The TWA Archives Department
Preserving our Legacy – Sharing Our Past

Dear Friend,

It's been said that to see the light in front of you, sometimes you have to take a look back. The following document was scanned courtesy of the Archives Department of the TWA Museum at 10 Richards Road in Kansas City, Missouri. The mission of the TWA Museum is to provide information to the public emphasizing the story, history and importance of the major role TWA played in pioneering commercial aviation. From the birth of airmail to the inception of passenger air travel, to the post-WWII era of global route expansion, TWA led the way for 75 years.

It is with great pleasure that we present to you a treasure from the Archives Library in PDF format. Be aware that most of our original print versions are several years old, thus you may notice some wear, page markups, folding, etc. We've tried to enhance the documents as best as we could, and we hope that you will be pleased.

In order to continue our great work, please consider a donation. The TWA Museum at 10 Richards Road is a non-profit 501(c)3 organization and all donations are tax deductible. If you would like to make a monetary donation, please send it to:

TWA Museum
10 NW Richards Road Suite 110
Kansas City, MO 64116

If you would like to make a TWA memorabilia donation: TWA memorabilia donations are very important to us and we thank you for your generosity. At the present time we have limited space in the Archive Department and currently that space is filled to capacity. Because of this temporary situation the TWA Museum request that all TWA memorabilia donations be put on hold until we can process the items we already have on hand. However, please feel free to email us a list, along with any information or photos, of your TWA memorabilia items and we will gladly review them as time permits us. If your donation items are then selected for further review by our archivist, you will be contacted by the museum at a later date. Please, No walk in donations at this time. Thank you for your consideration.

Sincerely,

Carol Emert, Archivist
Zana Allen and the many Archives Department volunteers
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816-234-1011

9-1-42

TRANSCONTINENTAL & WESTERN AIR, INC.

Kansas City, Missouri

AIRWAYS

The United States Bureau of Air Commerce supervises and operates 31,000 miles of regular airways in the United States. The bureau provides intermediate fields, weather and radio beam transmitting stations, beacon-lighted airways, teletypewriter circuits and other navigational aids necessary to the safe operation of transport aircraft.

Today there are 25,000 miles of lighted airways throughout the country. More than 250 lighted intermediate fields and 580 marked auxiliary fields supplement the commercial, municipal, military and state-owned airports providing adequate landing facilities.

DEFINITIONS

Civil Airways

A civil airway is a route in the navigable airspace designated by the Secretary of Commerce as a route suitable for interstate or foreign air commerce. It includes the airspace located vertically above an area on the horizontal plane contained within lines encircling each terminal airport, intermediate airport, and other intermediate points, specified on such airway within a radius of ten miles from the center of such airport or other specified intermediate point and also contained within two parallel lines located ten miles from the center line connecting the terminal airports by way of each intermediate airport or other intermediate point specified to designate the route of the airway. Each civil airway also includes the terminal and intermediate airports, emergency landing fields and all other air navigation facilities located, or which may be located and established, within the area.

Control Airport

A control airport is an airport which has been so designated by the Secretary to provide for the safety of aircraft moving in interstate or foreign air commerce.

Alternate Airport

An alternate airport is an airport, other than the point of first landing, specified in the flight plan and to which the flight may be directed in case of emergency.

Radio Fix

A radio fix is a geographical location on a civil airway above which the position of an aircraft in flight can be accurately determined by means of radio only. (Such as a cone of silence marker, Z type marker, fan type marker, or intersection of radio range "on course" signals.)

Check Point

A check point is a geographical location on the surface of the land or water above which the position of an aircraft in flight can be accurately determined by means of visual reference. (Such as a river, highway, mountain, bridge, lightship, etc.)

Radio Range Station

A radio range station is that point in a radio station from which radio signals are emitted for the purpose of assisting an aircraft to maintain a course.

Airport Control Tower

An airport control tower is an establishment properly situated and equipped to allow an operator thereof to adequately control air traffic in the immediate vicinity of the airport on or adjacent to which such airport control tower is located.

Airway Traffic Control Station

An airway traffic control station is a station operated by the Bureau for the purpose of air traffic control on civil airways within the jurisdiction of such station.

Airway Traffic Control Area

An airway traffic control area is an area within the limits of designated civil airways and over which a particular Bureau airway traffic control station exercises traffic control.

Airway Communications Station

An airway communications station is an airway radio, teletype or other communications station operated by the Bureau.

AIRWAY AIDS

Not so many years ago the only aid to cross country piloting was the compass. On many flights the pilot simply followed roads, railroads and rivers until by a round about course he reached his destination.

