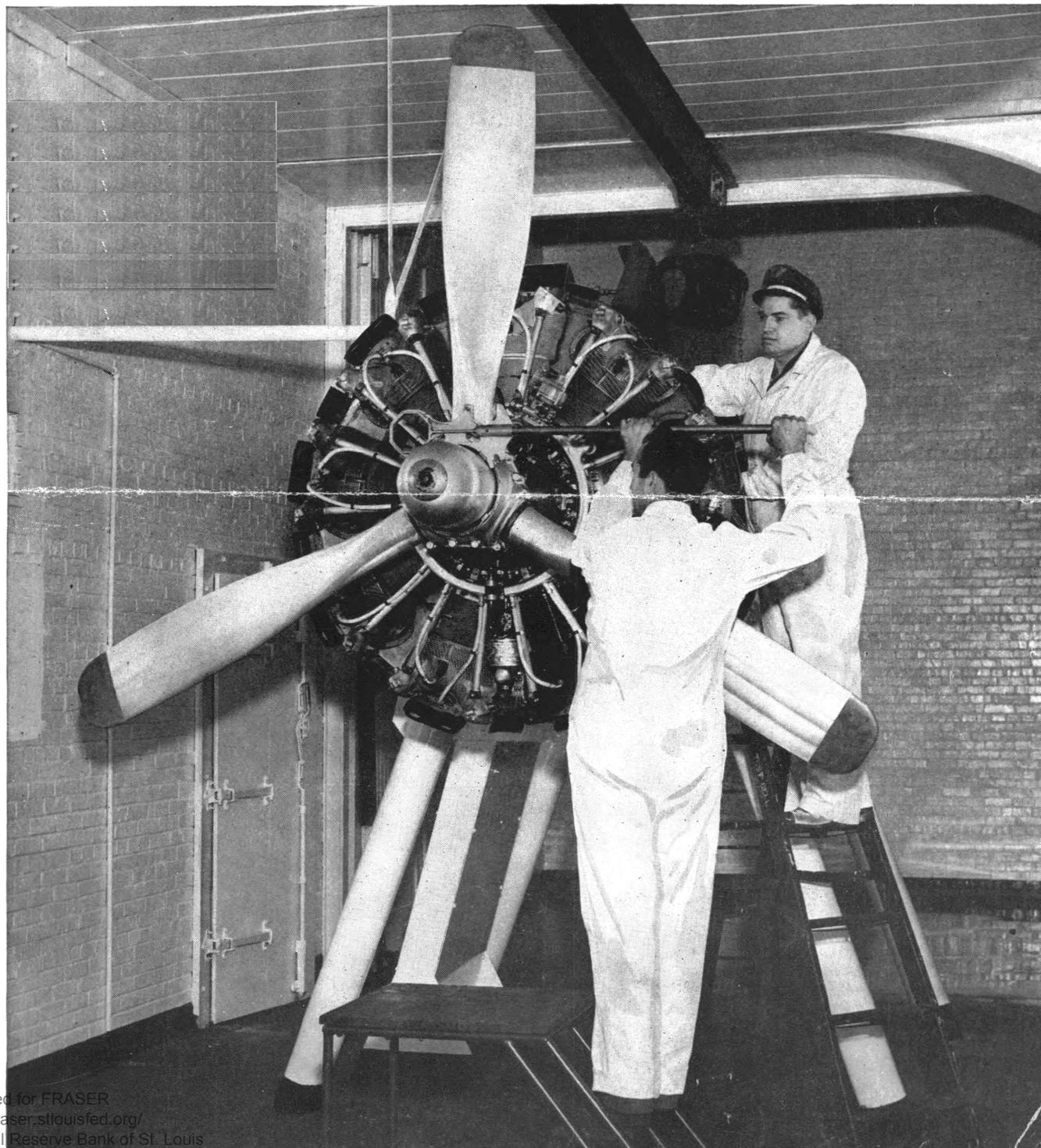


# EMPLOYMENT OPPORTUNITIES IN AVIATION OCCUPATIONS

Duties, Qualifications, Earnings and  
Working Conditions

UNITED STATES DEPARTMENT OF LABOR . . . BUREAU OF LABOR STATISTICS



**Cover picture** —Air-line mechanics installing a newly overhauled engine on a test stand, where it will be given a test run before being put back into service.

PHOTOGRAPH BY COURTESY OF CAPITAL AIRLINES.

**UNITED STATES DEPARTMENT OF LABOR**

**L. B. Schwellenbach, *Secretary***

**BUREAU OF LABOR STATISTICS**

**Ewan Clague, *Commissioner***

**EMPLOYMENT OPPORTUNITIES IN  
AVIATION OCCUPATIONS**

**Part 2.—Duties, Qualifications, Earnings,  
and Working Conditions**



**Bulletin No. 837-2**

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## LETTER OF TRANSMITTAL

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UNITED STATES DEPARTMENT OF LABOR,  
BUREAU OF LABOR STATISTICS,  
*Washington, D. C., August 22, 1946.*

THE SECRETARY OF LABOR:

I have the honor to transmit herewith the second of two reports on a study of employment opportunities in aviation occupations. This is one of a series of studies which are being conducted in the Bureau's Occupational Outlook Division. They are designed for use in vocational counseling of veterans, young people in school, and others interested in choosing a field of work.

The study was conducted under the supervision of Helen Wood. Samuel Vernoff had major responsibility for the field work. The report was prepared by Miss Wood, Hilda L. Pearlman, Mr. Vernoff, and Gloria Count. The Bureau wishes to acknowledge the generous assistance received from many members of the staffs of the Civil Aeronautics Administration, Civil Aeronautics Board, Federal Communications Commission, and National Mediation Board, and from officials of many companies, trade associations, and trade-unions.

