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# Day in the LIFE

## *Eye in the sky at Bradley International*

### *The science of "ready for lift off"*

by Doug Malan

Travel routes are clogged with traffic, especially on a good day. Merging into the fray requires patience and precision timing, and pre-empting stressful situations lies in the ability to communicate and monitor surrounding activity at all times.

Arriving safely at each destination is no easy task.

So you think navigating the interstates is a challenge? Try handling more than 20,000 arrivals and departures in one month as an air traffic controller at Bradley International Airport, not even considered one of the country's busiest facilities.

While warmer weather increases highway traffic, the same applies to the airspace over Connecticut. An intricate grid of air "lanes" crisscrosses the sky, invisible to the untrained eye on the ground. Each flight to and from the airport travels a highly specific route, and on consecutive clear days, vapor trails can be seen arcing in identical patterns.

"It's a complex system, very similar to a road map," said Mark A. Guiod, the airport's manager of air traffic. "There are only a certain number of ways to bring in and depart planes. It's a door in and a door out."

At Bradley, two separate groups of controllers monitor those passages from a 180-foot tower constructed by the Federal Aviation Administration (FAA) for $12.8 million in 1998. Sixteen controllers and two supervisors manage the control tower, a bright circular area filled with digital radar systems and panoramic views of the outlying area. Three posts handle all phases of flight when aircraft are within five miles of the airport and 3,000 feet in elevation.

Downstairs in the separate Terminal Radar Approach Control (TRACON) room, 28 controllers and three supervisors are responsible for tracking aircraft up to 50 miles away and flying at 10,000 feet. The only light comes from radar and computer screens and an occasional desk lamp that silhouettes controllers speaking in hushed tones through their headset radios.

On a recent weekday morning, the mood of both rooms seemed commensurate to the amount of natural light available.

### *State-of-the-art radar*

Controllers utilize the Standard Terminal Automation Replacement System (STARS), a sophisticated program designed by Raytheon, the FAA and the Department of Defense. When it was installed a few years ago, the software replaced technology that had been used at Bradley since the late 1960s. It is one of the first 50 airports in the country to receive the upgrade.

STARS is designed to share information between the FAA and DoD to enhance national security while the self-monitoring system contains built-in safeguards to maintain proper operation if a program malfunctions, reducing the number and duration of air travel delays.

Controllers can track as many as 1,350 aircraft at a time in a 50-mile radius while accessing updated weather reports and an aviation encyclopedia that assists with emergency situations involving distressed aircraft.

An independent feature of STARS allows the program to transmit important information to controllers, even during a total hardware or software failure. Considered the centerpiece of the FAA's modernized national air traffic system, STARS can expand as technology changes in the future.

"The capabilities of the system are phenomenal," said Jim Peters, FAA spokesman for the New England Region. "There was concern that the FAA would be unable to merge large systems," but STARS alleviated that.

Other technological advancements have changed the need to construct air traffic control towers in the middle of airports. Bradley's tower, a brown and blue silo rising from the 14,000-square-foot administrative building, sits at the edge of the property across the street from the New England Air Museum.
"With the technology today with digital radar and fiber optics, you can put (the tower) anywhere," Mr. Guiod said.

As a result, Bradley's controllers handle traffic at several smaller airports in Connecticut and Massachusetts that either have no tower or don't staff their tower around the clock.
Similarly, 22 air route traffic control centers around the country guide aircraft from sector to sector above TRACON airspace, handing off planes as they approach the runway. Aircraft beyond Bradley's TRACON room are guided by the Boston Air Route Traffic Control Center in Nashua, N.H.

Nationally, the Air Traffic Control System Command Center in Herndon, Va., is able to monitor airspace around the entire country and avoid overloading airports with too many flights at once, dramatic progression for an industry that started in the late 1950s to early 1960s.

## *In the tower*

Workload at the top is broken down by stage of flight, and all three certified positions rotate within the same shift to stay fresh.

Before a plane pushes out of the gate, the pilot communicates with flight data/clearance delivery. A series of alphanumeric codes is printed on a strip of paper indicating everything from the flight number to the date of the flight to the route the pilot will fly. All schedules follow Greenwich Mean Time.

If the pilot's codes don't match the flight data controller's, correct information is e-mailed to the cockpit and programmed into the airliner's autopilot function. The flight data controller also updates pilots on weather conditions, closed runways and other pertinent information.

"It's like if you're going to the mountains on vacation," Mr. Guiod said. "You'd plan the route and write it down so you know which way to go."

When the plane pushes away from the gate, ground control, which operates on a different radio frequency, governs the plane's journey. This controller is responsible for taxiway traffic leading to the runway and sequences numerous planes moving along the ground. The ground controller might stop a plane on the taxiway to allow an incoming flight to land, or the controller might tell which plane on the taxiway to depart first, based on its destination.

On a heavily traveled route such as the one into Washington Dulles International Airport, the ground controller's ability to sequence flights is essential when searching for a departure window among the other aircraft flying overhead toward Washington, D.C.

