United States Department of the Interior
National Park Service

National Register of Historic Places Multiple Property Documentation Form

This form is used for documenting property groups relating to one or several historic contexts. See instructions in National Register Bulletin *How to Complete the Multiple Property Documentation Form* (formerly 16B). Complete each item by entering the requested information.

____X___ New Submission _____ Amended Submission

A. Name of Multiple Property Listing

Sentinels of the Airways: Montana's Airway Beacon System, 1934-1979

B. Associated Historic Contexts

(Name each associated historic context, identifying theme, geographical area, and chronological period for each.)

The Airway Beacon System in Montana, 1934-1979

C. Form Prepared by:

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D. Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR 60 and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation.

_____ _____ _____
Signature of certifying official Title Date

_____
State or Federal Agency or Tribal government

I hereby certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

_____ _____
Signature of the Keeper Date of Action

E. Statement of Historic Contexts

(If more than one historic context is documented, present them in sequential order.)

Introduction

Many of Montana's nighttime airway beacons and associated outbuildings were constructed between 1934 and 1940, and most functioned as significant components of three major airway routes: the National Parks Airway, the Northern Transcontinental Airway, and the Great Falls - Billings - Cheyenne Airway. These beacons marked the air corridors between Salt Lake City, Utah and Great Falls, Montana (National Parks Airway); from Minneapolis, Minnesota to Seattle, Washington (Northern Transcontinental Airway), between Great Falls and Cheyenne, and a cut off between Strawberry Butte and Deer Lodge. These major airways were federally-sanctioned and supported routes to carry passengers and air mail. Additional routes, community, and military beacons (Glasgow and Malmstrom Air Force Bases) constructed and lit during the mid-twentieth century supplemented the network that aided pilots in nighttime navigation. By 1945, the nighttime navigation systems in Montana included 70 beacons strung across the state, with an additional 14 located at municipal and rural airports. Beacons at more airports, especially across the state's northern tier, were installed through 1959. In addition to the beacons themselves, the properties often feature generator sheds, shed foundations, warming sheds, and electrical circuit sheds associated with the beacons' historic operation.

Beginning in 1951, as improvements in radar and other navigational aids made the beacons somewhat redundant, the Civil Aeronautics Administration (CAA) began decommissioning beacons nation-wide. In 1964, the Federal Aviation Administration (FAA), the successor to the CAA, began to review the usefulness of the beacons it operated in Montana. Two years later, the FAA decided to retain eight beacons, and transferred twelve others to the Montana Aeronautics Commission (MAC, now the Montana Department of Transportation's Aeronautics Division), which formed the Montana Beacon System. MAC added another former FAA beacon, St. Regis, to the system in 1967, bringing the number of federal and state beacons across the state to 21. By 1979, the FAA had decommissioned its last beacons in Montana, and most of those became part of the Montana Beacon System as well. By the mid-1990s and through the first decades of the 21st century, the Montana Department of Transportation's Aeronautics Division maintained 17 of the surviving lighted beacons that guided aircraft over the mountains of southwestern and western Montana. Montana was the last state in the United States to operate and maintain airway beacons outside of airports, the last remnant of a national system that permitted nighttime flying to become commonplace in the U.S.

Early Aviation in Montana, 1901-1928

The history of flight in Montana began with daredevil aerialists who performed in fairs and carnivals across the state. Trapeze artists, balloonists and parachutists – and sometime a combination of all three – thrilled the crowds at the

Montana State Fair in Helena and similar gatherings in the 1880s and 1890s. Early aerialists possessed an adventurous spirit that often defied common sense. The list of those hurt and killed in their pursuit of conquering the sky is distressingly long, especially through the late nineteenth and early twentieth centuries. Means of personal mechanical transportation – automobiles and airplanes – were exciting curiosities. Their manufacturers desired that they become mainstream, and piqued the public's interests by holding exhibitions at fairs and other events nation-wide.

In 1901, Absarokee farmer Thomas Chalkley Benbow developed plans for an airship and secured a federal patent. In Red Lodge, in April 1902, with the help of some investors, he formed the American Aerial Navigation Company to construct an airship called the "Meteor," which he entered in the St. Louis Exposition Fair in 1904. The first recorded airplane flight in Montana took place at the Montana State Fairgrounds in Helena on September 26, 1910. Pilot J.C. "Bud" Mars made two successful flights that day in his Curtiss Aeroplane, named "Skylark."[1] Just a year later, on September 30, 1911, Cromwell Dixon made his famous flight across the Continental Divide from the State Fairgrounds.[2] Sadly, the nineteen-year-old Dixon died a few days later while performing aerial stunts at the Spokane Fair in Washington.[3]

Another famous aviator came to the Helena fairgrounds on September 23, 1913. Young Katherine Stinson earned her wings as a stunt pilot in 1912, and soon became an international celebrity as the "Flying Schoolgirl." On a tour promoting the idea that airplanes could be used by the US Postal Service, Stinson thrilled the Montana State Fair crowds by not only performing stunts, but also flying bags of mail from the fairgrounds and dropping them onto Helena's downtown post office. The *Daily Missoulian* reported, "another feature never seen in Montana before will be two flights daily by Aviatrix Katherine Stinson, a 20-year-old brunette, who won her pilots license on the daring she displayed. She will use a Wright biplane, the first seen in the state."[4]

Soon after the conclusion of WWI, pilots returning from the war established small airfields in several Montana towns. One early airfield was in Miles City – established in 1920 by Earl Vance and A.W. Stephenson, both Montana aviation pioneers. Earl's wife, Esther Combes Vance, holds the honor as the first woman licensed to fly airplanes commercially in Montana. The Vances established a flying service business in Great Falls by the late 1920s. Soon other aviation businesses sprang up in the state including Yellowstone Airways in Billings in 1927, Johnson Flying School in Missoula, and Steve's Flying School in Butte.[5]

Air Travel through the Night Sky

Before regular commercial passenger service began in Montana, and even elsewhere in the US, many Americans recognized the potential of the fledgling aviation industry. No one embraced it more than the Postal Service. Earle L. Ovington made the first Post Office Department-authorized mail flight by plane on September 23, 1911 at an aviation meeting on Long Island, New York. He made daily flights between Garden City Estates and Mineola, New York, dropping his mail bags from the plane to the ground where they were picked up by the Mineola postmaster.[6]

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[1] "Helena Sees Mars in Successful Flights," *The Daily Missoulian,* September 28, 1910. "J.C. Mars and Aeroplane Sklylark, Helena, 1910," Photograph. Montana Historical Society Photo Archives, PAC 79-36, unprocessed collection.

[2] "Across the Divide Dixon Sails Easily," *The Daily Missoulian*, October 1, 1911.

[3] "Conqueror of the Rockies is Killed at Spokane Fair in Fall of 100 Feet," *The Daily Missoulian*, October 3, 1911.

[4] "Nothing Can Mar State Fair's Success," *The Daily Missoulian*, September 21, 1913; Wiley, pp. 76-77; Montana Aeronautics Commission Photographs, PAC 79-36, unprocessed collection.

[5] Frank W. Wiley, *Montana and the Sky: Beginning of Aviation in the Land of the Shining Mountains*, (Helena: Montana Aeronautics Commission, 1966), pp. 99, 102, 104-108, 141, 144.

[6] Historian, U.S. Postal Service, "Airmail," U.S. Postal Service website, accessed March 7, 2014, http://www.postalmuseum.si.edu/museum/1d_Airmail_Flag.html.

Because they had the most training – and in hopes of training others - the Army controlled the airmail service when it began a regular route in 1918. Major Reuben H. Fleet flew a Curtiss JN-4H "Jenny" airplane from Philadelphia to Potomac Park in Washington, D.C., on May 15, 1918, the date regularly scheduled airmail service began between Washington and New York City. The flight in the opposite direction, between Washington D.C. and Philadelphia, proved less successful. An inexperienced pilot, having to rely on landforms and landmarks to guide his way, became disoriented and crash-landed just a few miles away from his starting point. Over the next year, the route became better established, and additional routes facilitated delivery across the treacherous Allegheny Mountains to Cleveland and on to Chicago.[7] In 1920, the Postal Service established a 2,680-mile transcontinental airway between New York and San Francisco, consisting of 15 landing fields spaced approximately 200 miles apart.[8]

Still, pilots only had minimal navigational aids in the cockpit, usually a compass and a hand-drawn map highlighting physical landmarks along the way. By 1921, their toolkit expanded to include altimeters and turn-and-bank indicators, but daylight continued to be crucial to safe flying. Because of this, as the airmail routes stretched across the country, the flights concluded at sundown, and the bags of mail transferred to trains for overnight transport.[9] Despite the safety afforded by day-flying, the U.S. Army experimented with nighttime flying techniques in 1921. Two lieutenants established a 72-mile air route between Dayton and Columbus, Ohio. The route included rotating beacons, field floodlights, and flashing markers "that enabled pilots to fly from one beacon to another."[10] Looking to convince Congress to fund the airmail program, Second Assistant Postmaster General Otto Praeger orchestrated a daring round-the clock flight on February 22-23, 1921, whereby four teams of pilots endeavored to fly coast-to-coast in a 24-hour period, two in each direction. The one of the eastbound teams was (barely) successful, following flares, bonfires, and alit gasoline drums to keep on course and land safely. The operation proved inefficient and costly – one of the pilots died in a crash. The Postal Service turned to private investors to create a beacon system to guide pilots along designated airways.[11]

In 1923, the Post Office began to construct the lighted airway routes using private investments. Electric and acetylene beacons and intermediate landing fields marked the flight route between Cheyenne, Wyoming and Chicago, Illinois.[12] Congress saw that such a mail delivery system could work, and in 1925 passed the Kelley Act (Air Mail Service Act) that allowed the Postal Service to contract with private companies to deliver airmail.[13] In 1926 Congress passed the Air Commerce Act.[14] This legislation shifted responsibility for airmail contracting to the Commerce Department, and within a year, the Postal Department transferred its Airways Division to Commerce, renaming it first the Aeronautics Branch, then changing the name to the Bureau of Air Commerce (BAC) in 1934. The Branch formulated a plan to erect beacon towers every 10 miles across flat terrain and every 15 miles in more rugged areas. The system included intermediate emergency landing fields every fifty miles. The beacons, moreover, featured directional lights that could be keyed to

[7] Nancy A. Pope, "Airmail Service Flag," National Postal Museum website, accessed March 7, 2014, http://www.postalmuseum.si.edu/museum/1d_Airmail_Flag.html.

