ABOVE GROUND LEVEL

agl Magazine™

DRONES

- Tower Inspections
- Risk Management
- A Drone as a Cell Site

SMALL CELLS

- Self-organizing Microwave
- Wireless Backhaul

June 2017 /// Volume 14 /// No. 6

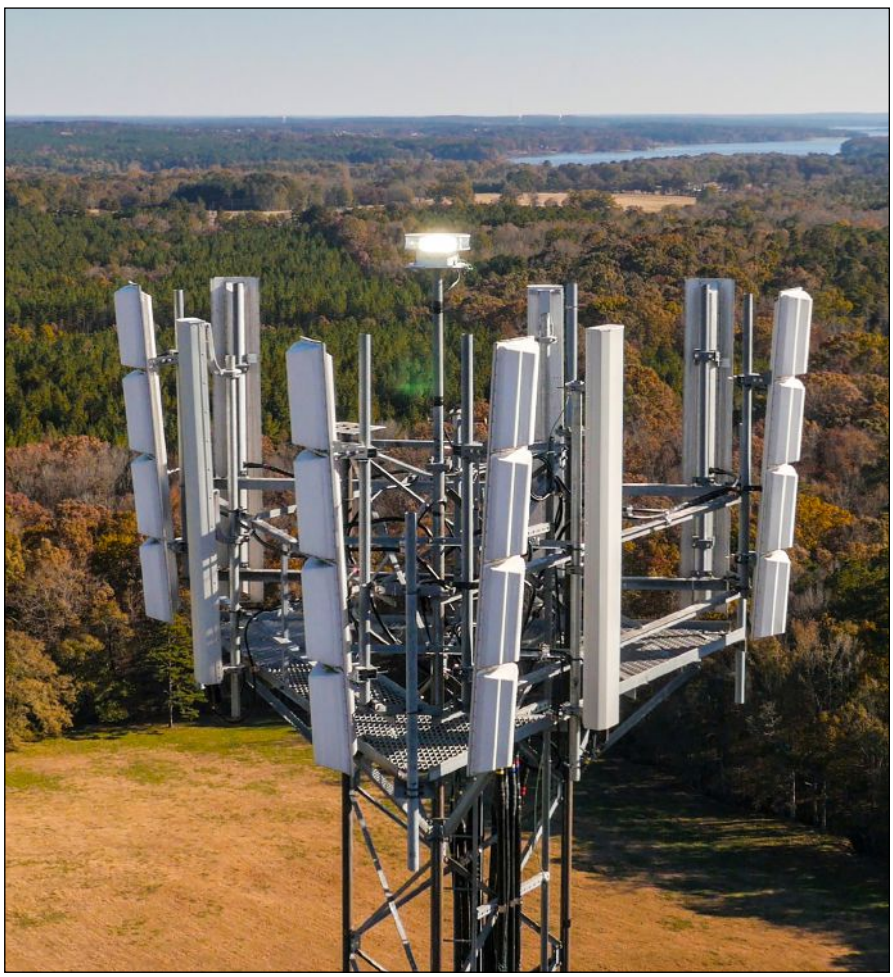
Protecting All Air Traffic, Birds Included

Changes in Federal Aviation Administration regulations give tower owners options for configuring obstruction marking to protect aviation and migratory birds while reducing operating and maintenance costs for lighting systems.

By Mark Lane

Towers of all shapes and sizes penetrate U.S. airspace to deliver various types of wireless telecommunications. The FCC's Title 14 Part 77 of the U.S. Code of Federal Regulations (14 CFR 77) establishes standards for determining obstacles to navigable airspace and how to safely mark them.

Marking towers with red and white lights, along with conspicuous paint patterns, has long been used to indicate aviation obstructions. Structures also employ different types of lighting technologies, including incandescent, halogen, neon, xenon and LED. For the last 10 years, tower lighting has been transitioning from incandescent and xenon-based systems to LED.



A Flash Technology Vanguard beacon.

Industry sources estimate that 20 to 30 percent of lit towers have converted to LED, leaving a considerable amount of incandescent and xenon lighting still in use.

For much of the last century, incandescent and xenon lighting have been dependable technologies for broadcast and telecom towers. However, they require periodic maintenance. Xenon flashtubes require replacement every few years, along with other components that ozone can damage. Nevertheless, periodic maintenance could be considered a small price to pay compared with the cost of replacing an entire system. A tower owner needs to decide at what point the frequency, power consumption and costs of maintenance outweigh a system replacement. If implemented properly with equipment selection, recent regulatory changes can actually lower maintenance costs.

FAA AC 70/7460-1L

In December 2015, the FAA released Advisory Circular 70/7460-1L, in support of 14 CFR 77. The new regulations change how towers are lit and monitored. The most noteworthy change describes an avian-friendly configuration. According to some studies, steady-burning red lights attract migratory birds. The goal of the avian configuration is to remove

lights that cause birds to fly into the tower's guy wires.

The new avian configuration consists of the following:

- Towers that are 350 feet tall or less need to flash the L-810 marker lights, referred to as L-810(F).
- Both the L-864 red beacon and the L-810(F) marker lights should flash in unison at 30 flashes per minute.
- Towers over 350 feet tall that consist of multiple tiers of beacons may remove the L-810 marker tiers.

Avian configurations were available prior to 70/7460-1L through an FAA waiver. Under 70/7460-1L however, all new tower filings and refiles of existing towers must meet the avian configuration. A tower must be refiled if the lighting type or tower height changes.

These changes do not affect towers marked with a steady-burning OL2 fixture. Towers using two L-810 marker lights on top are typically no more than 150 feet tall and do not require supportive guy wires.

