

PLANE TALK

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RADIO AND TELE-TYPE FACILITIES

THE two previous issues of "Plane Talk" were devoted to discussions of preliminary organization, financing, and management, and the development of airports along the route of Transcontinental Air Transport, Inc. In this, the third issue, appears a detailed description of the radio and tele-type communication system.

Constant radio communication between planes aloft and ground stations located at each airport has been provided through the Airways Communications system laid out by the Company. The system complies with the specifications of the U. S. Department of Commerce, and, although owned by the Company, becomes one of the official lanes of communication for the use of planes flying over this airway.

At each station radio buildings and towers will be erected a half mile or a mile from the airport. The two steel towers, each 128 feet tall, will be painted in alternate bands of yellow, black and white for daylight visibility, and lighted by obstruction and flood lights at night. Directly under the towers a network of 5,000 feet of ground wires will be laid 18 to 24 inches under the surface. The ground system alone covers a plot 100 by 400 feet.

In the two-room radio building or "shack," which is of frame construction, 22 by 28 feet, with a half basement and attic, will be set up the generating and operating equipment. One room is given

over to the motor-generator set composed of a three phase, 60 cycle motor operating on 110 to 440 volts, and a generator developing 2,000 volts at 1,700 revolutions per minute.

In the operating room, separated from the generators by two partitions, will be the 2 kilowatt transmitter, the control panels, the receiver and the radio direction

known, however, which side of the loop the signals come from. Signals from a plane due north, energize the antenna exactly as do signals originating in a due southerly direction. The second or "sensing" antenna then is placed in the circuit to determine on which side of the loop the pilot is flying. An indicator on the operator's table points to the pilot's compass bearing from the station and that bearing is transmitted aloft to the pilot.

The operating range of the apparatus is approximately 150 to 200 miles, which is more than sufficient to keep a pilot in constant communication with a ground station.

The radio "shacks" are piped for hot and cold water and a coal furnace provides heat for the long winter night watches. A first-class radio operator will be in charge of

each station with at least one licensed operator as an assistant. Stations will be operated from 7 o'clock A. M. to 10 o'clock P. M. when operations begin. Provision to extend the service to 24 hours daily has been made.

The procedure of calling and answering between planes and ground stations is similar to that adopted by the United States Department of Commerce. An example of the procedure follows:

"Airways Communication Station XYZ at Port Columbus Calling plane ABC. Hello, ABC."

The pilot replies with a like formula:



A section of the business district of Indianapolis as it will appear to passengers on TAT planes. In the center foreground is Monument Circle. Some of the buildings visible include the World War Memorial, the Post Office, the Chamber of Commerce and the Columbia Club.

finding apparatus.

The direction finder, formed of two antennae and a delicate receiver, is invaluable to pilots aloft in heavy weather. The ground operator, with only slight manipulation of his apparatus, can determine the pilot's exact position with respect to the ground station. To determine the position of the pilot, a movable loop antenna is rotated until the signals from the plane register in the head phones with minimum strength. Minimum, rather than maximum signals, are sought because of their greater accuracy. When minimum signals register the loop is known to be broadside to the plane. It is not



An aerial view of radio "shack" and towers being installed at all TAT airports. The towers each are 128 feet tall.

"Plane ABC replying to Airways Communication Station XYZ. Hello, XYZ."

Except in very adverse atmospheric conditions, communication is by voice transmission only. To overcome adverse conditions or in emergencies when voice transmission is not satisfactory, code is permitted. A switch provides for instant change from voice to code transmission.

The TAT radio installations being a link in the Department of Commerce Airways Communication system, radio service is rendered without cost to private, commercial and military planes using the airway on occasional flights. Planes using the airway on frequent or regularly scheduled flights are required to share the cost of the system.

Plane Installations

Aboard the planes will be a 100 watt voice transmitter operated by a dynamotor set driven by storage batteries, a radio beacon receiver, a microphone, a key for sending code, and two antennae—a vertical antenna for receiving, and trailing wire antenna for sending. All controls will be located in the pilot's cockpit and operated by that pilot not engaged in the actual flying of the plane.