[8] "Fad to Fundamental: Airmail in America Timeline," National Postal Museum Website, accessed March 11, 2014, http://postalmuseum.si.edu/airmail/timeline/timeline.html.

[9] "Airmail," p. 2.

[10] Nick A. Komons, *Bonfires to Beacons: Federal Civil Aviation Policy under the Air Commerce Act, 1926-1938*, (Washington DC: Federal Aviation Administration, 1978), pp. 130-31.

[11] Historian, U.S. Postal Service, "Jack Knight," U.S. Postal Service website, accessed February 15 2019, https://postalmuseum.si.edu/exhibits/current/airmail-in-america/some-early-pilots/jack-knight.html.

[12] Steve Wolff, "The Federal Airway System: The Early Years," Flight Service History website, accessed March 10, 2014, www.atchistory.org.

[13] 43 Stat. 805. The Air Mail Service Act limited contracting to shorter "feeder routes" along the first transcontinental airway between New York and San Francisco. By 1930, commercial companies could contract for longer routes.

[14] 44 Stat. 570.

provide important information for pilots. The planned system also included a network of radio beacons to aid in cross-country navigation.[15]

The Air Commerce Act also created the Airways Division within the Bureau of Lighthouses. Indeed, various federal agencies – including the War Department – had asked the lighthouse division to design lights to help aviation over the previous decade. Through the late 1920s and early 1930s, engineers worked to perfect and standardize the beacon design.[16] The Bureau utilized standards and schedules throughout the country, including Montana. When planning and survey for a major new airway to service the northern tier of states began in 1934, the project took advantage of the progress made over the previous decades.

Airway Beacon Design

The US Department of Commerce's Aeronautics Branch standardized the design of the beacon towers, beacons, and generator sheds by 1931.[17] In Montana, the International Derrick & Equipment Company of Columbus, Ohio fabricated the towers utilizing open-hearth steel with all components galvanized. To facilitate the transportation and construction of the towers, no component of the towers measured more than 22 ft. in length. The average tower height measured 55 ft., but in mountainous terrain, it stretched up to 91 ft. with each tower weighing 4,200 pounds. A 7-ft. square platform with a subway-type steel grating floor and angle steel guardrails capped each tower.[18]

The beacons underwent an evolution of design in the 1920s and early 1930s as federal authorities strove to provide more efficient light sources for its fledgling national system. The U.S. Post Office Department installed the first lighted beacons between Chicago, Illinois and Cheyenne, Wyoming in 1923. The Department experimented with different types of lights, settling initially on 24-inch revolving beacons. The type, however, proved unsatisfactory in the Rocky Mountains, where the terrain necessitated brighter lights with a greater viewing distance.

In 1931, the U.S. Patent Office granted John Bartow a patent for a new type of beacon that combined the advantages of high candle power "of the projector type with the wide-angle visibility of the flashing type" of beacon.[19] The beacon, encased by a glass dome, solved the problem of uneven pressure from high winds and proved less liable to freeze up in inclement weather in remote locations. The dome housed a 24-inch reflector amplified by three lenses, and the design made the beacon light distinguishable from other lights. The system, moreover, included red and green directional lights that corresponded with the air route; the red course lights flashed a Morse code signal identifying the specific beacon to pilots.[20] Bartow licensed General Electric to manufacture the beacon. The company continued to refine the design, which became the standard for beacons on the mountainous portion of the Northern Transcontinental and National Parks airway routes by 1934.[21]

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[15] Brenda J. Spivey, "Airway Beacons, an Integral Part of Montana's Night VFR Navigational History: Past History, Present Service and Present Value," (Master's Thesis, Embry Riddle Aeronautical University, 1995), pp. 3-5; Steve Wolff, "The Federal Airway System: The Early Years," accessed online March 11, 2014, www.atchistory.org; Komons, *Bonfires to Beacons*, pp. 134-135.

[16] For more information about the Bureau of Lighthouses' Airways Division see Mary Louise Clifford, "Research on the Airway Division, Bureau of Lighthouses," accessed online March 11, 2014, http://www.marylouiseclifford.com/sitebuildercontent/sitebuilderfiles/uslhsairways.pdf.

[17] The Department of Commerce renamed the Aeronautics Branch the Bureau of Air Commerce in 1934. Komons, *Bonfires to Beacons*, p. 136, 241.

[18] "Large Uses of Steel in Small Ways: Airway Beacon Towers." *Steel,* Vol. 89 (October 1, 1931), p. 50; Komons, *Bonfires to Beacons*, pp. 135, 137.

[19] Wolff, "The Federal Airway System;" Ritchie, "Development of Airway Beacons," *Aero Digest*, Vol. 27, no. 4 (October 1935), 38-39.

[20] On aeronautical charts, the beacons appeared with their number and morse code letter. The letters ran in this sequence: W (.--), U (..-), V (…-), H (….), R (.-.), K (-.-), D (-..), B (-…), G (--.) and M (--). To remember the order, pilots used the mnenonic "When Understanding Very Hard Routes, Keep Direction By Good Methods."

[21] Wolff, "The Federal Airway System;" Ritchie, "Development of Airway Beacons," *Aero Digest*, Vol. 27, no. 4 (October 1935), pp. 38-39; Bartow, J.B., "Beacon," U.S. Patent 1834041, filed January 14, 1930, and issued December 1, 1931.

The Bartow beacon emitted one million candle power every 1/10th of a second that could easily be seen over the rugged terrain in the American West. The beacon rotated at six rpm's and each beacon unit included a spare light bulb in case one should burn-out. Andrew Boone wrote in 1932 that:

> Seldom does a beacon light anywhere on the nation's air chain dim and die out. Two bulbs are fitted into each of the million-candle-power lights, although only one burns. Should the filament burn out, the light would dim momentarily while the other bulb is being pulled into an upright position by the electrically operated mechanism.

Although not confirmed, the bulb reportedly could be automatically placed in position within a few seconds of the primary bulb's failure.[22]

Electricity powered the beacons, either through a direct power line connection or by a generator in more remote locations. Buildings were constructed from a variety of locally accessible materials, with the most common being wood or standing seam metal, depending on site conditions.[23] Each building housed two generators: the primary unit and a backup should the main generator fail. The generator started and stopped running after receiving a signal from either an astronomical clock or a photocell at dusk and at dawn. Montana's airway beacons utilized both astronomical clocks and photocells. In 1936, the *Montana Standard* described the newly-lit beacon at the Homestake Pass near Butte [45.90771/-112.41491] as a 36-inch rotating, dual-lens model that had become the new standard. The article described its astronomical clock: "On the day the light was placed in operation, representative of the Bureau of Air Commerce wound a clock that control[led] the beacon. If not forgotten in the meantime, the clock will again be wound on December 12, 1945." Despite that, evidence suggests the photocells were best suited for "the unusual conditions caused by a cloudy or bright day."[24]

The electrical signal initiated a start-up sequence that involved the "crank, choke, start and connect" of the engine. Each generator utilized a 32-volt storage battery to begin the sequence. The operation of the generator kept the battery charged and each generator was equipped with thermostats and oil heaters in areas of severe winter weather. When the temperature dropped below 40º F, the starting sequence initiated itself. Gasoline motors fed by 515-gallon storage tanks located adjacent to the generator house powered the generators. Each generator used 9/10 of a quart of white gasoline per each kilowatt hour. Ideally, the gasoline tank required filling once every eight months.[25]

By 1965, a couple of different beacon styles graced Montana's towers, including 24-inch and 36-inch designs. Paul Watkins described the types to MAC Director Lynch: "The 36-inch beacons are double-ended and have one red and one white lense [*sic*] and at these locations [Willow Creek, Galen, Deer Lodge, and Silver Bow] there are no course lights. The 24-inch beacons are Crouse Hinds Dome type 500 and have 2 each course lights as indicated." Locations with the 24-inch style included Huntley, Broadview, Iron Rod, Edgehill, Hauser Lake, and Bull Mountain. Others, including those at Riverdale and Stanford, featured "FS-5026" beacons. Watkins also indicated that the tower platforms also varied, some featured a steel grating and others wood.[26]

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[22] Andrew R. Boone, "Night Flying with Safety," *Scientific American*, Vol. 147 (August 1932), pp. 71, 73.

[23] The generator house at the Lookout Pass airway beacon [47.2710.57/-115.402722] is built of brick to withstand deep snow and harsh weather.

[24] "Large Uses of Steel, 50; "Airway Beacon Power Plants," *Aero Digest*, Vol. 25 (November 1934), p. 40; "Lighthouses Move in from Coast as Transcontinental Airline gets Underway," *The Montana Standard*, February 16, 1936.

[25] "Airway Beacon Power Plants," p. 40; "Large Uses of Steel," p. 50.

[26] Paul E. Watkins, Chief, SMDO-1 to Director Charles A. Lynch, Montana Aeronautics Commission, February 12, 1965, Beacon Relocation Program 1965-1966 files, Montana Aeronautics Division Records on file at the Motnana Department of Transportation, and image on file at MT SHPO.