“It’s like merging on to an interstate,” Mr. Guiod said. “The planes have to be spaced out and lined up like a string of pearls coming into Dulles. You have to wait for an opening to depart and fall in line with the other planes.”

Once on the runway, local control, referred to by pilots as Bradley Tower, directs the plane.

“Everything is a definitive procedure based on safety,” Mr. Guiod said. “It’s based on the controller having a certain sovereign area that no one else can access without his or her permission. (Planes) don’t do anything until we tell them to do it.”

Commands and phrases also have their own strict rules. An FAA guidebook outlines the exact directives that should be used when communicating with pilots, and all radio transmissions are recorded to ensure proper procedures are followed.

“Quality assurance is a big part of what we do,” Mr. Guiod said. “Everything we say is broken down into specific phrases. Things happen so fast that a pilot has no time to guess what controllers mean. And the same rules apply to the pilot.”

TRACON controllers guide the plane until it climbs above 10,000 feet or leaves Bradley’s 50-mile jurisdiction. Along with its cache of programmed information, the radar includes conflict alerts that sound when planes start to get too close to each other.

An alert was triggered when a climbing airliner momentarily shared the same elevation with another plane headed in an opposite direction. The controllers, who were aware of the common situation, alerted the pilots and overrode the system. From radar alerts to reserve generators tested monthly, the control tower’s entire operation is designed to be ultra-sensitive.

“These are the redundancies built in for optimum safety,” Mr. Guiod said. “These controllers are working on conflicts three to four minutes ahead of what they’re saying.”

## *Inherent challenges*

The path to the control tower has evolved with the industry. Prospective controllers once were required to have only a high school diploma and the ability to pass a strenuous three-part written test. If they passed the test, they were sent to the FAA’s academy in Oklahoma for two months where there was a 60 percent to 70 percent failure rate. During the process, the government paid most of the students’ bills.

“You’d start with 100 people and end up with five or six who actually became controllers,” Mr. Guiod said. “That’s a lot of taxpayers’ money.”

Many controllers arrived from the military, but now the majority graduate from one of a dozen colleges in the country that offer a bachelor’s degree in air traffic control. Located in 10 states and Puerto Rico, the certified schools include Daniel Webster College in New Hampshire and Dowling College and the College of Aeronautics in New York.

Qualified candidates log 10 weeks of simulator training at the FAA academy before handling assignments at small airports for on-the-job training. On average, students will become fully certified by the FAA in three to five years, said Mr. Peters, FAA spokesman for the New England Region.

Even when certified, controllers constantly immerse themselves in training sessions to remain updated on new technology and safety procedures. The FAA normally requires this of all controllers, and the protocol in the tower and TRACON room at Bradley remained unaltered after the September 11 attacks, Mr. Peters said.

Moving from the control tower to TRACON is considered a promotion that requires stringent training in a small room next to TRACON. It's equipped with all of the same technology and driven by software that simulates airspace activity with built-in conflicts.

A controller on the other side of the partition enhances the mock flight patterns by acting as a pilot calling in for direction and assistance

Trainees must be able to handle 115 percent of Bradley's normal traffic load before moving into the official TRACON room where he or she will be guided by seasoned controllers during a shift. Though there's no timetable for becoming a TRACON controller, not everyone succeeds.

"The training is tailored to the worker, but they're not just thrown to the street if they fail," said Mr. Peters. "There's the stereotype of the government not looking at employees as assets, and we're changing that."

While Bradley isn't one of the busiest airports in the country, the job of an air traffic controller contains a certain amount of stress no matter the location. Controllers tend to gravitate toward airports and working conditions that fit their personality and lifestyle. As a young man in 1978, Mr. Guiod worked in the fast-paced tower at Boston's Logan Airport.

"It was high stress and non-stop activity, and I was young," said Mr. Guiod, who was married with a family by the time he arrived at Bradley in December 2001. "It depends on what you like to do. Air traffic controllers are problem-solvers. So if that's what you like, it's not overly stressful."

And it's not always a lot of traffic that creates anxiety. Several of the controllers, none of whom wished to be identified, said that snow and bad weather create more difficult variables than a busy day with a clear sky. The FAA is implementing a surface radar system, due for completion this fall, to assist ground traffic when visibility is at its lowest.

But traffic has increased at Bradley in the past couple of years with 96 more flights per day, Mr. Guiod said. As more airline companies are using smaller regional jets, the number of daily flights probably will grow. And while Bradley reports that the 6.7 million passengers who passed through its gates in 2004 nearly equal its pre-9/11 numbers, the control tower is operating "at 60 percent capacity," Mr. Guiod said.

Any future expansion would be predicated on business plans rather than concerns about an overworked staff.

In the glass-enclosed aerial perch in the tower and the TRACON cave of radar monitors, Bradley's traffic flow is synchronized by groups of controllers whose high-tech radar system provides boundless information and numerous levels of safety checks.

"We might not have the most efficient system in a business sense," Mr. Guiod said, "but in a safety sense, we have the best system in the world."