Towers Over 350 feet AGL

Implementing the changes found in 70/7460-1L will have varying effects on maintenance costs, depending on the tower's height. Owners of towers over 350 feet that deploy a red or red/white lighting system can remove the L-810 marker tiers from both the tower and periodic maintenance cycle. To do so, the tower owner must refile under 70/7460-1L and set the beacons to flash at 30 flashes per minute. However, changing the flash rate of the existing lighting system may have unanticipated ramifications. Also, the manufacturer may not support the change.

Prior to the release of 70/7460-1L, the red beacon was allowed to flash between 20 and 40 flashes per minute. Most of the industry standardized on 20 flashes per minute, because it provided the longest bulb life, whether using xenon or incandescent technology. In many cases, you will not even find the option to change the flash rate with older lighting controllers. Even if workarounds allow changes to the flash rate, such as replacing the controller board with one specifically programmed for 30 flashes per minute, the outcome is most likely to be undesirable. Running at 30 flashes per minute increases the run time by 50 percent and could require more frequent bulb replacement. The difference offsets the maintenance gains of not having to service the L-810 markers.

For xenon products, the amount of ozone created also increases by 50 percent, and the ozone degrades the power supply components found in the light housing, resulting in the need to replace them more often. Using a shorter flash duration with higher energy to maintain the same light output could reduce ozone creation. But increased run times negatively affect the wear on the xenon electrodes. In addition, this approach may not be approved by the OEM or might not be tested and found to meet the FAA photometry requirements.

In summary, modifying existing lighting systems on towers over 350 feet may not only fail to lower maintenance costs, but also could cause the system to fall out of compliance. Check with the original equipment manufacturer to see what options are supported by its product. The safest way to remove the markers from the tower is to upgrade to a lighting system that can accommodate the changes.

Towers Under 350 feet AGL

For towers 350 feet tall and shorter, the avian configuration has no maintenance benefit. As a matter of fact, not only do the L-810 markers have to stay on the tower, but they must also flash at the new higher rate of 30 flashes per minute, making the failure of one an event worthy of a NOTAM (Notice to Airmen).

The tower owner or its agent must open a NOTAM ticket with the FAA within 30 minutes of a detected failure of a tower's flashing lights. Advisory Circular 150/5345-43H, which brings further definition to 70/7460-1L, states in Section 3.3.5.2.2 Monitoring that:

1. Each separate L-864 light unit and each tier of the L-810 light units must be monitored for FLASH/FAIL status.
2. FAIL is defined as outage of any lamp in an L-864 light unit, outage of any lamp in a tier of L-810 light units, or failure of a flasher (steady on and/or total) for an L-864 or L-810(F) light unit.

Before 70/7460-1L, when a marker failed, the FAA did not require the tower owner or its agent to open a NOTAM. A technician simply addressed the failure during the next scheduled site visit. Now, if a tower is filed under 70/7460-1L, the tower owner or its agent must treat a marker failure the same as if a flashing beacon failed.

Although it doesn't make sense to deploy these changes for the purpose

of lowering maintenance costs, a refile could be unavoidable. If the owner wishes to install a dual system in order to stop having to paint the tower, a refile is required. Structural changes, such as an increase in height, also require a refile. Retaining the existing lighting system when refiling the tower may present another set of challenges.

First, the beacon needs to flash at 30 flashes per minute, presenting the same life expectancy considerations previously mentioned. Second, flashing the L-810 markers may not be an option for the existing lighting controllers in the field. Controllers use a mechanical relay to switch the markers on at night and then off during the day. A mechanical relay is not made to cycle 30 times per minute and will fail before a solid-state beacon relay would. Any changes made to the lighting system to make the markers flash need to account for this. Finally, given that the flashing markers are now NOTAM-worthy if they fail, accurate monitoring of a flashing power load is more important. If these concerns cannot be adequately addressed, a new lighting system may be required to safely accommodate the changes.

Upgrading to LED Lighting

When it's time to invest in a new lighting system, migrate to LED technology for a longer service life and lower power consumption. The system should support synchronized flashing of both the beacon and markers at 30 flashes per minute using solid-state relays. It should also be able to accurately monitor a failure of either one.

Not only do the beacon and markers have to flash in unison, but they also must have the same flash duration. Advisory Circular 150/5345-43H states in section 3.4.3.1 Simultaneous Flashing Systems: "All obstruction lights in systems composed of either L-810(F), L-864, L-856 or L-865 light units must flash within 1/60 of a second of each other." Older controllers in the field flashing at 20 flashes per minute typically will have a flash duration of 1,500 milliseconds. The flash duration can now be as short as 100 milliseconds, something many manufacturers have taken advantage of in order to lower power consumption.

With LED lighting, the steady power consumption of an L-810 marker has decreased from 116 watts to as low as 2 watts. The same technology used to monitor steady-burning incandescent markers on older controllers will have difficulty accurately monitoring a 100-millisecond flash on a fixture drawing 98 percent less power.

Flash Technology addresses accurate monitoring of low-power LEDs in the Vanguard series of lighting controllers. The new FTS 371 red-light controller uses a patent-pending technology to monitor the loss of a single flashing L-810 marker. The FTS 370 dual-light controller uses separate channel monitoring for each marker. Both systems can flash at 30 flashes per minute in either legacy flash mode (1,500 milliseconds) or an efficiency flash mode (200 milliseconds). The Vanguard series is fully capable of meeting the requirements of 70/7460-1L and keeping all air traffic safe, including birds. ■

Mark Lane is director of product management and marketing at Flash Technology. Visit www.flashtechnology.com.