The Airway Routes and the Beacon System in Montana, 1934-1959

In Montana, the first of the three major federally-designated airways, the National Parks Airway, ran north-south and connected Great Falls to Salt Lake City. The airway took the name of the first company to contract the route, National Parks Airways (NPA). Founded in 1927 by Alfred Frank, NPA was based in Salt Lake City. The federal government awarded the company a contract to carry airmail in 1928. NPA's planes shuttled between Salt Lake, Great Falls, and Glacier Park, with stops in Dillon, Butte, and Helena. The first NPA airmail plane arrived in Butte from Salt Lake City enroute to Great Falls on June 30, 1928; it made the 400-mile flight in 3 hours and 26 minutes. The company's chief of operations, Felix Steinle predicted the NPA would extend its service to Canada by the end of the year. He also hoped beacon-lighted nighttime flights would begin within three months. In 1934, NPA extended service with stops in Idaho Falls and West Yellowstone. Western Airlines purchased the company in 1938. Montana aviation historian Frank Wiley served as a reserve pilot for NPA and noted, "I well remember the National Parks boys airmailing, with their own money, telephone books stolen from their hotel rooms to help keep the poundage up in these economically precarious days of early airmail subsidy." The NPA was the first airline to utilize light beacons to assist nighttime flying in Montana. The Pocatello to Monida Pass segment of its airway route was lighted by beacons by 1934. The route to Helena through Butte would be lighted in 1935 and from Helena to Great Falls in 1937.[27]

In 1934, the federal government chose another pioneering air service, Northwest Airlines, to fly the newly established Northern Transcontinental Airway between Seattle and New York. By the time of their selection, Northwest Airlines had worked in the airmail business for eight years. Begun in September 1926, Colonel Lewis Brittin founded the airline, Northwest Airways, to fly mail for the U.S. Post Office Department in the upper Midwest. The following year, the company began carrying passengers and changed its name to Northwest Airlines. A group of Minneapolis, Minnesota businessmen headed by Richard Lilly purchased the company in 1929. The new owners expanded the air fleet and the company's services into Illinois and southern Canada. By the mid-1930s, when selected to fly the Northern Transcontinental Airway, Northwest Airlines' fleet consisted of 23 airplanes and the airline employed 119 people, including 23 pilots and co-pilots and 40 maintenance people. The airline flew 5,180 miles daily and carried 17,532 passengers in 1933. By 1939, there were three daily flights between Minneapolis and Seattle with extensions into the western Pacific Ocean to Japan and Alaska.[28]

Plans to light the Northern Transcontinental Airway proceeded quickly. The BAC announced in September 1934 its intent to construct 125 beacon lights and intermediate emergency landing fields every 50 miles between Minneapolis-St. Paul and Seattle. The Bureau estimated the cost of the project at around $275,000, all which would be paid by the federal Public Works Administration (PWA). Construction of the first towers in Montana began in October 1934 between Miles City and Billings.[29]

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[27] Spivey, pp. 3-5. From 1928 through 1931, intermediate landing fields for the Great Falls, Montana, to Salt Lake City, Utah, airway were planned, surveyed, cleared and installed. In Montana, these sites included Monida, Dell, Dillon, Twin Bridges, and Piedmont (Whitehall Field), with plans and surveys being made for facilities that would be built at Armstead, Boulder, Mitchell, and Cascade; Byrd's South Pole Plane Opens Air Route Through Butte," *The Anaconda Standard*, 1 July 1928; Wiley, *Montana and the Sky*, 277-279.

[28] "Airways of the United States," *Aviation*, vol. 33, no. 11 (November 1934), pp. 346, 348.

[29] The Department of Commerce surveyed the Missoula-Bozeman segment of the Northern Transcontinental Airway in the summer of 1934. U. S. Department of Commerce, "Five New Federal Airways under Survey and Construction." *Air Commerce Bulletin*, vol. 6, no. 2 (15 August 1934), pp. 30, 31; "Beacon Light Sites have been Selected," *The Helena Independent*, October 5, 1934; "Will Begin Task of Lighting Airways Soon," *The Helena Independent*, September 6, 1934; "Northern Air Route is to be Lighted," *The Helena Independent*, September 7, 1934; "Much Equipment on Northern Airways," *The Helena Independent*, October 19, 1934.

The BAC constructed beacons on the Lookout Pass to Bozeman Pass segment of the airway route in the spring and summer of 1935, and construction of airway beacons between Bozeman and Helena occurred during the summer of 1935. By early September, beacons had been erected at Bozeman Pass, Strawberry Butte [45.96960/-111.32827], Townsend, and the Spokane Hills [46.54279/-111.71160] east of Helena. Supervised by BAC engineer A. S. Watson, construction crews consisted of 24 men, all hired through the National Reemployment Service offices in the counties where the construction occurred. Skilled workers and supervisors, however, were not hired through the service. The crews completed towers at Belgrade and Toston by September 15, 1935. When the Bureau completed the beacon system to Helena, Northwest Airlines flew a Lockheed Electra passenger plane into the city's municipal airport the night of September 15th. The inaugural flight utilized the beacons to navigate to Helena. From there, the flight turned south to Butte and then proceeded westward to Seattle. That day, the *Helena Independent* reported that "A [90-foot] tower is now under construction on the Continental divide south of the highway over MacDonald Pass (NR#14000462/24PW1093) near the public campgrounds . . . it will house a large direction and safety light."[30]

The BAC began installation of the 12 beacons on the Lookout Pass to MacDonald Pass segment of the Northern Transcontinental route in February 1935. The airway followed the route of the wagon road built by Captain John Mullan from 1859 to 1862. Since many of the beacon sites in western Montana were in national forests, BAC enlisted the aid of the National Forest Service in erecting the beacons. In late March 1935, the Forest Service provided mule pack trains from its Remount Depot at the Ninemile Ranger Station [NR Reference # 80002425] to carry nearly 14,000 pounds of "steel, sand, gravel and other material" to the beacon construction site on University Mountain [46.85298/-113.92923] a few miles east of Missoula. When the task was completed at University Mountain, Forest Service packers and mules hauled construction materials to other beacon sites on the Lolo National Forest in Montana.[31]

Completion of the Northern Transcontinental Airway's beacon system occurred in November 1935. The last beacon erected on the route was on MacDonald Pass [NR Reference # 14000462]. The Civil Aeronautics Administration (CAA) lit the beacon on November 10, 1935. The completion of the system caused celebration in Helena as attested by a November 22 event held at Helena Municipal Airport where an estimated 4,000 people braved frigid weather to attend. Attendees heard speeches by local officials, including BAC Director Eugene Vidal. The *Helena Independent* called the celebration the "Hanging of the Golden Lantern marking the inauguration of the night flight of the Northwest Airlines following completion of the beacon system from the Twin Cities to the coast."[32]

The BAC began work on lighting the Salt Lake City-Butte segment of the National Parks Airways route simultaneously with the Northern Transcontinental route (both included Helena as a stop). Bureau surveyors A. H. Hadfield and E. L. Bufkin surveyed the Dell – Helena segment of the line in the summer of 1935. Work on the installation of the ten beacons between Helena and Dell began in October of that year. The *Montana Standard* reported that the beacons would be located approximately 15 miles apart with flashers installed to indicate obstructions through the mountainous country. By

[30] The "public campground" is now named for Cromwell Dixon, the first person to fly an airplane over the Continental Divide. Martin J. Kidston, *Cromwell Dixon: A Boy & His Plane, 1892-1911*, (Helena, Mont.: Far Country Press, 2007), pp. 135-36; "Four of Six Airways Beacon Towers Built," *The Helena Independent*, September 4, 1935; "Beacon Light Sites have been Selected," *The Helena Independent*, October 5, 1935; "Northern Air Route is to be Lighted," *The Helena Independent*, September 7, 1934; "Much Equipment on Northern Airways," *The Helena Independent*, October 19, 1934; "Start Construction of Airway Beacons," *The Helena Independent*, August 2, 1935; "First Flight of Northwest Airlines through Helena to Start Sunday from Seattle," *The Helena Independent*, September 13, 1935; "People are Urged to Witness First Northwest Flight," *The Helena Independent,* September 15, 1935.

[31] "Missoula," *The Helena Independent*, February 20, 1935; "pack Trains Plod up Mountain Tops Heavily Loaded, *The Helena Independent*, March 27, 1935.

[32] "Celebration Here," *The Helena Independent*, November 10, 1935; "Thousands Forget Quakes to Join in Celebration of Transcontinental Airline," November 23, 1935; "Helena Marks Air Line Event," *The Helena Independent*, November 24, 1935.

the first week of November, three of the five beacons between Helena and Butte had been installed, including the Homestake Beacon [45.90771/-112.41491], which had to be installed before winter set in. Each beacon was "of the revolving type, casting a ray of more than 1,000,000 candlepower." The BAC lit the Homestake Beacon in mid-December 1935. The *Helena Independent* reported that the beacon "would guide planes into Butte at night, a revolving beacon has been put into operation." Hadfield supervised the construction crews on the project, all of which were hired through the Butte and Helena National Reemployment Offices.[33]

The Department of Commerce's BAC completed the installation of the beacons between Helena and Dell by mid-December 1935. The inaugural night flight on the National Parks Airway occurred on December 20, 1935. Late in the evening on that day, a twin-motored Boeing airliner carrying ten passengers and mail landed at the Helena Municipal Airport, attended by a crowd of "hundreds" of Helena citizens. After photographs and refueling, the plane took off for Butte. The *Montana Standard* reported:

> Shortly after midnight the great Boeing took off again for Butte, following the beacons of Canyon Ferry [Spokane Hills], Boulder Hill, and Elk Park [Whitetail]. Ten minutes out of Helena, Butte's multi-colored Christmas raiment of dazzling lights stood out in bold relief in the darkness ahead and shortly after the National Parks' first official night flight had been completed.[34]

The following day, Whitehall residents boasted that their community was "surrounded by air beacon lights."[35]

However, despite progress in other directions, the 90-mile section between Helena and Great Falls remained unlit and suitable only for daytime flying. In 1935, Great Falls was the only major urban center in the state that did not have round-the-clock air service. For unknown reasons, the federal BAC seemed reluctant to install beacons on the 90-mile air route. Consequently, in January 1937, the chambers of commerce of Helena and Great Falls, along with local civic clubs, launched an intensive campaign to secure federal funding to light the route. Prior to that, in September 1936, they obtained leases from the Montana Department of State Lands (now Department of Natural Resources and Conservation) for two beacons: one southeast of Wolf Creek and another near Montana native and Hollywood actor Gary Cooper's family ranch [47.01844/-111.96341]. It wasn't until the late August 1937, however, before work began in earnest to install five beacons between Helena and Great Falls.[36]

During the late 1930s, the BAC, usually at the urging of local civic groups, established branch airway routes or cut-offs, of the longer transcontinental routes. In 1937, the Bureau established cut-offs of the Northern Transcontinental Airway Route from the Strawberry Butte Beacon westward through Three Forks, Butte, and then to Deer Lodge, where it rejoined with the main route. The Bureau constructed six beacons along the cut-off: at Three Forks, Lewis and Clark Cavern, Cardwell, Silver Bow, Galen, and the Deer Lodge airport. The Homestake Beacon functioned as a hub between the cut-off and the north-south National Parks Airway.