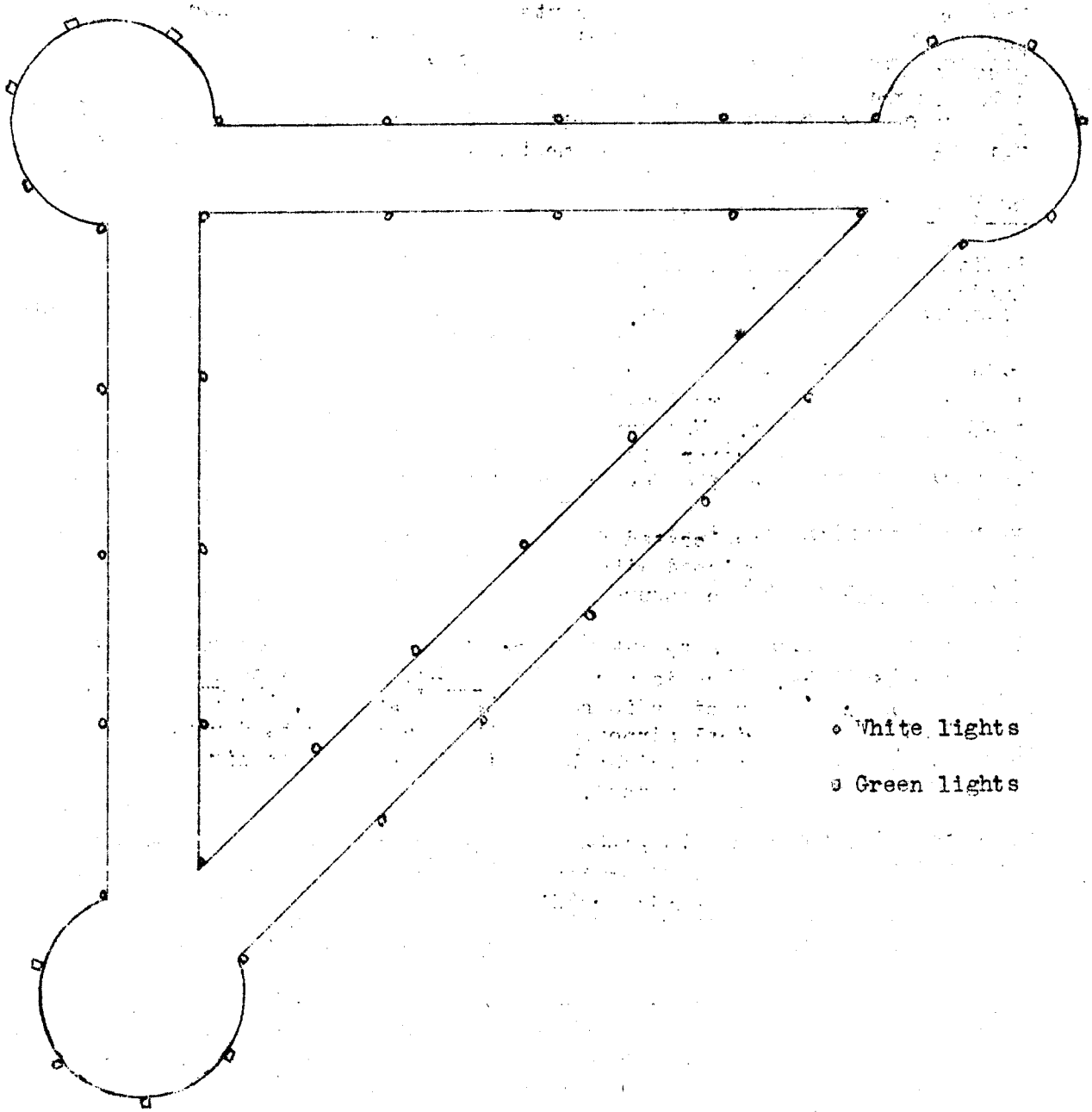
In those days an airport was simply a field more or less large and level enough for a plane to land and take off. Airways did not exist.

The father of airway development was the air mail service started in 1918. On the first night air mail flight in 1921, bonfires served as route markers. By 1923 the first airway was equipped with electric light houses and some lighted emergency fields went into service. By July 1st of 1940, planes of all types were traveling over 35,477 miles of modern airways in the United States.

Landing fields are now scientifically designed--some with mile-long, hard-surfaced runways to accomodate great passenger liners. Modern air terminals are completely equipped for convenient air travel.

In the daytime, roof or ground markings help in identifying airports. At night, boundaries of airports are marked by white boundary lights about 300 feet apart. Green lights mark the ends of the runways. Red lights mark obstructions around the boundary of the airport.

EXAMPLE A:



Runways have flood lights and the wind direction indicators are illuminated to make night landings easier and safer. For some distance around major airports, obstructions are marked for easy visibility by day or night.

Nine Minutes from Intermediate Fields

Along the entire TWA route there are numerous intermediate and auxiliary fields between terminals so that at no time during a trip is a TWA plane more than nine minutes from a suitable landing site.

The more important intermediate ports have caretakers who look after the equipment provided by the Federal Government. All of these ports have gasoline available for the use of any ship in an emergency. If the caretaker is not on the field, many of which are located in isolated country, the TWA Captain has a key which gives him entry to the equipment sheds. Telephones are also available at most fields.

Radio and Weather Stations

Radio beam and weather broadcasting stations are located about every hundred or two hundred miles along the airway and are staffed by trained radio and weather attendants.