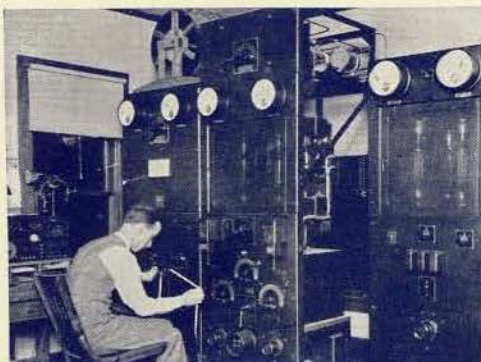
Although it is not planned to equip the TAT airway with a radio directive beacon when operations first begin, the service no doubt will be installed later. The directive beacon sends out a beam of continuous radio waves, which the pilot follows by means of his beacon receiver, making it possible for him to dispense with compass flying.

The vertical antenna, which extends six feet above the fuselage, is used because of its greater accuracy in receiving the directive signals. The trailing wire antenna, carried on a reel when not in use, is longer and gives a wider operating range.

Ordinarily radio communication between two planes aloft at the same time

will not be necessary, but is possible if desired.

Radio communication between TAT units will be on the intermediate frequencies reserved by the Federal Radio commission for mobile communication. One of the bands extends between 850 and 1050 meters. The Department of Commerce has reserved a wave length of



In the left of the lower photograph is shown the keyboards and glass fronts of two tele-type machines. The operator is shown at a typewriter receiving a message from a plane aloft. The photographs are of apparatus similar to that which is being installed by TAT.

900 meters for general transmission from ground to plane. The radio beacon is transmitted on wave length of 1034 meters.

The Company has applied for licenses for twenty-two planes to operate on a specific wave length between 600 and 900 meters to be allotted by the Radio Commission. The Company also has requested a specific wave allocation in the band between 109 and 133 meters. The two specific allocations, when made by the Radio Commission, will be reserved for transmission from plane to ground and the 900

meter wave length used from ground to plane.

Such standardization of wave lengths simplifies the duties of both pilot and ground station operator, as it gives a definite wave length on which they may listen for signals.

Commercial Use

Aside from the purely Company communication, such as weather reports, and orders to pilots aloft, the radio system will be available to passengers for commercial use. But, because of the almost continuous use to which the system will be put by necessary operating communications, passengers will be requested to limit their use of the radio aloft to essential business or emergency use.

In commercial operations the message will be sent from plane to ground station and relayed by telephone to the nearest commercial telegraph station.

It will be possible also to relay a telephone message between a plane and a city far from the route of TAT by a hookup of the radio and telephone facilities of the American Telephone and Telegraph Company. Such communication,

Interior views of radio and tele-type installations. The upper photograph is of the radio control panels and the receiver. The narrow tape which the operator holds in his hands has just come from a tele-type machine.



while past the purely experimental stage, is not advisable except in extreme emergencies.

Radio transmission will be restricted to messages between ground station and

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planes, and occasionally between two planes aloft at the same time. It will not be used for messages between two ground stations. For those messages the tele-type system has been installed.

The Tele-Type

The tele-type machine is a combination of telegraph and typewriting instruments. A message typed on a keyboard of one tele-type machine appears instantaneously on the machines at all other stations on that circuit. As each letter is typed at point of origin, it appears on a narrow tape which passes under the type bars of the other machines. The same machine is used for both sending and receiving.

The machine has the general appearance of an over-size typewriter with the standard keyboard. The type is all in capitals.

The reverse side of the tape on which the message appears is gummed and when complete, the message may be pasted on a blank similar to a commercial telegraph form.

The TAT tele-type system is divided



Glendale field, Los Angeles, as seen from the air. TAT planes will operate from this field.

to the western cities. For a message originating at Columbus, Indianapolis, St. Louis, Kansas City or Wichita and destined to a station west of Waynoka, a relay is necessary. The relay is accomplished merely by retyping the message on a second machine at Waynoka.

The tele-type system was developed to meet the demands of TAT and other air transport companies for a means of rapid and continuous ground communications.

ever, is entirely at the discretion of the Company.

In future editions of "Plane Talk" other phases of the organization will be described, including the weather bureau which the Company has formed. Each detail of the Company's operation has been planned and will be completed along the lines ordered by Mr. C. M. Keys, president of TAT, who has forbidden operation until "the day we are properly ready."