Another airway, established in 1934, supported the airmail route between Billings and Cheyenne, Wyoming. The route soon extended to Great Falls and was lit between May 1939 and April 1940. It consisted of a string of beacons and

[33] "National Parks to have Beacons from this City to Dell
[34] "First Night Airmail Trip Made from Butte to Helena," *The Montana Standard*, December 21, 1935.
[35] Ibid; "Whitehall Surrounded by Air Beacon Lights," *The Montana Standard*, December 22, 1935.
[36] "Helena to Work for Lighted Air Route to Great Falls," *The Helena Independent*, January 1, 1937; "Land Board Leases Sites for Beacon Lights asked by Federal Airway Board," *The Helena Independent*, Spetember 18, 1936; "Helena-Falls Air Lane to be Lighted About Dec. 15." *The Helena Independent*, October 14, 1937; "This City Leads State in Use of Air Facilities," *The Helena Independent*, August 29, 1937.

landing fields that stretched from Great Falls to Lewistown, then southeast to Lavina, and on to Billings and south past Lodgegrass and into Wyoming.[37]

The beacon system reached its zenith nationwide in 1941, but in Montana the number of beacon sites statewide continued to increase. According to aviation historian Tom Johnson, by 1945 Montana boasted 84 beacons – a combination of community owned, BAC, and military beacons - strung across the state with 70 located between airports and 14 at airports. There were also "flashers" that marked the course in the mountainous western one-third of the state.[38] By 1949, other airways crisscrossed Montana, including routes that linked Great Falls to Kalispell in the west and to Cut Bank on the Hi-Line.[39] The airway routes continued to be refined, and by the end of the 1950s, several additional airports across the Hi-line boasted beacons, including Havre, Shelby, Conrad, Chester, and Malta.[40] As radar and radio communication improved, however, the CAA began to assess the necessity of the lighted system. In 1951, the CAA transferred ownership of "several" beacon towers to the Montana Highway Department for use as VHF radio towers.

Still, the beacon system laid the ground work for the modern federal airway system. Historian Edward P. Warner noted:

> Of all American contributions to the technique of air transport operations flying at night by beacons was the greatest. How great it was, and how far it put the United States ahead of the rest of the world, was attested to by the fact that, as late as the early 1930's, when Americans were flying more or less routinely at night, Europeans were still fingering the hem of the idea of night flying."[41]

Federal Decommissioning and the Transition to State and Local Control, 1964 - 1979

The lighted airway beacon system flourished in Montana into the mid-1960s. Historian Brenda Spivey explains that:

> During that decade navigational technology advanced so quickly that many pilots thought the beacon system was becoming antiquated. The Federal Aviation Administration, in cost cutting efforts, began to pare down the system by decommissioning many beacons, especially in parts of the country where the FAA was unchallenged. The mountainous states were not so easily persuaded, and in Montana's case the responsibility of system maintenance was transferred to a state level.[42]

In 1958, the newly-established FAA took jurisdiction over the navigation systems along designated airways. Like the CAA before, the agency quickly began to assess its resources and questioned the necessity of the national beacon system given the advances in technology over the mid-twentieth century. Beginning in 1964, the FAA made several attempts to decommission their airway beacons in Montana, but opposition by pilots, the Montana Aeronautics Commission (MAC), and the state's congressional delegation prevented the shutdown. In 1965, the agency, with the assistance of the MAC, again surveyed the beacons under federal control. As a result of the survey, by 1967 the FAA decommissioned all but

[37] Writers' Program of the Work Projects Administration in the State of Wyoming, Sponsored by Secretary of State Lester C. Hunt, *Wyoming: A Guide to Its History, Highways, and People, [reprint]* (Lincoln: University of Nebraska Press, 1981), p. 88; United States Coast and Geodetic Survey, *Sectional Aeronautical Charts: United States*, "Butte, MT" and "Yellowstone National Park" sectionals, 1935 – 1971. (Washington, D.C. : U.S. Coast and Geodetic Survey, 1927-), Library of Congress Geography and Map Division, https://www.loc.gov/item/2009582532/.

[38] Tom Johnson, "Research Collection of Aeronautical Charts, 1943-1947," on file at Montana State Historic Preservation Office and Montana Department of Transportation Aeronautics Division, Helena, MT.

[39] Civil Aeronautics Board , "United States Air Transportation System: Routes Permanently Certificated, March 31, 1949," Map, reprinted in Wiley, p. 12.

[40] United States Coast and Geodetic Survey, Sectional Aeronautical Charts: United States, "Butte, MT" and "Yellowstone National Park" sectionals, 1935 – 1971. (Washington, D.C. : U.S. Coast and Geodetic Survey, 1927-), Library of Congress Geography and Map Division, https://www.loc.gov/item/2009582532/.

[41] Edward P. Warner, *Early History of Air Transportation,* (York, Pennsylvania, 1937), pp. 26-28.

[42] Spivey, p. 5.

eight of its beacons and transferred responsibility thirteen of the others to the MAC (including St. Regis, which was turned off briefly but relit by the MAC).

Several FAA beacons, particularly along the original Great Falls – Cheyenne route, were sold to communities and relocated to assist navigation and improve safety, illuminating localities at every corner of the state – including Hamilton, Eureka, Sidney, and many in between.[43] During the summer of 1966, the Seeley Lake community, for example, acquired the Raynesford beacon, and the Hauser Lake beacon went to Plentywood airport. The rotating beacon at the White Sulphur Springs airport arrived there from another location by the summer of 1967.[44] Acquisition of a beacon within a previously unserved locale often markedly improved and contributed to the development of that community's regional transportation system, and substantially improved air travel safety in the area. The FAA also donated towers for alternate uses to state agencies and local governments.

During the 1970s, the FAA continued to work with MAC to relinquish responsibility for the beacon system. Between 1977 and 1979, the FAA decommissioned three beacons and transferred five to the MAC. The federal agency also transferred Mullan Pass and Monida Pass beacons to MAC. MAC refined their system as well, and decommissioned four of their beacons (Bozeman, Sherman Gulch, Montana City, and Saltese). The year 1979, then, marked the close of the FAA's ownership of the lighted beacon system in Montana, and that year the MAC owned 19 beacons, and maintained an additional four at the West Yellowstone, Dell, Townsend, and Lincoln airports.[45] Through the 1980s and 1990s, Montana pilots thwarted additional attempts to turn off Montana state's lighted beacon system. Each time the idea was broached to turn the system off, it proved unsuccessful despite efforts by the Montana state government to cut costs. In 1988 and 1991, student pilots, private pilots, and commercial pilots let the Montana Aeronautical Division (successor to the MAC) know that they strongly believed the beacons contributed to flight safety and rated the cost of operating the beacons as "beneficial" or "very beneficial."[46]

By October 2017, the obsolescence of the system, the cost of maintaining it, a shrinking maintenance budget, and lack of qualified staff to maintain the lights all contributed to the MDT's decision to decommission the beacon system under their purview. Because some controversy surrounded the decision, Mike Tooley, MDT director, formed a panel, the Airway Beacon Working Group (ABWG), to study the issue and make recommendations regarding the future of the airway beacons. To that end, the ABWG solicited public comments and held three public information meetings, at Billings, Missoula, and Helena, in the summer of 2017. Based on public and written comments and the recommendations of the ABWG, the director decided on October 26, 2017 to decommission all but the MacDonald Pass Beacon (24PW1093).[47] The MacDonald Pass, Strawberry Butte (24GA1962), and Spokane (24BW1139) beacons, would remain in operation until June 30, 2019 while the remaining 14 beacons would be immediately decommissioned, and the power shut down to them. The MDT has planned a phased approach to transferring ownership of the beacons to interested parties: the first phase

[43] Phillip H. Hauck to Midland Electric, "Notice to Proceed," August 10, 1966 and Division of Architecture and Engineering, "Beacon Relocation Bid Results," Airway Beacon files, Montana Department of Transportation Aeronautics Division, Helena, MT.

[44] "Beacon Relocation Bid Results," Airway Beacon files, Montana Department of Transportation Aeronautics Division, Helena, MT; United States Coast and Geodetic Survey, Sectional Aeronautical Charts: United States, "Butte, MT" and "Yellowstone National Park" sectionals, 1935 – 1971. (Washington, D.C. : U.S. Coast and Geodetic Survey, 1927-), Library of Congress Geography and Map Division, https://www.loc.gov/item/2009582532/.

[45] In 1967, the MAC relit the St. Regis beacon [UTM 11:647410E/5238935N]. The other MAC beacons were at Boulder Hill, Whitetail, Spokane Hill, Strawberry Butte, Canyon Resort, Monida, Stoney Point, Wolf Creek, Hardy, Avon, Bonita, Alberton, and Lookout Pass. The MAC decommissioned its beacon on Boulder Hill between Helena and Butte in 1984, and Bozeman Pass in 1993. Spivey, pp. 10-13.

[46] The MAC became part of the Montana Department of Transportation in 1991 and redesignated the Montana Aeronautics Division; Spivey, p. 13.

[47] NR-listed July 29, 2014, NR#14000462.

would involve beacons located on land leased from private individuals or companies, and the second phase would focus on beacons sitting on state or federal land.[48]

Original beacons outside MAC/Aeronautics Division ownership continue to light airports and mark terrain across the state. For example, airport at Big Timber retains its original beacon, tower, and generator shed, constructed in 1935 as part of the Northern Transcontinental Airway. Recently decommissioned by MDT, the new private owner relit the National Parks Airway Stoney Point beacon – visible across much of the Helena valley. The airfield at Stanford still makes use of the beacon moved there after the FAA decommissioned it in 1966. Though the full system – the series of beacons that lead pilots, one to the next, through the night – no longer functions as a reliable unit, those still standing convey the significant history of aviation in Montana.

Maintaining the Golden Lanterns, 1938-2018

The beacon system required careful maintenance, and though the technology included failsafe redundancy, there were incidents that called for immediate repair. The Civil Aeronautics Administration (CAA) assumed maintenance of the airway beacons from the US Department of Commerce in 1938. The CAA divided each state into districts and assigned a maintenance man to each district. Across the country, the BAC employed an army of "mechanicians" to maintain the beacon system. Generally, the men visited each beacon every two weeks and made adjustment and repairs, when necessary. On average the generators required a complete overhaul every two years. Most of the time, major repairs and generator overhauls occurred on-site, however, moving a generator off-site for repairs infrequently occurred. Maintenance duties included greasing the rotating beacons, replacing burned out bulbs, and adjusting the directional lights.

