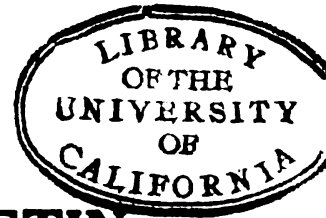


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AIRWAYS RADIO STATIONS CONTRIBUTE TO SAFETY AND RELIABILITY OF AIRCRAFT OPERATIONS

Although all of the aids to air navigation on the Federal airways system are vitally important to operators of both scheduled and miscellaneous services, the most dramatic incidents usually occur in connection with the use of aeronautical radio.

Radio-communication stations, radio range beacons, and radio marker beacons are designed to be of special assistance at times when adverse weather puts obstacles in the way of flight. Thus radio takes a leading rôle at times when the stage is set for unusual flying operations.

One radio station, in addition to performing its regular functions for an airway, has been of assistance to aircraft flying over a part of the Atlantic Ocean in ship-to-shore mail service. It was found possible to render this special service without interfering with regular duties, and without extra expense to the Federal Government. The radio station is located at Boston, Mass., and broadcasts from both the

radio communication and radio range transmitters have been received by the airplanes flying to shore from the ocean liners *Europa* and *Bremen*.

A radio range transmitter marks four courses, adjacent courses ordinarily being at right angles to each other. However, it is possible to shift the courses to some extent, making two of the angles between courses less than 90° and the other two angles more than 90°. Thus, if two airways intersect at the location of a radio range, two of the beams may be directed along one route and two along the other. In other cases, there are two beams not actually marking airway routes, but these extra beams may be utilized by airmen approaching from off the airway.

The radio range beacon at Boston, established for radio directional service on the New York-Boston airway, has one course extending out 200 miles over the Atlantic Ocean. The ship-to-shore craft customarily flying from the

Bremen or *Europa* to Cape Cod, and thence down the coast to New York found it helpful to make use of the radio beam leading them in the direction of Boston.

RANGE BEAM SHIFTED TO NEW COURSE

It was found, however, that the beam did not pass directly over the tip of Cape Cod, first landfall for the aircraft. A slight shift in the course, accomplished by an adjustment at the transmitter, oriented the beam over the course which was most logical for the airplanes to fly, and made the radio range beacon serve this extra purpose automatically.

The radio communications station at Boston broadcasts weather information with respect to the New York-Boston airway over the normal range of an airways radio communication station which is 100 miles in all directions. Since the station is located on the coast, it may be heard for some 100 miles at sea. The ship-to-shore flyers accordingly found it possible to listen to the regular broadcasts to get information as to weather conditions at Boston and along the route which they would be flying after passing Boston and proceeding toward New York.

In another part of the country during the past year an air-line pilot added another item to the chronology of blind flights completed successfully through the use of radio aids. The flight was between Columbus, Ohio, and St. Louis, Mo.

Reporting on his flight the pilot said that when he left Columbus at 1.20 a. m. with a cargo of mail and express the weather was good at his point of departure. Visibility was unlimited and the ceiling consisted of an overcast at an altitude of 2,500 feet. Light rain was reported in the vicinity of Indianapolis.

He encountered the reported light rain at Cambridge City, Ind., but had no difficulty in proceeding to Indianapolis, arriving at the latter place at 2.55 a. m. The 3 a. m. weather report indicated unfavorable conditions ahead, at St. Elmo, St. Louis, and New Florence, but as ample ceiling and unlimited visibility were reported for Kansas City, his destination, he did not hesitate to continue.

FLIGHT PROCEEDS THROUGH CLOUD BANK

As Terre Haute, Ind., had reported a ceiling of 1,500 feet, he planned to fly underneath the clouds at least

until reaching Effingham, Ill. However, at Brazil, Ind., he encountered broken clouds at 500 feet, underneath the overcast. As he proceeded he found himself flying in a solid overcast, and therefore climbed to about 1,000 feet, where he leveled off in the clouds to fly by radio range and instrument. After six minutes of this he flew out of the clouds and found that he had reached the vicinity of Terre Haute. The pilot's account continued:

I still believed at the time I would be able to fly under it as far as Effingham, Ill., but I immediately began hitting scud at 50 feet as soon as I had passed over Terre Haute. Thinking that this would also be of a local nature, I pulled up about 200 feet more and flew a compass course to Marshall, Ill. I soon found that this was a general weather condition because I saw no more holes in this low overcast after passing the Wabash River. Realizing then that it would be impossible to fly under it any more I settled down in the cockpit and prepared to do instrument flying until I reached the top of this overcast.

