

Virginia Aviation History Project



Lighting the Night for Virginia Airways

by Linda Burdette, Feature Article Editor

It began with a casual conversation while traveling around Virginia in the quest to complete the Virginia Aviation Ambassador program. While visiting the Lawrenceville-Brunswick Airport, I mentioned that I wrote articles for the Virginia Aeronautical Historical Society. Eyes immediately lit up. “Did you know there was a beacon near here years ago to guide pilots? Back then there weren’t any navigational aids and the pilots followed a trail of rotating beacons. Yeah, one of them was just off the airport here.” Well, interest piqued, I had to find out more about these beacons.

Today’s aircraft find their way by using airways and their ground-based navigational systems based on the development of the VOR, DME, and ILS since World War Two. Today’s airways, though, trace their roots to a time before radio.

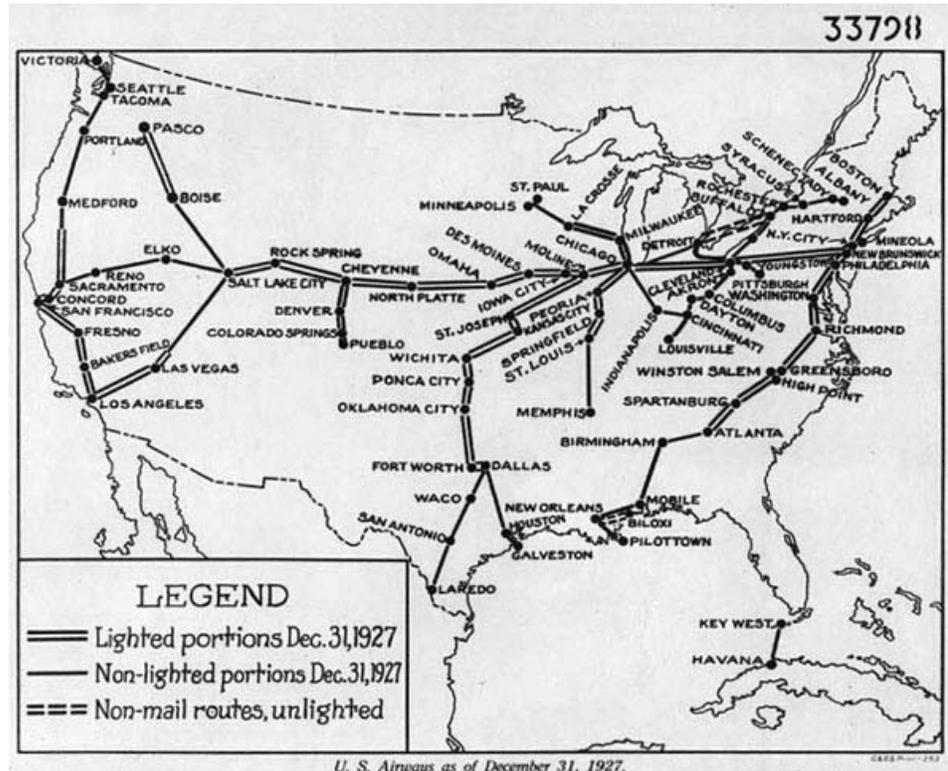
On May 15, 1918, the U.S. Post Office began the new and innovative service of air mail. President and Mrs. Woodrow Wilson, Assistant Navy Secretary Franklin D. Roosevelt, the Postmaster, and Members of Congress were all present to witness the event. Pilots selected for the initial run included Lieutenants Howard P. Culver, Torrey H. Webb, George L. Boyle, and James C. Edgerton. The two former were accomplished pilots, but although Boyle and Edgerton had completed pilot school, they had barely flown.

President Wilson signed a letter carrying the first airmail stamp to be auctioned for charity when it arrived in New York. Boyle was handed a map showing the route from Union Station in Washington, north to Philadelphia 128 miles away and told to follow the railroad tracks. At 10:45 a.m., Boyle tried to start the plane’s engine—three times. The crowd laughed as mechanics ran for gas, realizing that the aircraft had not been fueled.

Boyle took off 45 minutes late. He carried 3,300 letters weighing 140 pounds and barely cleared the trees. Boyle circled, then flew away—but to the south. Just 24 miles away, on a farm near Waldorf, Maryland, Boyle landed and flipped over. He was unhurt, but his mail had to be unloaded and put onto a train to Philadelphia.

The other pilots had better luck at navigation. Lieutenant Webb took off at 11:30 a.m. from Belmont Park in New York and arrived at 12:40 p.m. in Philadelphia. Webb handed Lieutenant Edgerton 150 pounds of mail. Edgerton took off and landed in Washington at 2:30 p.m. to a small but cheering crowd.