The Homestake Beacon was included with those at Cardwell, Whitetail [46.07988/-112.14020], Silver Bow, Galen, and Deer Lodge in one district, and in 1946, Whitehall resident R.L. Griffin was responsible for their maintenance. The CAA required Griffin to inspect the beacons every month, but breakdowns often had him visiting the sites more often, including "not altogether happily," during near blizzard conditions." Maintenance was difficult in the winter months, especially in the area surrounding Butte where the average altitude of the beacons in his district was 5,000 ft. Described by the *Montana Standard* as a "Lighthouse Keeper of the Air," Griffin, during inclement weather, had to pack in tools to repair the beacon along with emergency provisions in case he was stranded overnight at the site; he walked in on skis or snowshoes in those instances. The CAA provided over-night shelters at the Homestake, Silver Bow, and Cardwell beacons. Each shelter was provided with a wood stove. Despite the "hardship [and] hazards which under some circumstances might be described as downright dangerous," Griffin enjoyed the job, calling it "really an interesting and healthy occupation." For the most part, however, the ingenious design of the beacons negated the need for anything other than routine maintenance.[49]

In January 1951, a Montana Highway Patrolmen noticed the beacon on MacDonald Pass stopped rotating during a cold snap. In minus 40-degree weather, the CAA technician travelled to the top of the snowy pass and climbed the 91-foot tower to assess the problem with the beacon. The extreme cold froze the grease that allowed the beacon to rotate and,

[48] Tom Kuglin, "Still up in the Air," *The Independent Record*, May 29, 1917; Tom Kuglin, "Vestige of Aviation History," *The Independent Record*, March 13, 1917; Tom Kuglin, "State to Decommission all by one Historic Airway Beacon," *The Independent Record*, October 28, 2017.

[49] "Airway Beacon Power Plants," p. 40; Frank Quinn, "CAA Maintenance Men Perform a Vital Job in Caring for Airway Beacon Lights," *The Montana Standard*, 17 November 1946; "Stove Taken," *The Montana Standard*, 2 December 1972; "Beacon Light Atop MacDonald Pass Freezes at Night," *The Helena Independent Record*, January 29, 1951.

consequently, blown the electrical fuse that regulated the power. After rewiring the beacon, it once again grudgingly started up. The technician suffered a frostbitten forehead during the ordeal.[50]

F. Associated Property Types

(Provide description, significance, and registration requirements.)

Introduction

The majority of the standing airway beacons in Montana group into two alignments, east-west among the Northern Transcontinental Airway Route , and north-south along the National Parks Airway Route. The two airways intersect at Helena, Montana. To date, 17 beacons associated with the two main airway routes that fell under the oversight of the MAC remain in place.[51] All of these beacon towers are in good condition. Five retain their original generator sheds and four display the foundations of generator sheds removed in the past. All of the beacons received power directly from electrical transmission lines. Accordingly, many have standalone electrical circuit sheds associated with them. Not all the electrical circuit sheds, however, are of historic age. Known warming sheds are associated with three beacons in Montana. Another major airway, stretching from Great Falls to Cheyenne, Wyoming featured beacons installed by 1940.

In addition to the beacons associated with the linear routes, this MPD also covers beacons located at municipal (i.e., West Yellowstone) or rural (such as Lincoln, Dell, and Ryegate) airports. Airport and landing field beacons were erected as part of the airway routes, and often retain their original equipment. For example, the Dell Airport in Beaverhead County has its original beacon and generator shed. Beginning in the 1950s, some beacons were decommissioned by the Civil Aeronautics Administration (CAA) and its successor agency, the FAA. Those beacons, relocated during the period of significance identified in this MPD, stand in alternate sites and may or may not retain their lighting equipment and associated support structures.

Individual airway beacons will be examined and their National Register eligibility determined according to National Register Bulletin No. 15, "How to Apply the National Register Criteria for Evaluation." In Montana, to be eligible for individual listing in the NRHP under this MPD, beacons must be documented in primary and/or verifiable secondary sources, such as aeronautical charts published during the period of significance (1934 – 1979).

Property Types Descriptions

Name of Property Type: Montana's Airway Beacons

Rural Airway Beacon Sites: These include individual beacons in Montana located along airways designated and/or in use between 1934 and 1979, but not located at airports or landing fields. The beacons at the different locales generally bear a strong resemblance to each other as by 1931, the BAC standardized the tower design. Each site may consist of the steel beacon tower, beacon light, generator shed or generator shed foundation, warming shed, and/or electrical circuit shed. The standardized towers range in height from 15 ft. to 91 ft. depending on location and are comprised of steel angle section surmounted by a standard 6 ft. x 6 ft. steel grate platform with steel angle section safety railing.[52] The platform, accessed by a steel ladder attached to the tower and a trapdoor, supports the revolving beacon sitting on top of a steel

[50] "Airway Beacon Power Plants," p. 40; "Beacon Light Atop MacDonald Pass Freezes at Night," *The Helena Independent Record*, January 29, 1951.
[51] The MacDonald Pass Airway Beacon (NR#14000462) was listed in the National Register in July 2014.
[52] The Homestake Airway Beacon is set at the highest elevation of all the Montana beacons at 7,200 ft. Consequently, the tower is only 15 ft. in height as compared to 55 ft. and 91 ft. for the other towers.

pedestal.[53] In addition to the beacon, some platforms also support two course lights, a circuit box, and a lightning rod. Each corner of the tower is anchored to a concrete footing. Most rural airway beacons still display the 1930s design and operation, generally 20-inch, 24-inch, or 36-inch designs, but the beacon lights themselves were updated in the early 2000s to make them more efficient. Throughout Montana, the lighted navigation facilities included rotating beacons, rotating beacons with course lights, rotating beacons with code flasher, flashing code beacons, and flashing beacons (which generally mark high terrain).

Generator sheds are historically associated with the rural airway beacons. When originally installed, self-starting generators connected to astronomical clocks or photocells provided electrical power to the beacons. There were two generators at each beacon: the main generator and a backup. Both were fueled by white gasoline tapped from 515-gallon fuel tanks. The generators were low maintenance, requiring refueling every eight months. Most of the beacon sites included a generator shed that rested on concrete foundations with internal footing walls to support the heavy generators. The sheds, which varied in dimension, displayed a rectangular footprint covered by a gable roof. The walls and roof were made of standing seam metal. Each shed included a doorway (with a wood paneled door) and three windows. The window openings held 6-over-6 double-hung windows protected by wire mesh. There were two sheet metal ventilators on the roof, which was painted a fluorescent orange. The Lookout Pass generator shed proved an exception. Because of the heavy snow load in the pass, the generator shed was built of brick and featured three roof ventilators. The existing generator sheds are sometimes located adjacent to the towers or located at sites near the towers with easier road access.

As technology and infrastructure improved, all Montana beacons were connected directly to electrical power lines, rendering unnecessary the generators and generator sheds. Connecting to power lines resulted in the eventual removal of the actual generators from the sheds, and in some cases, the sheds themselves, leaving only the foundations. These foundations, however, still exhibit the spatial relationship between the towers and the generators and match standardized drawings developed in the early 1930s.

With the removal of the generators, electrical current for the beacons was controlled by a series of circuit breakers. These are now sheltered in small sheds located adjacent to the bases of the beacon towers or in circuit boxes attached to the tower. The standardized historic circuit breaker shed footprint appears to be 6.5 ft. x 4.5 ft. with the wood frame walls clad in drop siding covered by a gable or shed roof. There are no windows piercing the walls of the shed and access to the interior is gained though a single door clad with a drop siding. Among the MAC-owned beacons sites, many of the original circuit breaker sheds were replaced by prefabricated metal sheds that are not historic age.

Because these beacons often are located at remote locations that are difficult to access, especially during the winter months, some originally had warming sheds associated with them that housed a wood stove, beds, and a table. These warming sheds were simple wood frame or concrete block structures with gable or shed roofs. At least three warming sheds remain: at Wolf Creek, Bonita [46.74682/-113.62271], and St. Regis [47.28722/-115.05034].

Historic Beacons at or in proximity to Municipal or Rural Airports: Concurrent with the placement of beacons on the Northern Transcontinental, National Parks, and Great Falls - Billings - Cheyenne airway routes in the 1930s, the BAC installed beacons and generator houses at municipal (i.e., Billings, Belgrade, Dell, Helena, etc.) airports and at small rural airports, designated as emergency landing fields. Those beacons averaged between 55 ft. and 90 ft. in height depending on location and included generator sheds identical in design to the mountain beacons. Additionally, several Montana

[53] The domes were originally made of glass, but Lexan domes are sturdier and less of a target to sharpshooters and adverse weather conditions. The Montana Aeronautics Division replaced the original domes in the early 2000s.

airports acquired beacons through the mid-twentieth century as supplemental airways were established and localities worked to improve air navigation in their region.

Relocated and Repurposed Beacons or Generator Sheds: Beginning in 1951 and accelerating in the 1960s, the CAA and FAA decommissioned beacons as improved radar and other navigational aids rendered at least a portion of the lighted beacon courses redundant. Several beacons and their associated structures were transferred to local and county governments, and moved to assist navigation to rural airports.[54] The CAA, and later the FAA, also donated the towers for alternate uses to state agencies and local governments. For example, in 1951, the CAA transferred ownership of "several" beacon towers to the Montana Highway Department for use as VHF radio towers. Some beacons appear to have been moved to as yet unidentified museums. Some of these repurposed towers may still exist; if so, and if their locations are determined, they could be recorded and evaluated for their National Register eligibility as part of this MPD.[55]

Significance

An airway beacon must be significant in local, state, or national history, engineering or culture, and possess sufficient integrity of location, setting, design, material, workmanship, feeling, and association to convey that significance. In addition, the airway beacon must meet one or more of the four National Register Criteria:

A. be associated with events that have made a significant contribution to the broad patterns of our history; or
B. be associated with the lives of persons significant in our past;
C. embody the distinctive characteristics of a type, period, or method of construction, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. have yielded, or may be likely to yield, information important in prehistory or history.

The specific means by which an airway beacon may meet each of the National Register Criteria are discussed below.