As I started climbing the rain increased to a steady downpour. I immediately tuned in on the Terre Haute range again and picked up the beacon course, following it in the direction of St. Louis. The range was working very well, coming in strong and clear. Believing that I would reach the top of this overcast around 5,000 feet I kept climbing until I reached this altitude, but again no luck, just more rain prevailed.

Trying various altitudes in the hope of finding a clear stratum, and also in an effort to find a temperature not too uncomfortably chilly, the pilot proceeded, but found it necessary to continue flying blind. Then, in his own words:

As I had been out of Terre Haute 35 minutes and had been on the range this should put me in the vicinity of Effingham, Ill. Sure enough—two minutes later I passed a glow that I concluded must be Effingham. I then tuned out the Terre Haute range beacon and tuned in on the St. Louis range beacon. Finding that the two met at this point made me more positive that this glow was Effingham. The St. Louis range came in very clearly and I followed it to St. Louis, listening to the weather reports as Δ CQ (the radio communication station at St. Louis) broadcast them. I was never able to fly between layers of the clouds or on top of them during the remainder of the trip to St. Louis. The rain had stopped about 20 miles west of Effingham, but the trip to St. Louis was made through solid clouds.

AIRPORT LOCATED BY CONE OF SILENCE

As I had been out of Terre Haute 1 hour and 35 minutes, and the St. Louis range was coming in strongly, I realized I was close to Lambert Field. But as KCQ had just reported 100 feet and one-fourth mile visibility, there was no use to go down. At 5.16 I passed through the cone of silence over the St. Louis beacon range. I knew then that I was directly over Lambert Field. At this time I came out of the clouds at 4,000 feet. I changed my compass to west, tuned out the range, and

held conversation with our ground stations at St. Louis and Kansas City.

The trip from St. Louis to Kansas City was made either above the overcast or between layers of it. I followed the Columbia range to Columbia, Mo., and passed over the cone of silence of the beacon range there at 6.30. The weather was as KCQ had just reported it, with a few breaks in the overcast, and for the first time since leaving Terre Haute I was able to see the ground.

KBC at Kansas City was reporting 700 feet and 2 miles visibility. From then on I followed the Columbia range for about 30 minutes, as the overcast had become solid again. I then tuned in on the Kansas City radio range and flew west-northwest until I reached the Chicago leg of the range and followed it to Kansas City. I passed over the cone of silence at 7.44.

At Kansas City the top of the overcast was about 3,000 feet. After passing over the cone of silence I held conversation with our company station. I was informed that the ceiling was still 700 feet and visibility $1\frac{1}{2}$ miles. I turned around again, picked up the Chicago leg of the Kansas City beam, and settled down over the municipal airport at Kansas City.

I want to say that all the radio ranges were operating in excellent condition. Without them and without the weather information of the Department of Commerce radio stations it would have been impossible to have made this trip.

PASSENGER PLANE FINDS RADIO VALUABLE

On the day following the flight described above another pilot of the same air line, flying in the opposite direction with passengers was enabled to avoid difficulty by making use of the airways radio facilities.

This pilot, after leaving Kansas City, found that the high-frequency receiver over which he generally received communications from his company's own radio station had ceased to function. His aircraft transmitter, however, was all right, so that he was able to report the difficulty direct to the company's own radio operator. Thereupon, the men on the ground who were responsible arranged for transmission of any necessary messages over the Department of Commerce radio communication station. From time to time special broadcasts were made for this particular plane in addition to regular weather broadcasts. The pilot acknowledged them through the company radio operator at the Kansas City Airport, who, in turn, relayed the pilot's messages to the operator of the airways station at the same airport. After the pilot had proceeded farther along the route, a similar procedure was followed at St. Louis.

When the pilot arrived in the vicinity of New Florence he discovered that he would have to leave the St. Louis radio range beacon course and fly around a severe line squall. He advised the St. Louis operator to that

effect and reported that he would attempt to approach on the north course of the St. Louis range. From time to time special instructions were broadcast to him, enabling him to avoid local storm areas.

At last, approaching the airport at St. Louis, he requested that the radio range beacon be operated continuously, without interruption for weather broadcasts or messages to airmen, for the few minutes that it would require for him to reach the airport. Such a request is usual under such circumstances, and the airways division encourages pilots to make it in order that they will be sure to have the benefit of range signals during maneuvers preparatory to landing.

The pilot landed his craft safely, and reported that the radio facilities had rendered aid which was extremely important in the successful completion of the flight.