Hourly from these stations are broadcast the weather conditions along that sector of the airway and every half hour each station sends its own local weather report. When an airline plane is in the area of the Bureau of Air Commerce, operators tune in on the company's radiophone frequencies to render any service they may to passing aircraft.

Every TWA terminal is located on a large, modern airport with unobstructed approaches and is equipped with every devide to assist in the safe operation of aircraft and to assure regularity of schedules.

Although it can only be "seen" by those who understand its importance to aerial navigation, there is a complete air-highway system thoughout the United States made up of radio range "beams" signals, intermediate fields, commercial and municipal airports and the beacon lights for night flying. These air highways are considerably safer on fog ridden nights than the highways on the earth's surface.

In addition to the regular airway radio range stations, certain purely local ranges are maintained at terminal airports to assist approaching and departing aircraft during conditions of limited visibility and ceiling.

AIRWAY TRAFFIC CONTROL

Historical Explanation and Purpose

It is not necessarily the purpose of the Airway Traffic Control System to advise the airlines as to when it is and when it is not permissible to fly along a Federal airway but to act as a centralized bureau of information in which it is possible for each individual airline operating within a given sector to obtain traffic information in order that their flights may be cleared safely. Prior to 1936, there was no centralized bureau that might be used for this purpose. After several years of flying scheduled airline flights (during which time the airline operators were dependent upon the accuracy of the radio operators of the various airlines for information necessary for the purpose of safely controlling a flight), the airline organizations decided to establish what was known as the Airway Traffic Control System.

The system installed at this time might be likened to the average modern-day road highway police traffic control system. At that time, the Airway Traffic Control had no Federal authority and operated merely on an interline cooperative basis. After a few months of operation with this type organization, it was found to be highly successful and as a result the Civil Aeronautical Authority took over the entire system. Since that period, they have greatly enlarged the organization, and it is now known as the "Federal Airway Traffic Control System".

Comparison of Federal Airway Traffic Control System to the Up-to-Date Highway Road Patrol System

In order to better describe the purposes and the manner in which the Federal Airway Traffic Control System functions, let us apply it to the State Highway Patrol organization used for the purpose of controlling Auto Highway Traffic throughout many of these United States. When the average family starts out in their automobile for a trip along the highway in the majority of our different states, we find that every effort has been made in most cases to protect this family as far as traffic is concerned. Good roads have been built; signs have been posted warning the driver of dangerous curves or any other construction which might be considered hazardous; lights have been installed warning us of busy intersections and at times when traffic becomes extremely heavy at different points located along the highways throughout the United States, we find officers who are actually engaged in directing traffic to the highest possible degree of safety.

It is with this same idea in mind that the Federal Airway Traffic Control System has been set up. When an airplane takes off from one of the major airports located in or near one of the controlled area boundaries, each Captain of the flight must supply to the Airway Traffic Control System through the individual company's communication system, certain information that will advise the Airway Traffic Control personnel as to the definite plans which the pilot intends to carry out during the entire flight.

This information will include the station from which the flight is proceeding, the flight number, the company's ship number and the Captain of the flight, the time off the ground and the cruising altitude, the estimated time over various check points, the cruising time and the elapsed time which the Captain expects to consume in cruising the aircraft between the two stations.

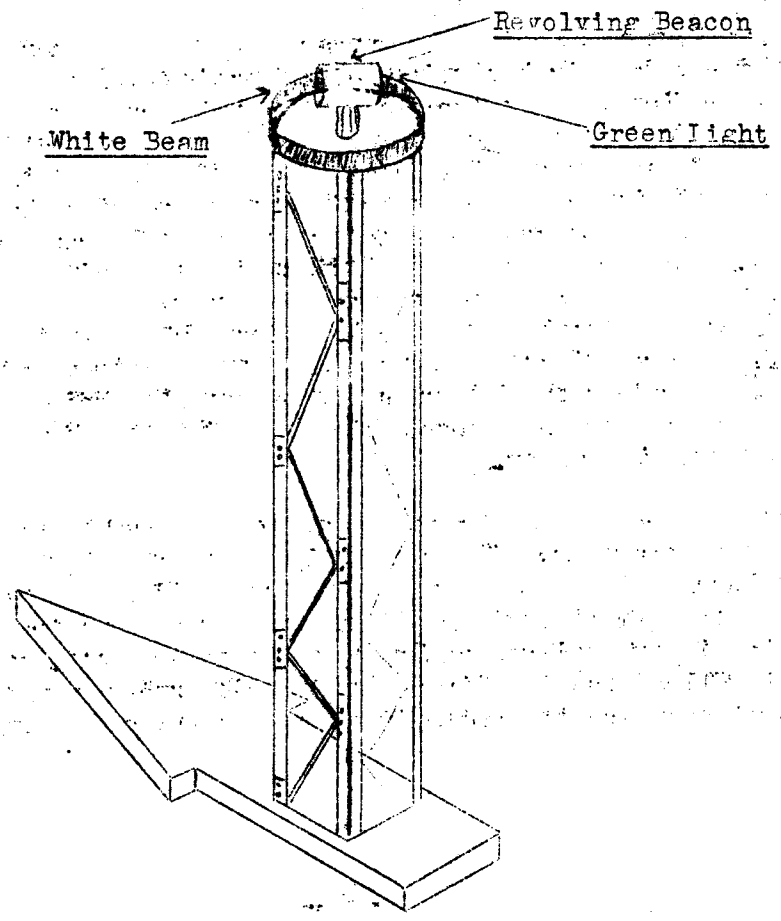
At control airports, air traffic control towers and control tower operators (aerial "traffic cops") have made tremendous improvements in the safety of local air traffic.