National Register Criterion A: Under Criterion A, an airway beacon may be eligible for the National Register through its association with historic themes. Applicable areas of significance for airway beacons defined in National Register Bulletin No. 16 include:

- Transportation: Every airway beacon in Montana may be eligible for listing in the National Register of Historic Places as associated with the "broad pattern" of transportation in Montana. The beacons hold additional significance under this theme because of their association with the history of aviation in Montana and the significant role aviation played in the socio-economic development of state during the twentieth century. The beacons facilitated nighttime passenger, airmail, and private plane travel in Montana and were important to providing guide lights even to surface transportation. The beacons also guided lost pilots to safety during inclement weather. The beacons made nighttime airline travel during the formative years of the airline industry in the United States commonplace; they continued to serve this purpose as the industry matured after World War II. Locally, beacons may be significant for their association with the development of local airports through the mid and late twentieth century.

[54] "Beacon Relocation Bid Results," Airway Beacon files, Montana Department of Transportation Aeronautics Division, Helena, MT; United States Coast and Geodetic Survey, Sectional Aeronautical Charts: United States, "Butte, MT" and "Yellowstone National Park" sectionals, 1935 – 1971. (Washington, D.C. : U.S. Coast and Geodetic Survey, 1927-), Library of Congress Geography and Map Division, https://www.loc.gov/item/2009582532/.

[55] "Color-Sound Filming will Start June 1," *The Helena Independent Record*, 17 May 1951; Spivey, "Airway Beacons," p. 11.

National Register Criterion B: Under Criterion B, an airway beacon may be eligible for listing in the National Register if a historically significant person's importance relates directly to the structure. Since the National Register's guidelines state that properties significant as an important example of an engineer's skill should be nominated under Criterion C, it is rare that a beacon would be found eligible under Criterion B. Because all historic airway beacons in Montana were constructed from standardized designs, under this MPD, no airway beacon in the state is eligible for the National Register under Criterion B.

National Register Criterion C: Under Criterion C, an airway beacon site may be eligible for the National Register if it embodies "the distinctive characteristics of a type, period, or method of construction," or represents a "significant and distinguishable entity whose components may lack individual distinction." The only applicable area of significance for airway beacons under this criterion from Bulletin 16 is in the category of engineering.

- Engineering: The airway beacons represent the pinnacle of lighting technology at the time of their construction. In 1931, inventor John Bartow obtained a patent for a "projector type[beacon] with the wide-angle visibility of the flashing type" beacon.[56] Bartow designed the lamps specifically to maximize candlepower and minimize maintenance in the sometimes-harsh environmental conditions of the American West. Enclosed in a glass dome, the beacons flashed a one million candlepower light beam every 1/10th of a second by means of a light bulb intensified by lenses and mirrors. When bulbs failed, a unique system automatically replaced them so that the beacon light continued uninterrupted. With Bartow's beacons as a design baseline, the mechanics of the beacons remained generally the same through the period of significance, though some models varied, including 20-inch, 24-inch, and 36-inch variants. Some beacons also displayed red and green course lights that flashed a Morse code signals to ensure that pilots at nighttime were on the correct course. The beacons were, at first, powered by self-starting generators that required bimonthly maintenance, primarily to refill fuel tanks. The generators were activated either by astronomical clocks or photocells.

  The towers were designed specifically to allow easy transport to the construction site and quick construction. The towers consist of steel angle sections generally preconstructed in 22-foot lengths to facilitate transport. The generator sheds were also built of prefabricated components that allowed ease of construction. The generators, sand, and cement for the foundations were hauled to the construction site. The later electrical circuit sheds were also prefabricated and transported to the construction site. The structural design and sturdy construction of the towers and sheds were well-suited to the environmental conditions at the sites they were/are located.

The 1931 model beacon tower was constructed at all Montana beacon sites, municipal airports, and emergency landing fields from 1934 to 1959. They're all identical in design with the only variation in the height of the tower, which varied based on individual site conditions. The towers feature the same equipment: a beacon light, circuit box, and lightning rod. Most rural airway beacons featured course lights as well. Additions to or loss of that standard equipment may diminish integrity.

Like the beacon towers and beacons, the generator sheds were also constructed from a standardized design development by the BAC in the early 1930s. The metal-clad, rectangular sheds featured gable roofs topped with ventilators, three six-over-six windows, and a wood paneled door. The Lookout Pass shed is built of brick, a necessity to withstand heavy snowfall in the winters. Any existing variations in the design would need to be evaluated for integrity. In those locations

[56] Wolff, "The Federal Airway System;" Ritchie, "Development of Airway Beacons," *Aero Digest*, Vol. 27, no. 4 (October 1935), 38-39.

where the generator sheds no longer remain, the associated foundation would allow these sites to continue to impart the organizational aspects of the beacon operation.

At least three of the 17 beacons that fell under the oversight of the MAC/Aeronautics Division have warming sheds associated with them (it is unknown if any warming sheds remain that were associated with beacons outside MAC-oversight). It has yet to be determined, though, if the warming sheds and many of the accompanying electrical circuit sheds are historic and, if so, how much integrity they retain. They, too, will be examined.

The loss of generator sheds or warming sheds where the beacon tower and beacon remain complete, do not overtly detract from the significance of the property. As technology improved, generator sheds were replaced with other means to power the beacon, relegating both the generator shed, and where applicable, the warming shed, unnecessary.

National Register Criterion D: Under Criterion D, an airway beacon or its remains could be eligible for the National Register if it can yield important information about beacon technology or construction. The information should be embodied in the beacon or its remains; the mere existence, or former existence, of a beacon at a particular location does not constitute sufficient important information. Furthermore, the information would most-often be available through other sources, such as historical documents, plans, or extant beacons. Consequently, it is anticipated that under this MPD, no airway beacons in Montana are eligible for listing in the National Register under Criterion D.

Registration Requirements

The following Registration Requirements will be used to help determine the National Register eligibility of Montana airway beacons under this MPD. The individual beacon locales may be comprised of the following: the beacon/tower, the generator sheds, generator shed foundations, and electrical circuit sheds. The majority of beacons remain in their original locations. However, beacons relocated for re-use to different venues, such as airports, may also qualify for listing in National Register due to their association with the FAA and MAC decommissioning process during the 1960s and 1970s, and/or acquiring significance in their new location.

Additionally, beacons must fall within the period of significance called out in this document, 1934-1979. An end date of 1979 for the period of significance corresponds to the year the FAA relinquished responsibility for its the last Montana beacons under their control.

National Register Criterion A: An airway beacon may be eligible for listing in the National Register of Historic Places under Criterion A if it is:

1. Associated with U.S. Department of Commerce's Bureau of Air Commerce's (BAC) efforts to establish a system of lighted airway beacons across Montana beginning in 1934.

The BAC installed lighted airway beacons on Montana's airway routes, the majority of which were constructed between 1934 and 1940 and illuminated the along the National Parks, Northern Transcontinental, and the Great Falls - Billings - Cheyenne airways routes. Others supplemented the system by providing navigational support at and near local airports, or through mountainous terrain. In Montana, the FAA began assessing the value of and the potential to decommission the beacons as other aids to navigation, including radio and radar, rendered them redundant. Between 1966 and 1967, the Montana Aeronautics Commission (MAC) assumed ownership of 13 beacons sites from the FAA. The FAA retained eight, and decommissioned others. During the 1970s, FAA worked with MAC to transfer their remaining beacons to

MAC control, and completed that task in 1979. By 1993, MAC owned 17 beacons, and maintained four others at local airports. Others are owned locally.

The beacons were critical to the development of nighttime passenger and airmail traffic in Montana and marked the expansion of the aviation industry in Montana and the United States through the mid-twentieth century. For decades, the beacons guided pilots across Montana's night skies and, in many documented and undocumented cases, rescued lost pilots or kept them flying through inclement weather on the right course. Part of the airway beacon system functioned in its original capacity until 2018 when the Montana Department of Transportation turned power off to all but three beacons (MacDonald Pass, Spokane, and Strawberry Butte) still under their control.

The remaining airway beacons stand as a visible reminder of aviation's early days and the importance placed on the new industry by local, state, and national organizations, government entities, and the public. The beacons also represent the rapid advances in lighting technology during the mid-twentieth century. The beacons threw out one million candlepower light and included course lights that flashed Morse code signals, informing pilots that they were on the correct course and at the correct altitude to avoid crashing into the Rocky Mountains of western and southwestern Montana. The beacons still exhibit that unique lighting system developed during the Great Depression. The power system for the beacons was also significant, involving self-starting generators that required minimal maintenance and ingenious astronomical clocks or photocells to ensure they turned on and off at the appropriate times. Montana's airway beacons have functioned individually and/or as part of a larger well-developed and well-maintained system across the state beginning in 1934.

2. Associated with the FAA decommissioning process, establishment of the Montana Aeronautics Commission's role in owning and maintaining beacons after 1966, and the relocation of beacons to airports, landing fields, and other locales for directive uses.

The importance of beacons to rural navigation is illustrated by their numbers across Montana by mid-century.[57] The improvement of radar and other navigational aids, however, resulted in the CAA to begin decommissioning beacons nationwide in 1951, a process that continued under the auspices of the FAA (created in 1958) into the 1970s. In Montana, the assessment process began in the early 1960s. Many of these beacons were donated by the FAA, to the MAC, local governments, and other recipients for use. A few beacons and towers were repurposed, but most were put back to work in their original capacity.

National Register Criterion B: An airway beacon may be eligible for listing in the National Register of Historic Places under Criterion B if:

1. A historically significant person's importance relates directly to the structure.

Since the National Register's guidelines state that properties significant as an important example of an engineer's skill should be nominated under Criterion C, it is unlikely that a beacon would be found eligible under Criterion B. Because all historic airway beacons in Montana were constructed from standardized designs, it is unlikely that any airway beacon in the state is eligible for the National Register under Criterion B under this MPD.

[57] Tom Johnson, "Research Collection of Aeronautical Charts, 1943-1947," on file at Montana State Historic Preservation Office and Montana Department of Transportation Aeronautics Division, Helena, MT.