However, Lieutenant Boyle's experience proved prophetic. Navigation became the Achilles' heel of air mail. Maps showed large cities but no elevations or landmarks. Mail planes of the day normally came equipped with a compass, a turn-and-bank indicator, and an altimeter. Pilots were often skeptical of their instruments and would only fly along a well-known route. In those days, maps printed for



other applications provided the only source of navigation information and the first airmail pilots flew cross-country by following railroad tracks and jotting down notes, describing routes between airfields. This system worked adequately, of course, when the weather was clear and the sun was out. Weather and night flying, however, posed different problems and it didn't take long for the Post Office to understand that a system had to be developed to allow flight in all types of conditions.

Paul Henderson, who became the Second Assistant Postmaster General in 1922, believed that Air Mail would become profitable only when it became a round-the-clock operation. He knew that in 1919, U.S. Army Air Service Lieutenant Donald L. Bruner began using bonfires and the first artificial beacons to help with night navigation. In February 1921, an airmail pilot named Jack Knight put this to the test with his all-night flight to Chicago from North Platte, Nebraska. Knight found his way across the black prairie with the help of bonfires lit by Post Office staff, farmers, and the public.

Henderson saw what was needed. "An airway exists on the ground, not in the air". He pressed his requests for the development of a system using rotating light beacons for the Air Mail routes. Congress, in 1923, approved funding for the lighting of the Transcontinental Air Mail Route designed to link the east and west coasts. Work started immediately on the Cheyenne to Chicago segment. Being in the middle of the nation, flights starting at daybreak on the coasts would be able to fly to either end of the lighted segment before dusk. Other planned routes soon followed, including one from New York to Washington, and eventually to Atlanta.

On July 1, 1924, postal authorities began regularly scheduled night operations over parts of this route. By 1927, the Post Office, under the Air Commerce Act, transferred 4,121 miles of lighted airways to the Department

of Commerce, including 2,041 miles on the transcontinental route. The airways contained 719 airway beacons and 124 intermediate (emergency) fields, each with beacons and airfield lighting. By 1933, the Federal Airway System operated by the Airways Division comprised 18,000 miles of lighted airways containing 1,550 rotating beacons and 236 intermediate landing fields. Air Mail pilots routinely navigated the skies during the night, following the “signposts” of the rotating beacons.

This was the first ground based civilian navigation system in the world. High-intensity beacons were established approximately 10 miles apart along these civil airways. Intermediate landing fields provided every 30 miles along these routes, in the absence of suitable commercial or municipal fields, were equipped with beacon, boundary, approach, obstruction, and wind-cone lights.

Night or day, from elevated platforms, a 24 inch searchlight rotating at 6 rpm, containing a 1000 watt lamp, swept the sky. At the top of a 51-foot steel tower, the beacon consisted of a 24-inch parabolic mirror and a 110-volt, 1000 watt lamp. The beacons, rotating at 6 rpm, showed a one-million candlepower flash every 10 seconds for 1/10th second duration. The beam from the airways beacon, aimed 1.5° above the horizon, was a high-intensity pencil of light of about 5-degree beam width visible 20 to 40 miles in clear weather. A small percentage of the beacon’s light was reflected upward to provide close-range visibility.

Two course lights were mounted on the tower just below each searchlight; one pointed forward along the airway and the other pointed backward. These 500-watt searchlights gave a 15 degree horizontal beam width.

The course lights were fitted with either red or green lenses. Every third beacon had green course lights signifying that it was on an intermediate landing field. Thus the pilot knew at a long range the availability of landing fields. (This is the forerunner of today’s airport rotating beacons which alternately flash green and white.) All other beacons had red course lights.

As the mechanism revolved and the clear flash of the beacon passed from the pilot’s vision, the red or green flash of the course light came into view. Course lights flashed coded dot-dash signals to indicate the beacon’s position on the airway. Code signals ran from 0 to 9; thus, if a pilot received a signal for the number 4, he knew he was flying over the fourth beacon of a particular 100-mile stretch of airway. But he could not determine his precise position merely by receiving a course-light signal if he did not know independently over which 100-mile stretch he was flying.

Letters designated the airways, the first letters of their terminal cities. The order of the letters was established as south to north and west to east. Thus Omaha to Chicago was Airway O-C. LA-SF defined the Los Angeles to San Francisco airway, and so forth.

Regular maintenance of the airway beacons and intermediate fields was crucial. This duty was entrusted to Airway Caretakers. Daily they climbed the steel towers to check every beacon within their territory, cleaned dirty lenses, replaced burned-out bulbs, etc. Repair problems requiring more expertise or equipment and tools not locally available were referred to “mechanicians,” who serviced a 175-mile route with a half-ton pickup truck.