To the cross country pilot the biggest improvement is the modern airway which is linked by radio and teletype equipment for communication between ground stations and for contact with planes in flight.

The pilot on the air highway is guided by the airway beacons. These beacons are located about fifteen miles apart all along the airways and are marked by an identifying number. The beacons are simply revolving search lights mounted on high towers. From the air they show a white flash six times each minute.

At most beacon towers course lights, fixed position search lights, point in both directions along the airway. If there is no airport at the beacon, the course lights are red. Beacon lights with green course lights are located on intermediate landing fields placed about fifty miles apart along the airway.

EXAMPLE B:



Important landmarks either on or near the airway are sometimes marked by red landmark beacons. Some landmark beacons are equipped with a stationary projector which points a clear pencil of light toward the nearest landing field. Others are not.

In addition to these visible signposts, there is the invisible network of radio ranges to guide the pilot along the aerial highway. Because of its value in bad weather when other forms may fail navigation by radio is increasingly important. The radio range is formed by radio signals sent out from a range station on the airway. Let's see how it works.

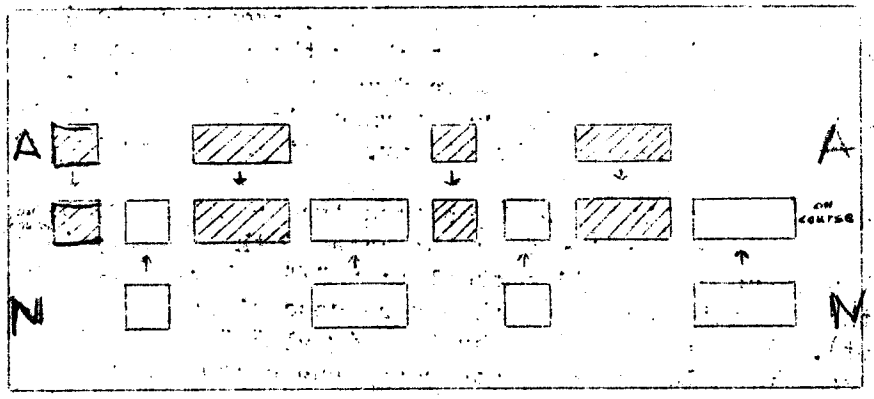
With certain types of radio antenna the radio waves spread out fan shaped. The radio range station uses two sets of these directional transmitters with antenna crossed like the letter "X". The antenna pointing nearest north and south sends out the Morse code signal "N" (a dash followed by a dot). The areas crossed by the signal "N" are called N Quadrants. On the same wave length, the other antenna sends out the letter "A" (a dot followed by a dash). The areas covered by the letter "A" are called A Quadrants. (See TWA Airway Map and Log.)

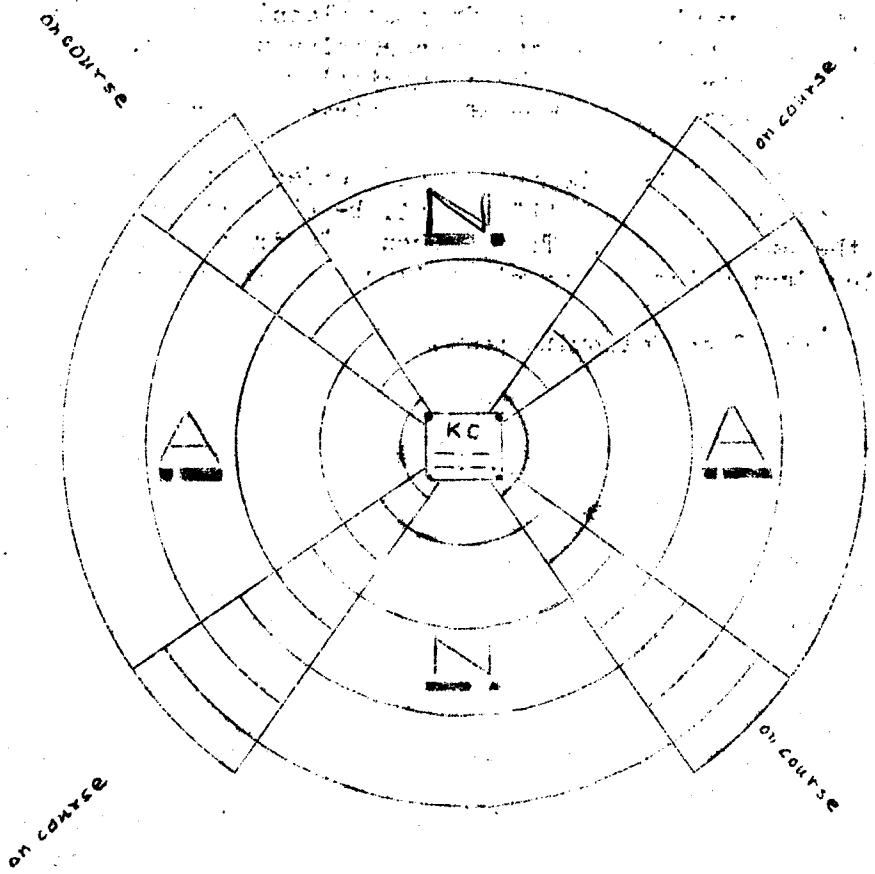
Each quadrant covers a little more than a quarter of a circle. Therefore, there is an overlap. In the four overlapping zones, the "A" and the "N" signals blend to form a steady or continuous sound. These are "on course" zones. The direction of the transmitting antenna sends the "on course" zones along the actual legs of the airways served by the range stations.