National Register Criterion C: An airway beacon in Montana may be eligible for listing in the National Register under Criterion C if it:

1. Remains in its original location.

Most of the airway routes and locations of the airway beacons Montana were established by the U.S. Department of Commerce's Bureau of Air Commerce (BAC) from 1934 to 1940.[58] Three major airways in Montana included the National Parks, and the Northern Transcontinental, and Great Falls - Billings - Cheyenne airways; those routes are still marked by airway beacons dating from 1934 to 1940. Airplane pilots could follow the historic airway routes at nighttime by following the lighted beacons that originally marked the airway routes in western Montana. Ground traffic could also follow them, scanning ahead for the familiar flashes from mountain tops along today's Interstates 15 and 90 and US Highway 12. Beacons located at airports and landing fields supplemented the system.

2. Was moved to its new location within the period of significance, and has therefore, acquired significance related to its relocated position.

With the relocation of beacons and towers beginning in 1951 and accelerating through the mid-late 1960s, many assumed similar roles but in different locations. The relocated beacons often gained a second life for use at publicly-owned airports, landing fields, and other locations, indicating their value as a navigation tool for pilots was recognized across the state.

3. Includes the beacon tower and beacon housing. Any beacon location that hosts a tower missing the beacon housing must include at least a generator shed (or shed foundation), and/or warming shed (if applicable), and/or electrical circuit shed (if applicable).

The beacon towers in the system that remain in their original location are original as is much of the beacon apparatus. However, while the loss of generator and warming sheds at a beacon property is unfortunate, their loss, usually as a consequence of advancing technology, do not overtly detract from the significance of the property, especially at those locations where the beacon tower and beacon remain complete.

Many beacons retain their original generator sheds, while others feature the concrete foundations for sheds removed long ago when they were replaced by direct connections to electrical power lines. Some of the beacons have electrical circuit sheds and/or warming sheds at the sites. Many system beacons are located in remote areas and not easily accessible by the public.

Relocated beacons and towers need not include a generator shed, and/or warming shed, and/or electrical circuit shed. Relocating towers and beacons often resulted in their placement in less rural areas, such as near or at established airports or landing fields. Because the new locations were generally closer to developed areas, the need to relocate warming sheds or generator sheds was lacking due to the presence of existing infrastructure.

National Register Criterion D: An airway beacon in Montana may be eligible for listing in the National Register under Criterion D if:

1. It can yield important information about beacon technology or construction.

The information should be embodied in the beacon or its remains; the mere existence, or former existence, of a beacon at a specific location does not constitute sufficient important information. Furthermore, the information should not be

[58] The Department of Commerce's Aeronautics Branch determined the site of the Monida Pass Airway Beacon in 1931. Technically, its located in Idaho just a little over a thousand feet south of the Montana border. The beacon was significant to the National Parks' Airway Route in southwestern Montana and is included in this MPD.

available through other sources, such as historical documents or extant beacons. It is thought that no airway beacons in Montana are eligible for the National Register under Criterion D under this MPD.

V. Integrity

In addition to the National Register criteria to be considered eligible for listing in the National Register, properties must also retain integrity. The integrity of each resource is assessed through the following aspects:

Design, Materials, and Workmanship: An airway beacon must be able to convey its design features. This includes the standard tower, platform, and beacon housing/beacon machinery. Except in those cases where a beacon and tower have been moved to a location with existing infrastructure, loss of any of the tower features necessitates the presence of the generator shed/generator shed foundation, and/or warming shed (if applicable), and/or electrical circuit shed (if applicable) [power lines providing electricity to the beacons may also be present]. The presence of the non-tower resources at locations where the tower has been compromised, will allow further elucidation of the role of the beacon at that specific location.

A loss of the generator shed and foundation, and/or changes to the beacon array, would result in diminished integrity of design, materials, and workmanship; however, these changes may not be severe enough to preclude listing in the National Register and will be reviewed on a case-by case basis. Disqualification of National Register eligibility or listing would depend on the severity of the alteration. Alterations may include recent replacement of parts with modern technology or building materials, which could impact integrity of design, materials and workmanship. The addition of repeaters and other modern equipment on the beacon towers does not result in significant loss of integrity.

Setting and Location: Integrity of design, materials and workmanship has a direct bearing on the integrity of setting and location, two aspects that yield equal effect on overall integrity. Many of the beacons are in remote locations. Municipal and rural airports, however, occur in more populated areas, with the result that the setting may have been compromised somewhat by the addition of new buildings at and around those locations. Repurposed beacons have likely been relocated from their original sites.

Construction of an airway beacon site must date from 1934 to 1959 and be at the original construction site, except where the beacon and tower have been relocated, in which case, the beacon and tower must have been moved within the period of significance (1934 – 1979), allowing for the structure to gain significance in its new location. The date of construction of beacons and associated equipment at and nearby local airports and landing strips may also include CAA-programmed locations through the 1950s. At some beacon sites, modern telecommunication equipment, including towers and equipment buildings, have been constructed in proximity to historic airway beacons. The presence of recent communications structures may potentially impact a beacon site by diminishing the integrity of setting. Each identified beacon location will require an examination of whether historic or modern facilities (if any occur) in the proximity have an adverse effect on the setting of the airway beacon sites. While physical and visual intrusions can diminish integrity of setting and location, they don't in themselves preclude eligibility of a beacon. The degree of the development may determine a beacon's eligibility or listing in the National Register.

Feeling and Association: The integrity of design, materials, and workmanship also bears directly on the integrity of feeling and association, which have equal effect on overall integrity. Integrity of feeling and association of an airway beacon will be lost if modern materials cover the historic materials or are of such scale and contrast to the remaining

historic materials that the observer is either more impressed by the alterations than the historic resource or cannot even recognize the historic resource.

G. Geographical Data

This nomination applies to properties located within the present boundaries of the State of Montana.

H. Summary of Identification and Evaluation Methods

(Discuss the methods used in developing the multiple property listing.)

This Multiple Properties Nomination is a product of an on-going research and field survey project. One airway beacon in Montana is listed in the National Register of Historic Places at the time of this MPD: the MacDonald Pass Airway Beacon (24PW1093/NR#14000462). Airway beacons that fell under the purview of the Montana Aeronautics Commission that are recorded and determined eligible for the NRHP include Strawberry Butte Airway Beacon, in Gallatin County, the Spokane Hill Airway Beacon near Winston in Broadwater County, the Stoney Point (Rehberg) Beacon (24LC2610) and Wolf Creek (24LC2795) north of Helena in Lewis & Clark County, the Alberton (24MO1724), University Mountain (24MO1722), and Bonita (24MO1725) beacons in Missoula County, the Silver Bow beacon in Silver Bow County, the Homestake Airway Beacon straddling Silver Bow and Jefferson counties, and the Hardy Beacon (24CA1773) in Cascade County.

The history of Montana's airway beacons is well documented in contemporary newspapers, such as Butte's *Montana Standard*, the *Great Falls Tribune*, and the *Helena Independent*. There are also many contemporary magazine and journal articles about aviation in the United States and the importance of beacons to nighttime airplane navigation across the country. More recent histories of beacons in general, and in Montana specifically, include Nick A. Komons' *Bonfires to Beacons: Federal Civil Aviation Policy under the Air Commerce Act, 1926-1938* (Federal Aviation Administration, 1978), and, importantly, *Brenda J.* Spivey's "Airway Beacons, an Integral Part of Montana's Night VFR Navigational History: Past History, Present Service and Present Value" (Embry Riddle Aeronautical University, 1995). This document represents a continuing effort by the Montana Department of Transportation in collaboration with the Montana SHPO to document the existing airway beacons in the field and assess the significance of each remaining beacon to the historic flight courses. This document will contribute to a statewide historic context for Aviation in Montana.

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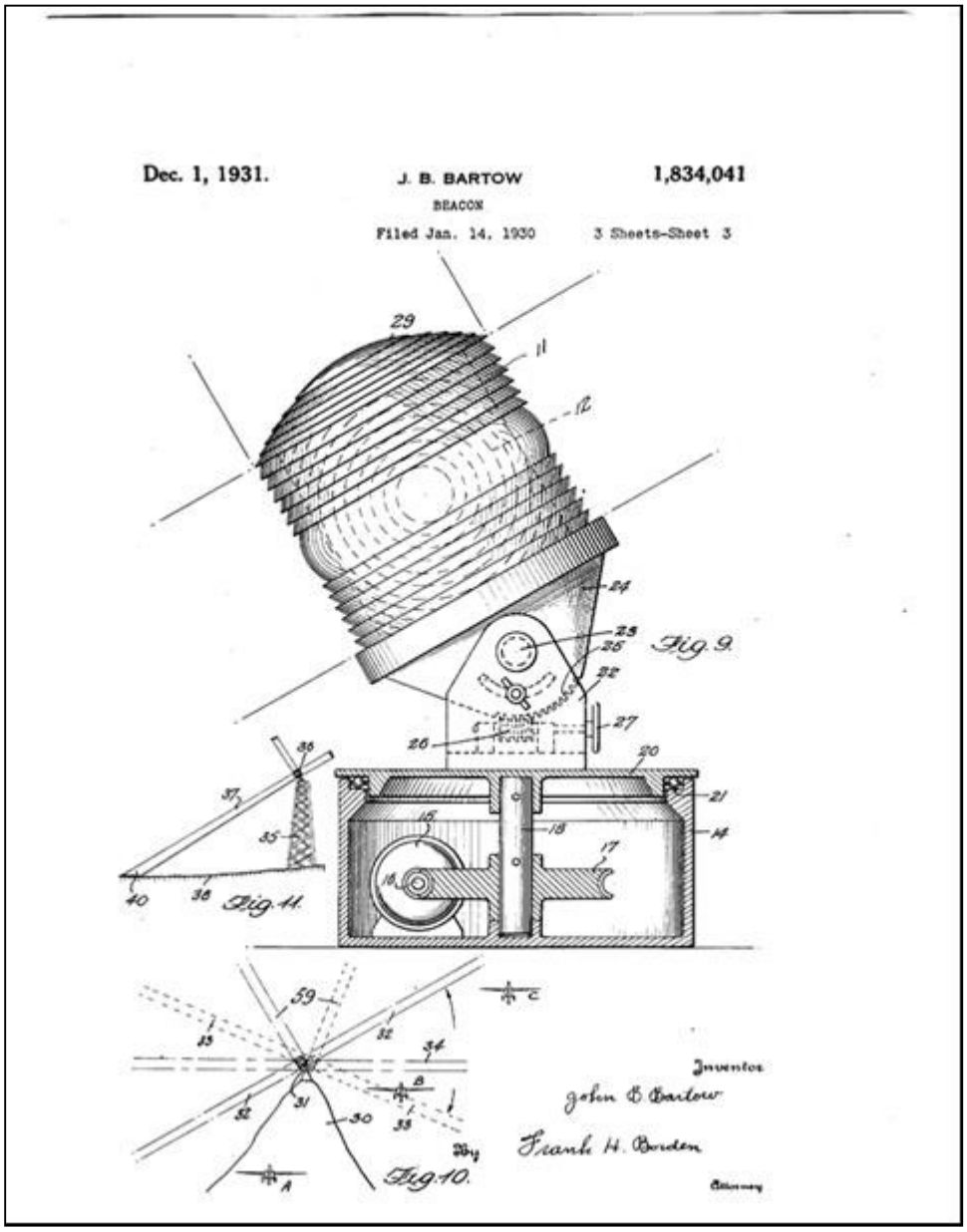

