social media. The Runway Safety office is also working with AOPA on updating its runway safety course in 2014. Be on the lookout for more information on runway safety advancements in future issues. 

Tom Hoffmann is the managing editor of the FAA Safety Briefing. He is a commercial pilot and holds an A&P certificate.

Learn More

Pilot's Handbook of Aeronautical Knowledge – Runway Incursion Appendix Chapter

<http://go.usa.gov/WKTG>

FAA Runway Safety Report 2011–2012

<http://go.usa.gov/WKTK>

Runway Safety Flash Cards (accessible for mobile devices)

www.faa.gov/mobile