The pilot when using the radio range endeavors to stay on the "on course". If he gets an "A" or an "N" signal, he changes his direction to again obtain the steady sound. The "on course" directs him over the radio range station from which he can plot his course to arrive at the nearby airport.

See Example C on following page.

EXAMPLE C:





A plane flying along an "on course" zone is said to be "riding the beam". At regular intervals (about 3 seconds apart) the "N" and "A" Quadrant signals are interrupted for the range station identification. This is sent in Morse code, first in the N Quadrants, then in the A Quadrants. Due to the arrangement of the transmitting antenna system, there is a cone of silence directly over the station. The radio receiver suddenly seems to go dead. This marks the position of the station and gives the pilot one more check on his position.

At regular scheduled intervals, in most cases three or four times each hour, voice broadcasts are sent out from the radio range stations. The broadcast gives the correct time, ceiling, visibility and weather conditions. At the radio range station airport and along the airways heading to the terminal airport, the various airway weather forecasts are also broadcast at certain\times.

The radio range station reaches the limit of its useful range at about 100 miles. The pilot then tunes his radio to the frequency of the station ahead.

Another type of radio aid known is the fan marker beacon used to help the pilot check his actual position. These beacons send an identifying signal or number in code which gives the marker position on the airway.

We have considered how the development of an extensive airway system with its lighting and radio facilities has made flying easier and safer. As modern radio equipment has improved, more radio aids to navigation have been made available. Two of these modern flying aids are the radio compass and the radio direction finder. Both use the directional properties of a loop antenna. The loop receiver is connected either to the headphones or to an indicator on the instrument panel. Sometimes both are used.

The strength of the signal or the movement of the indicator shows whether the plane is on the proper heading. When the receiving loop is pointed toward the station, the signals are strongest. When the loop is at a right angle to the station, the signals are weakest.

Most types of radio direction finders or "homers" can be tuned to commercial broadcast stations. The most modern type takes bearings automatically without the necessity of the pilot making a computation.

Airport Control Tower

The exchange of information between aircraft and ground near crowded airports is important to the safe, rapid handling of air traffic. The airport control tower is the heart of the airport traffic control system. From the tower, signs can be given to all pilots on the ground and in the air.

The "traffic cop" of the airport system is the airport traffic control tower operator. He is certificated by the C.A.A. in the same way that the pilot is. His job is to keep traffic moving with safety.

The control tower operator uses three methods to signal instructions to pilots on the field and in the air:

1. Lights
2. Flags
3. Radio

Let's see how these means of signaling are used to direct the flow of traffic. First the use of lights from the control tower.

The light used for signaling the individual pilot is like a spot light with a very narrow beam. The light is aimed like a rifle directly at the pilot. Signals with this light are as follows:

If the airplane is taxiing:

A red light means stop.
A green light means clear for continuing taxiing.
A blinking red light means return to the hangar line for further instructions.

When a pilot is in position for takeoff:

A red light means wait.
A green light means clear for takeoff.

When an aircraft is in flight:

A red light means give way to other aircraft and continue circling.
A green light means cleared to land.

The second method of signaling the pilot is with colored flags.

When a pilot is taxiing:

A red flag waved by the operator means stop.
A white flag waved by the operator means cleared for continued taxiing.

When a pilot is in position for takeoff:

A red flag waved by the operator means wait.
A white flag waved by the operator means cleared for takeoff.

To an aircraft in flight:

A red flag waved by the operator means give way to other aircraft and continue circling.
A white flag waved by the operator means cleared to land.

A pilot answers light and flag signals and shows his understanding of the message by signaling with the airplane. This is done by movements of the controls.

On the ground:

Moving rudder from side to side.
Moving ailerons.

(Uses whichever signal can be most easily seen by control tower operator.)

In flight:

Rocking wings from side to side.

Radio communication has practically replaced light and flag signals in scheduled airline flying. Airplanes equipped with radio must keep listening on the airport frequency, usually 278 kilocycles, while they are in the control area. The pilot without a transmitter answers radio information by movements of the control surfaces in the same way in which he answers lights and flags.