RADIO AIDS PILOT IN DUST STORM

Pilot S—, flying from Portland, Oreg., to Pasco, Wash., in a scheduled air transport line craft, encountered a heavy dust storm. He reported his position as "over Pasco field" and requested the ground crew to listen for the roar of his engine. The crew could not hear it, and decided that he had become confused as to his position. Meanwhile the intermediate airways radio station at Arlington had overheard the conversation and called the pilot. (Intermediate airway stations operate as marker beacons, indicating specific localities by code, and also can operate as 2-way radiotelephones.) S— answered Arlington, and then realized that as the low power of the intermediate station would not enable it to communicate with any one farther away than 40 or 50 miles, his craft would have to be in the vicinity of that station. Shortly afterwards the Arlington operator heard the airplane to the south of his station and informed S— of his position. The pilot then was able to proceed on his course, tune in on the Pasco radio range signals in the vicinity of Umatilla, and proceed to Portland.

Pilot A —, flying for the same air transport company but from Portland to Medford, Oreg., found himself between two heavy layers of fog. As he approached Medford he began to doubt the accuracy of the radio range course, thinking that he was headed too far west, his magnetic-compass bearing indicating that he should bear more to the east. However, he placed his re-

liance upon the radio signals. Presently these signals indicated that he was passing over the radio station at Medford, and the ground crew heard his engines. The pilot doubts whether he would have reached his destination without the aid of the radio range beacon.

Reports of two flights on the New York-Montreal airway, in one of which the pilot was directed to fly 20 miles west of the airway, thereby avoiding a severe thunderstorm, and another telling of an order to a pilot with four passengers to turn back and land at Montreal from where he had departed earlier, are typical of the routine work of radio communications stations.

An instance of initiative and devotion to duty which particularly impressed an air-line official was recounted by the latter in a communication to the chief engineer of the airways division from which has been extracted the following:

A dangerous fog condition developed rapidly one night about 8 p. m. One of our ships was ferrying from Charlotte to Atlanta at that time, but I do not think your operator knew it. However, he realized the danger and broadcast about seven times during the next hour. Our pilot, ferrying the ship, arrived in Atlanta in time to warn the pilot of our north-bound ship. While the two were checking weather conditions, Atlanta closed in as well as the whole eastern seaboard, which remained so for a period of nearly 10 hours. We had a double section that night and might have lost two ships. Such work as this can not be commended too highly.

INTERMEDIATE STATION UTILIZED

Another instance of the aid rendered by the intermediate airways radio stations took place at the intermediate landing field formerly located at Lexington, Nebr. An air-line pilot landed at the field during a period of poor weather and then attempted to go on. However, weather conditions showed no improvement and he was forced to return to Lexington. Fog was so heavy that he could not see the lights on the field, but the ground crew listened for his engine and kept in touch with him by radio. When the airplane arrived over the field one member of the crew took up a post outside the radio and teletypewriter building and called out information as to the location of the plane to the operator inside. The radio operator in turn gave the information to the pilot. In this way the two ground men enabled the pilot to maneuver his craft into position for landing. There was enough visibility with-

in a few feet of the ground so that the pilot was able to get the aircraft onto the field safely.

Sometimes the regular operation of airways radio stations incidentally renders practical service to nonaeronautical interests. For example, a Forest Service officer informed the airways radio operator in charge of a station in Montana that—

The fire season on this forest has come to a close after a very hazardous season during which he found it necessary to extinguish 105 forest fires of various sizes. In our preparations to handle the fire situation this summer not the least valuable was the service which you so generously rendered us. Due to this service we were enabled to concentrate our forces, equipment, and supplies and place men in strategic positions during these periods that weather conditions made so hazardous.

COOPERATION WITH FIRE FIGHTERS

The airways division personnel had cooperated with the Forest Service by giving it complete airway weather information by telephone several times a day. Such cooperation is extended in a number of national forests.

Again, an airways traffic supervisor reported to Washington that a sheep herder had installed a portable radio receiver to listen to airways weather broadcasts. This information enabled him to move his herds to lower elevations when he learned that conditions of storm and low temperatures were forecast.

Public utility agents charged with maintenance of power and telephone lines in isolated areas pay close attention to airway weather information, particularly during winter months. By this means they are forewarned as to probable conditions and able to equip themselves for the kind of weather they will face on emergency maintenance trips.

Such incidental uses of airways weather information interfere in no way with the regular operation of the stations for the benefit of airmen, and the broadcasts may be received by anyone who has a radio set capable of receiving on the airways frequencies (224 to 350 kc.).

To operators of aircraft the radio aids are indispensable. At times when weather conditions are good the stations enable flights to be made more efficiently and expeditiously, and when fog, clouds, or storms make air navigation more difficult it would be virtually impossible to operate without radio.