Caretakers at intermediate fields were on duty from 6:00 pm to 6:00 am. If a pilot “dropped” in to one of these emergency fields, caretakers were expected to provide transportation to and from town, furnish them with meals, and assist in repairing their aircraft.

The beacons were also built to aid daytime navigation. Each tower was built on an arrow shaped concrete slab that was painted yellow. The arrow pointed to the next higher numbered beacon. An equipment/generator shed next to the tower had the beacon number and other information painted on the roof.

Because of this effort, by the mid-1920s the Postal Service was able to focus on safety and reliability as well as on expanding operations. It established minimum lighting requirements for all airmail stations: a 500-watt revolving searchlight, projecting a beam parallel to the ground to guide pilots; another searchlight projecting into the wind to show the proper approach; and aircraft wingtip flares for forced landings. It also prescribed that all landing fields should be at least 2,000 feet by 1,500 feet to allow plenty of room for landings. As a final safety device, the requirement for a searchlight to be mounted on airmail airplanes was appended to the Post Office's set of requirements.

In October 1931, D. C. Young of the Airways Lighting Sub-Committee recapped the progress of lighted airways at a lighting conference in Pittsburgh, Pa.

“Ten years ago, a scheduled night flight by airplane across the United States was only a dream. Now, such flights occur nightly, and on scheduled time. The converting of this hazardous journey into one of comparative safety ... is the achievement of constructing aerial highways for the airman.

However, just as the last of the light beacons was being put in service, the introduction of the first low frequency (low hundreds of kilocycles) radio range stations began. The Bureau of Standards had begun to work on two-way technology in December 1926 at its experimental station in College Park, Maryland. By 1928, they had developed a radio navigation beacon system, and in 1929 the Aeronautics Branch standardized a four-course radio range whereby pilots listened to audio signals to determine if they were on course. In September 1929, Army Lt. James H. Doolittle became the first pilot to use only aircraft instrument guidance to take off, fly a set course, and land. He used the four-course radio range and radio marker beacons to indicate his distance from the runway. An altimeter displayed his altitude, and a directional gyroscope with artificial horizon helped him control his aircraft's attitude, without seeing the ground. Following this, the Aeronautics Branch stepped up installation of four-course radio ranges, and this technology became standard for civil air navigation through World War II.

But the light beacons had left an important legacy. They had established the concept of airways in the sky.

And Virginia?

Well, we know that one of the air mail routes went from Washington to Richmond to Atlanta, Georgia, and from there mail could be carried along unlighted routes to both Mobile, Alabama, and to Miami, Florida. The beacon at the Lawrenceville-Brunswick Airport was doubtless part of that system. Another one was at Studley, in Hanover County, just north of Richmond. Beacon Field in Alexandria was also part of it, owing its name to the program. The beacon was installed in the 1920's on land owned by W.F.P. Reid and the airport followed, obtaining a license on April 11, 1932.

And a very tangible part of that history can be seen at the Virginia Aviation Museum. The 1927 Pitcairn PA-5 Mailwing on display has seen many of the beacons while flying air mail. When flying the mail became open to private contractors in 1926, Pitcairn Airways of Byrn Athyn, Pa., was one of the first to be granted a Contract Air Mail route. Flying the mail from New York to Atlanta to Miami, the company later became Eastern Air Transport, forerunner to Eastern Airlines. The company selected Richmond's Byrd Field as a

center base for its two divisions - Hadley, N.J., to Richmond and Richmond to Atlanta. Aircraft flying the northern route were equipped with radio as an experimental program; those flying the southern route to Atlanta had nothing but the airway beacons.

The Centennial of Flight web site includes a map of the U.S. showing the routes in 1927, and the Virginia route is clearly shown, although it gives no details of the specific locations of the beacons in Virginia. The search goes on for a detailed map with all the Virginia beacons identified.

Sources:

Virginia Aviation Museum

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Aviation Records - Improvements in Design bring Speed and Endurance Records, 1929-1931, The Triumph of Instrument Flight, Copyright 2007 Franklyn E. Dailey Jr.



Help Wanted (Needed!)

For some time I have had research put on hiatus for a book about the Virginia Air National Guard. I'd like to finish the project. I would like to talk to anyone who might be able to provide their insights into the Guard.

One thing I am very concerned about getting is a list of serial numbers of all aircraft flown by the unit. Anyone with details such as this would be of great help. I have so far documented about 250 individual aircraft. My biggest gap is in the B-26 and F-84 eras as well as all aircraft of the utility unit.

If anyone is interested in seeing some of my work, I have a website which features a portion of my information. I have purposely locked out the 149th History portions to save for the book. The pages begin at <http://www.caiella.org/BasePages/Aviation/192FW.html>.

Thank you for any help you can provide.

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