The standard procedure for an airplane with a receiver on it is as follows:

The control tower operator calls the pilot as he starts to taxi into position for takeoff and asks for a signal that the pilot is listening.

The pilot answers by moving either the ailerons or rudder, whichever the operator asks for.

The tower operator gives permission for takeoff.

The tower operator also:

Gives permission to taxi after a landing.
Warns approaching aircraft of other aircraft in vicinity.
If necessary, tells approaching aircraft to continue circling.

Where airplanes are equipped with two-way radio, no visual signals are used by either the control tower operator or the pilot. With the two-way radio, the pilot should call the control tower operator for taxi clearance before starting to taxi. He should receive takeoff clearance before beginning his takeoff. After the takeoff, the pilot should keep tuned to the control tower while he is near the airport.

When approaching any airport, pilot contacts control tower by radio and gives his exact position. Control tower operator answers him by radio giving wind direction and velocity over the airport and any "traffic" in the vicinity. During periods when ships are flying on instrument, it is sometimes necessary for ships to circle the airport at various altitudes while waiting their turn to land. When this occurs, the pilot is assigned a definite altitude and a specific area where he stays until the tower operator tells him he may land. No other ship awaiting its turn to land is permitted to fly at that altitude. Always there is at least 1,000 feet of altitude between every ship in the vicinity.

9-1-42

GENERAL INFORMATION

Contact Flight:

Contact flight is flight of aircraft in which the altitude of the aircraft and its flight path can at all times be controlled by means of visual reference to the ground.

On Top Flight:

Flight of aircraft made above an overcast.

Between Layers Flight:

Flight of aircraft made above one layer of clouds and below another layer.

Instrument Flight:

Flight of aircraft in which the visual reference to the ground is not continuously available and the altitude of the aircraft and its flight path can be controlled in part or in whole by reference to instruments only.

Ceiling:

The distance from the cloud base to the ground.

Unlimited Ceiling:

A ceiling is considered unlimited when clouds cover less than one-half the sky or when the base of the clouds is more than 9,750 feet above the point of observation. CAVU

Visibility:

Visibility is the greatest distance toward the horizon at which conspicuous objects can be seen and identified.

C.A.V.U.:

Ceiling and visibility unlimited.

Headwind:

Wind blowing in direction opposite which plane is traveling thereby causing the speed of the plane to be decreased.

Tailwind:

Wind blowing in same direction which plane is traveling thereby causing the speed of the plane to be increased.

Crosswind:

Wind blowing at right angles to direction plane is traveling thereby causing "drift" (a slight deviation sideways of direct course) which is corrected by the pilot by instruments.

Turbulence:

Any degree of air or atmospheric disturbance sufficient to cause pitching or rolling of an airplane in flight. Turbulence may be described as slight, mild or severe.

use turbulent instead of rough

Ice:

TWA planes are equipped with several de-icing methods; however, TWA's operating policy usually prohibits a scheduled flight from departing from a station when there is a possibility of an icing condition being encountered.

Thunderstorms:

A thunderstorm contains strong vertical currents of air so that sometimes you may experience a change of several thousands of feet in altitude within a few seconds. These vertical currents of air are called "up drafts" and "down drafts".

Temperature:

Ordinarily the temperature decreases approximately 3° F for every 1,000 feet of altitude. For example: temperature at sea level is 70° F. At 5,000 feet above sea level, it would be approximately 55° F.

TRANSCONTINENTAL & WESTERN AIR, INC.

Kansas City, Missouri

FLYING PROCEDURES

Each scheduled airline flight is operated in accordance with prescribed regulations and procedures.

Plane movements and the responsibilities of flying personnel must be coordinated with the activities of ground personnel, and with the movements of other aircraft.

The Flight Superintendent (Dispatcher) is the airline company's coordinating agent. Before each flight is begun the Captain and First Officer plan the flight in detail with the Flight Superintendent utilizing data and recommendations supplied by the Meteorological Department.

During the conduct of the flight the coordination is effected by use of two-way radiotelephone communication between the plane and ground stations.