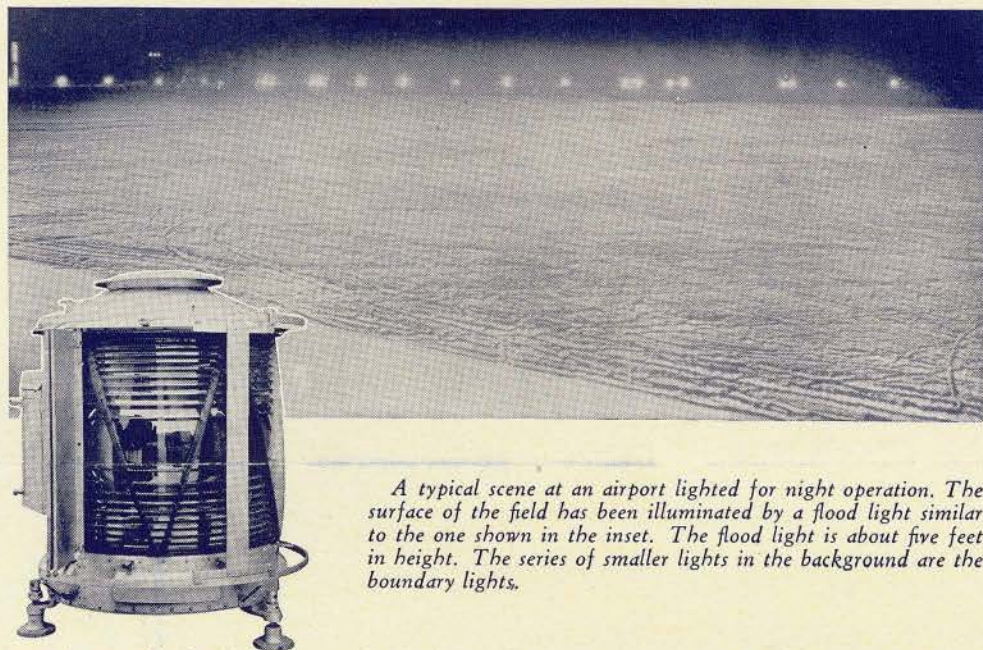
NIGHT OPERATIONS

IN preparation for night flying, which will be inaugurated as an alternative service on the Western Division of TAT, the Company is installing standard airport illumination systems on the fields which it owns. In cases where operation will be on municipally owned fields the cities themselves are planning to install illumination equipment which has received the approval of the Department of Commerce.

Standard airport illumination consists of obstruction lights, field boundary lights, approach lights, flood lights and ceiling lights. The ceiling light and its mechanical operation is an interesting phase of aeronautical development.

The light, as its name indicates, is designed to reveal the height of the clouds over the airport. Its beam is trained upward at an angle and the point where the beam strikes the clouds is "sighted" on a triangulation instrument. The instrument is calibrated to give the exact height in feet of the cloud formations. The height of the ceiling, when ascertained from the ground, is radioed to planes due to land at the airport. The ceiling height is also one of the factors considered in forecasting weather changes.

The nature of the other lights in the system is indicated largely by their names. Red obstruction lights are placed on hangars, passenger stations, radio towers and other buildings or obstructions which might interfere with a clear landing. Ob-



A typical scene at an airport lighted for night operation. The surface of the field has been illuminated by a flood light similar to the one shown in the inset. The flood light is about five feet in height. The series of smaller lights in the background are the boundary lights.

into three individual circuits and a "split," or relay circuit breaking at the St. Louis Airport. The individual circuits extend from Columbus to Waynoka, Waynoka to Clovis, and Clovis to Los Angeles and San Francisco.

A message typed on the keyboard at Columbus, for example, appears instantly on machines at Indianapolis and St. Louis. By a request for a "through" circuit the message can also be made to appear on the tape at Kansas City, Wichita and Waynoka.

Likewise, a message typed at Indianapolis appears on the tape at Columbus and St. Louis and can be routed through

A major use for the system will be in disseminating weather reports. It will be employed also in plane dispatching, ordering plane movements, transmission of reports, reservation requests and inter-company messages.

The machine in most cases will be located in the office of the airport manager or in the weather bureau, and should future development prove it necessary, the circuit may be duplexed so that two messages may be transmitted simultaneously.

The tele-type is also a part of the Airways Communication system of the Department of Commerce, as is the radio system. The use of the tele-type, how-