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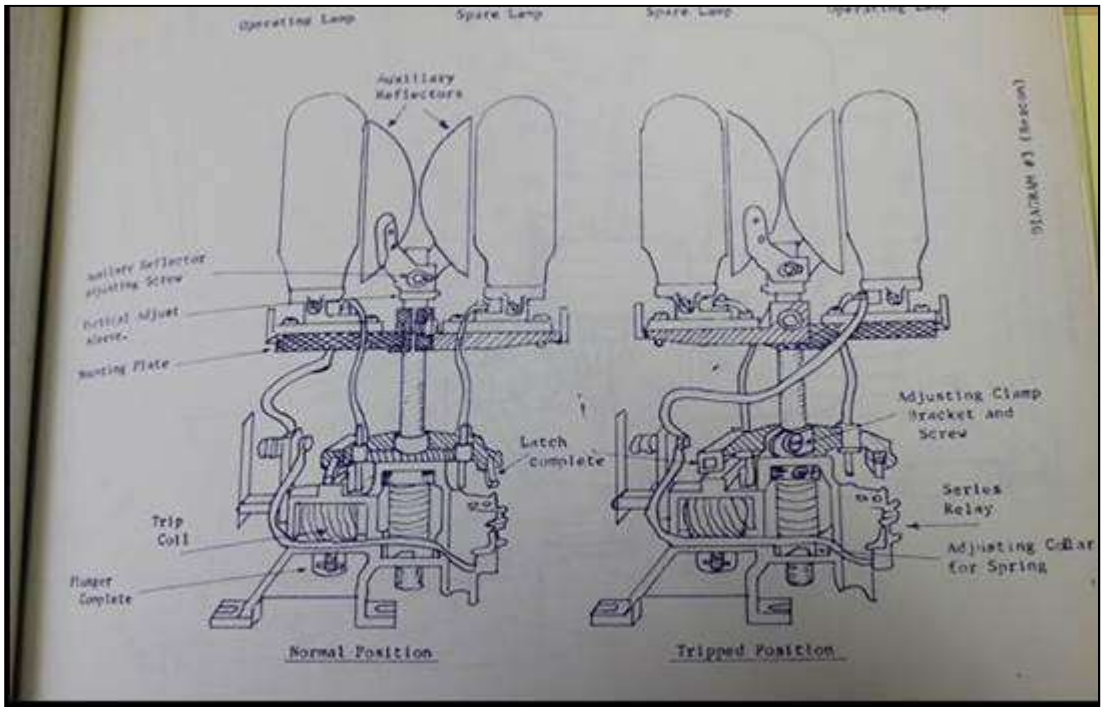
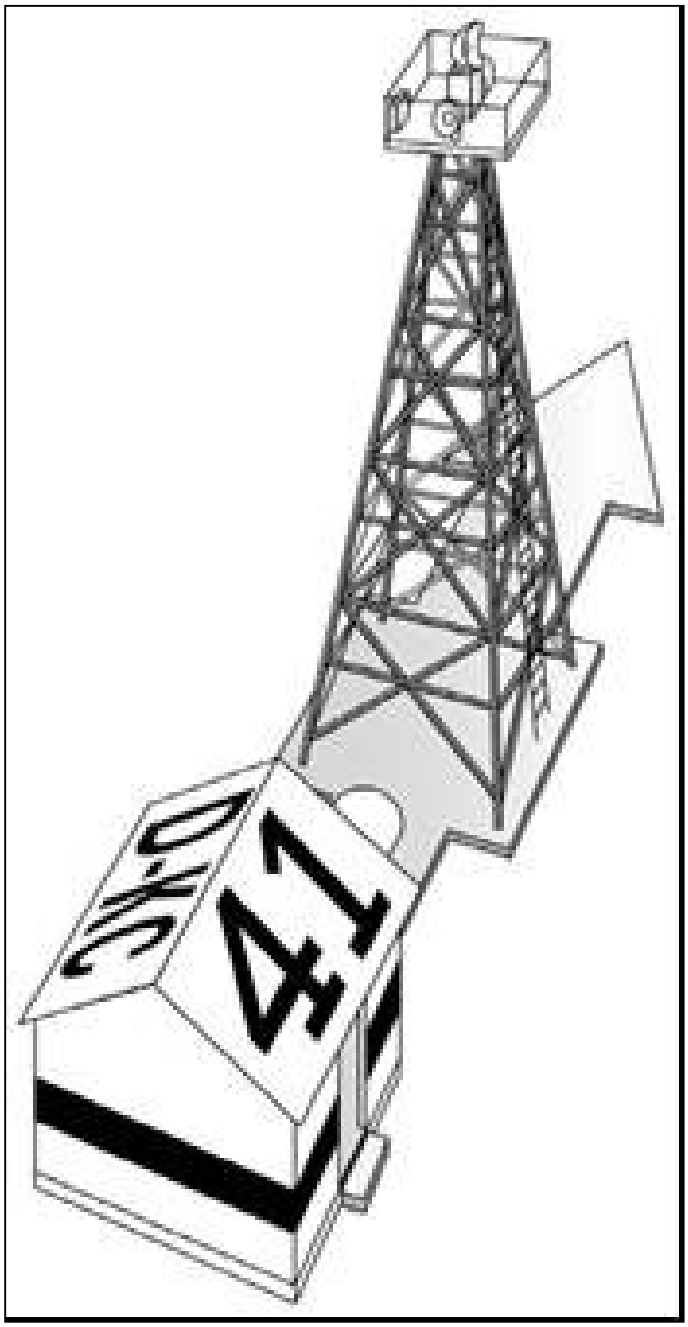
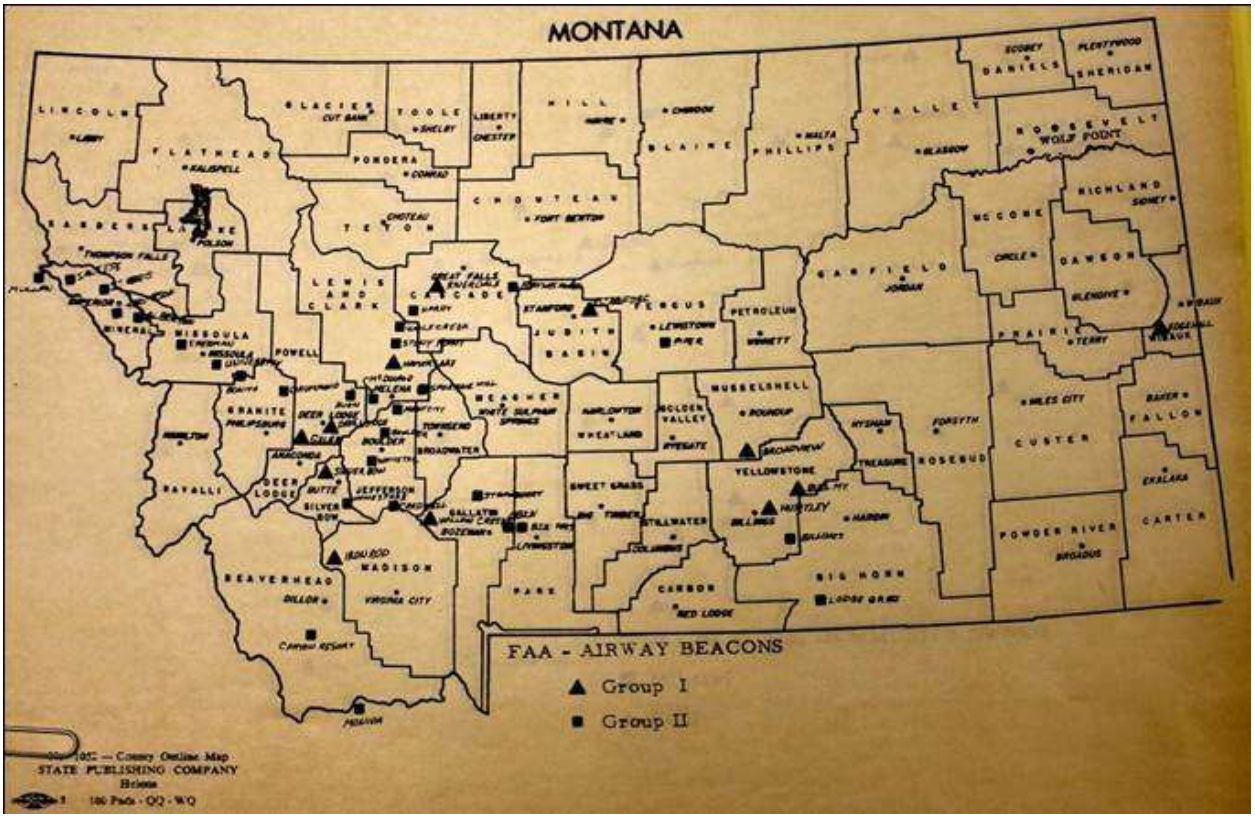


Diagram of beacon design showing mechanism for switching bulbs in the event the first burns out. "Beacon Files," Montana Aeronautics Division, Helena, MT.



Standardized beacon design by 1931 included a tower, generator shed, and often a concrete directional arrow. The generator shed roof displayed markings that indicated the airway designation and distance along the airway.



In 1965, the FAA surveyed the Montana beacon system, and grouped them, identifying "Group I" as those that should be decommissioned, and "Group II" as those to remain lit. "FAA – Airway Beacons," Map, Beacon Relocation Program Folder, Montana Aeronautics Division Archives, Helena, MT.