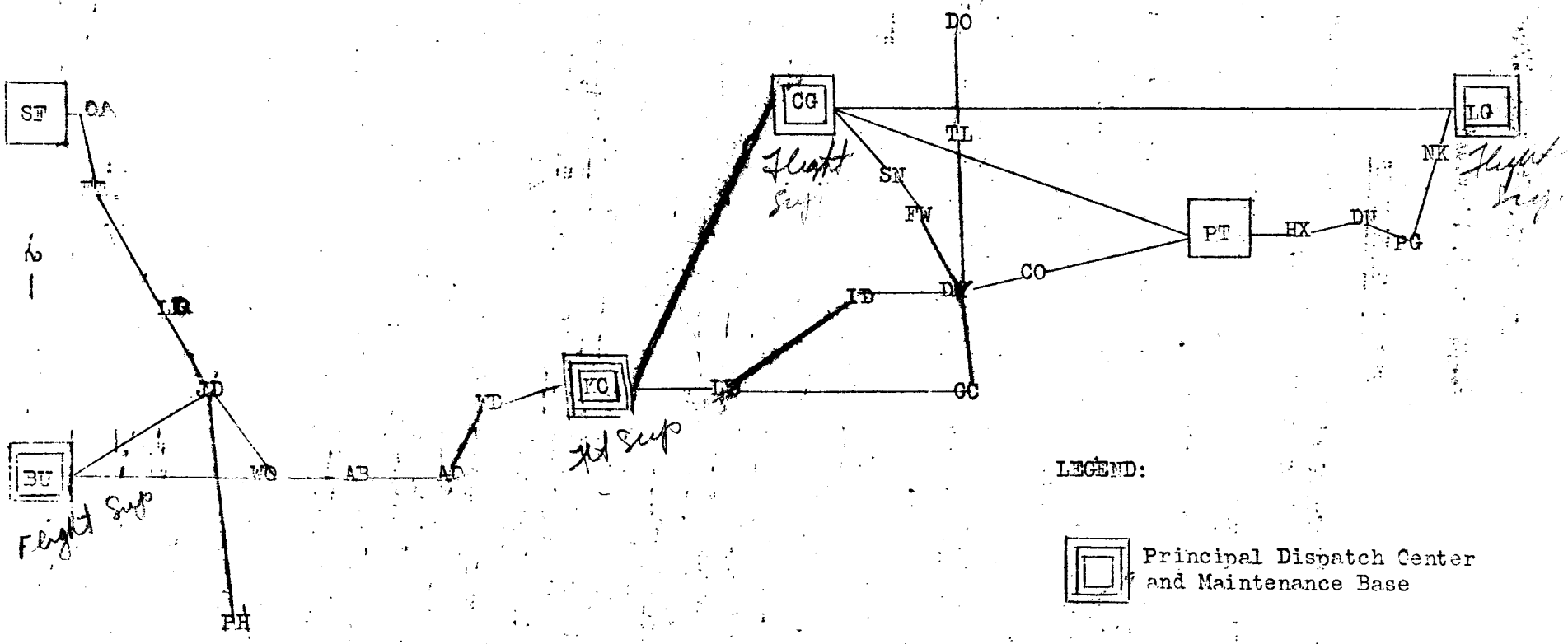
Each time a flight departs from a station a "Flight Movement Report" if compiled and forwarded to station at which the flight is scheduled to stop, and to the Flight Superintendent.

Flight Superintendents' offices are located at strategic points to provide the best possible flight control, and a transcontinental flight will be under the control of several Flight Superintendents as it passes through their respective control sectors. The originating Flight Superintendent relinquishes control as it leaves his sector, and the Flight Superintendent of the sector which the flight is entering assumes control. In order to provide uniform and systematic control Flight Advisory Forecasts are issued at prescribed intervals during the day, by the Kansas City Flight Superintendents' office. These advisory forecasts outline the operation of all Company flights for the entire system.

The advisory forecast is distributed to all stations and makes possible the efficient coordination of all flight handling by flying personnel, Flight Superintendents, station personnel, Passenger Agents and the Traffic Department.

A progress chart giving the general procedure in operation of a routine flight follows:

FLIGHT CONTROL CENTERS
and
MAINTENANCE BASES



LEGEND:

Principal Dispatch Center and Maintenance Base

Dispatch Center and Maintenance Base

Maintenance Base only

PROGRESS CHART OF SCHEDULED TRANSPORT FLIGHT

1. Flight Schedule

The flight schedule is arranged by the Traffic Department in cooperation with the various Operations Departments involved in assigning planes, and equipment for flight. The Traffic Department must take into consideration the proper time for the flight to operate, the stations to be served and whether such schedule will be approved by the Civil Aeronautics Board. These schedules are usually prepared and published in monthly timetables and aviation guides.

2. Plane Check

The plane to be used is checked and approved by the Maintenance Department for proper mechanical operation.

3. Commissary Supplies

Commissary and Food Purveyors supply the plane with pillows, blankets, magazines, food service and other items for the enjoyment of the passengers.

4. The Flight Plan

The Flight Plan which is prepared by the Captain presents in detail the complete operation of the flight to the next division point, and outlines alternate procedures to be followed in the event of unexpected conditions arising. Nothing is left to chance. The pilot enters on the plan his estimated time over various "check points"; the altitude at which he expects to fly, having taken into consideration the winds aloft; the percentage of horsepower to be used; the estimated gasoline consumption; the compass course to be followed on various "legs" of the flight; the climbing time, cruising time and elapsed time.

As alternate procedure the pilot states where he will land in case of unexpected storms or failure of any of his equipment. Sufficient fuel must be provided not only to reach the alternate airports, but, after reaching any of these airports, there must be enough fuel remaining for 45 minutes additional flight.

5. Flight Clearance

A clearance form is properly prepared and executed for each flight between specified clearance points and is signed by the Captain and by the Flight Superintendent or by duly authorized station personnel.

The clearance form shows the station from which the plane is departing; the limiting terminal of the route over which the flight is scheduled to operate; the time the flight is to depart; date; plane number; license number; the route to be flown; if instrument release, alternate airports shall be shown on this form; and various other information pertinent to the flight. Should a flight be delayed more than 45 minutes a new clearance form must be prepared, or a new time shown validating the original form.

The original copy of the form is used by the Captain and the duplicate is kept on file for a period of 30 days. Attached to it are all current weather reports, and all current reports or information pertaining to weather, irregularities of navigational aids and facilities, aircraft instruments and equipment effecting the flight.

6. Passenger Bookings

"Passenger Bookings" is a list of the passengers who will board the plane, supplied by the Traffic Department.

7. Hostess Check of Cabin

The Hostess checks the cabin of the plane for completeness of supplies and equipment.

8. Fueling the Plane

The maintenance crew fuels the plane with the prescribed amount of gasoline and oil ordered by the Flight Superintendent and shown on the clearance form.

9. Check of Passengers

Station personnel check the passengers upon arrival at the station, weigh their baggage, and collect their tickets. The station personnel also handle the mail and express authorized for the flight, assuring that it is properly loaded on the plane.

The plane may be released for flight only after ground personnel have determined that (a) the maximum allowable gross load for the type plane involved is not exceeded, and (b) the plane is loaded to longitudinal balance in such a manner that the Center of Gravity is within the limits as prescribed by the Company. Longitudinal Center of Gravity is governed primarily by the proper distribution of cargo and passengers to points fore and aft of the plane. The lateral Center of Gravity will be controlled in flight by the Captain regardless of placement of passengers or cargo.

10. Release of Flight

The Station Manager releases the flight, being accomplished by the Passenger Agent's salute to the Captain signifying that the plane is properly loaded and ready for departure.

11. Two-Way Radio

Two-way radio contact is maintained by radio ground station. This is discussed under Airway Aids and Communications.

12. Flight Movement Report

Station Manager, or his representative (Passenger Agent) prepares and forwards the Flight Movement Report which supplies the following information for the station or stations ahead:

Name of station sending report; the flight number; the route, the time in and out of the station submitting report; plane number; names of the crew; total passengers aboard and their destinations and seats; which passengers desire limousine service; the total weight of the cargo, including passengers, and its distribution; the cargo off at the next station; the fuel load carried; station to which the flight has been cleared; the baggage being carried and its distribution by station; the mail, express and company material being carried and its destination to various stations; and any further remarks necessary.

13. Reporting Progress of Flight

The Captain keeps the Flight Superintendent and stations advised of progress of flight by radio-telephone until arrival at the next forward station.

Regularly during the flight the pilot reports to the ground radio operator the time he passes various "check points". At any time during the flight he may use his two-way radio to communicate with the ground, and the flight dispatcher similarly may at any time contact the Captain in charge giving him advisory information.

A flight log is kept of every trip so that it may be studied to determine better operating methods. Information as to functioning of the motors, altitudes, temperatures, air speed, and general weather conditions are accurately recorded for every flight.

14. Arrival at Next Station

Upon arrival at next station, mail, passengers and express are handled by station personnel.

15. Repeat

Items 5 to 14 are repeated as flight progresses to next station.

In the operation of a flight, good flying technique and Civil Air and Company regulations must always be taken into consideration. For example, here are a few procedures that must be adhered to;

Takeoffs and Landings

Airplanes usually takeoff and land into the wind because greater lift and stability are provided on takeoffs, and reduced speed and stability are provided on landings. At times it is necessary for a plane to land or takeoff in a cross wind, but it is usually considered unsafe to takeoff or land with the wind.

Speed on Takeoff and Landing

TWA equipment or other large Douglas transports normally leave the ground at a speed between 80 and 95 miles per hour. Landing speeds for such equipment begin at 80 miles per hour and decreases to as low as 65 miles per hour. The rate of descent for passengers comfort is usually never more than 300 feet per minute. When there are sleeping passengers aboard the rate of descent is about 200 feet per minute.

Climbing airspeed is slightly higher than 120 miles per hour, and approximately 300 feet per minute. However, the rate of the climb depends somewhat on the load.

Altitudes

The pilot must always remember when flying cross country that north and eastbound flights are to proceed at odd altitudes, and west and southbound flights are to proceed at even altitudes. This procedure is established as a safety precaution. For example, eastbound flights travel at 1,000, 3,000 or 5,000 feet; northbound flights at 1500, 2500 or 3500 feet; westbound flights fly at 2000, 4000 etc; and southbound flights at 2500, 4500 etc.

Flights are permitted to operate only when the ceilings and visibility are above certain minimum limits set by the Bureau of Air Commerce and the Company. Minimum altitudes are those at which aircraft may fly in accordance with specified type of flight operation. For example, aircraft must fly at least 1000 feet above cities and congested areas, 500 feet over ground or water in open terrain. If the sky is overcast during hours of daylight aircraft must be flown at least 300 feet below the overcast and 500 feet above open terrain, and there must be a visibility of at least one mile. This means that for flying in accordance with "Contact Flight" rules during the hours of daylight there must be a ceiling of at least 800 feet and visibility for one mile. Otherwise the flight must be flown on instruments which require different minimum altitudes.

There are many more items that must be taken into consideration during flight; some of these will be discussed later in your course.