EWAN CLAGUE, *Commissioner.*

HON. L. B. SCHWELLENBACH,  
*Secretary of Labor.*



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**Captain and co-pilot making a pre-flight cockpit check on a 4-engine plane.**

# EMPLOYMENT OPPORTUNITIES IN AVIATION OCCUPATIONS

## *Duties, Qualifications, Earnings, and Working Conditions*

"What are my chances of finding a satisfactory job in aviation?" This is a question of urgent concern to many air-force veterans and young people leaving school. Part of the answer is to be found in an earlier pamphlet which discusses the employment outlook in aviation occupations.<sup>1</sup> The major conclusion reached there is that, despite the prospect of rapidly expanding employment opportunities, there will be a surplus of qualified applicants during the next few years in practically all aviation occupations and therefore very stiff competition for jobs.

A man who wants to know if a certain occupation will suit his interests and abilities and if he has a good chance of getting a job in the face of the expected competition needs answers also to the following questions: What are the

duties of this occupation? What licenses and other qualifications are needed? How much will military aviation experience help in getting a job? What are the earnings, hours of work, and other working conditions? This pamphlet gives information on all these questions—for all flight occupations and many other operations and communications jobs, both with the air lines and in other aviation services.

The summaries which follow give the highlights of the data for each occupation. First, there is a brief statement on the employment outlook in the particular occupation (based mainly on the earlier report).<sup>1</sup> Then, some of the most important facts from this report are presented (with page references to the fuller discussions).

### Summaries, by Occupation

#### *Pilots*

*Employment outlook.*—Employment of pilots is increasing rapidly, both with the air lines and in other commercial flying services and flying schools. Nevertheless, all but the most highly qualified men will find it hard to get pilot jobs during the next couple of years. In mid-1945, the total number employed was less than 10,000. By 1950, it may reach 35,000 or 40,000, and it will continue to rise thereafter. There were, however, 200,000 pilots in the armed forces during the last months of the war.

<sup>1</sup> U. S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 837-1: Employment Opportunities in Aviation Occupations, Part 1—Postwar Employment Outlook. Washington, 1945.

The number of these and other men with flying experience who are in the market for jobs will far exceed the number of openings for a year or two and probably longer.

*Duties.*—Air-line captains and co-pilots not only share the job of piloting planes but also have to prepare flight plans and handle other ground duties. Pilots outside the air lines do many different types of work—for example, transport flying, flight instruction, and demonstrating and selling planes. Those employed by the Civil Aeronautics Administration are mainly inspectors. (See p. 8.)

*Qualifications.*—Every pilot must have a CAA certificate. In addition, air lines have strict hiring standards with respect to flying

experience, education, age, physical condition, height, and other personal characteristics. Fixed-base operators generally emphasize experience and flying skill in hiring pilots. For CAA inspector jobs, long and varied flying experience is required. To retain their certificates and stay in the occupation, pilots must pass periodic, rigid physical examinations. (See p. 10.)

*Hours of work.*—Air-line pilots normally fly a little less than 85 hours a month on domestic routes, but their ground duties also take up considerable time. Pilots in fixed-base operations tend to have long and irregular working hours. CAA inspectors are on a 40-hour week. (See pp. 31, 36, and 37.)

*Earnings.*—Best paid are air-line captains, who had typical earnings of \$600 to \$850 a month in domestic flying at the end of 1945, compared with \$220 to \$380 for co-pilots. Earnings were considerably higher in international flying. Pilots employed by some fixed-base operators in the Northeast made from \$3,000 to \$5,000 in 1945. Those who are CAA inspectors earn from \$4,150 to well over \$6,000 a year. (See pp. 33, 37, and 38.)

*Vacations.*—Pilots in domestic air-line flying are generally allowed a 2-week vacation with pay; those in international flying, a month's paid vacation. CAA pilots receive 26 days of "annual leave" per year. (See pp. 36 and 38.)

*Unionization.*—Virtually all air-line pilots are represented by the Air Line Pilots Association (AFL). (See p. 39.)

### ***Flight Engineers and Flight Mechanics***

*Employment outlook.*—Jobs will be few and difficult to obtain in these occupations for some time to come. Less than 1,000 flight engineers and mechanics were employed in early 1945. In all probability, less than 2,000 will be employed in 1950. The numbers of air-force veterans, air-line ground mechanics, and others seeking to enter these occupations will no doubt be much greater than the number of openings indefinitely.

*Duties.*—A flight engineer or mechanic is carried only on some four-engine air-line planes. Flight engineers operate certain controls while in flight, make emergency repairs,

and handle other duties. Flight mechanics are strictly maintenance personnel. (See p. 14.)

*Qualifications.*—For flight-engineer jobs, the air lines require CAA mechanic certificates with both "A" (aircraft) and "E" (aircraft-engine) ratings, broad experience in aircraft maintenance and inspection, and specified personal characteristics and education. Requirements for flight-mechanic jobs emphasize maintenance experience. Men must pass rigid physical examinations to enter either occupation, and at intervals thereafter to retain their jobs. Air-force veterans will practically always need experience in air-line ground maintenance work to qualify for flight jobs. (See p. 14.)

*Hours of work.*—Flight-hours generally average between 85 and 100 a month. Some time must also be spent in ground duties. (See p. 32.)

*Earnings.*—Typical earnings of fully qualified flight engineers late in 1945 ranged from \$250 to \$500 a month, depending mainly on length of experience. (See p. 34.)

*Vacations.*—Men in international operations generally get a month's paid vacation each year; those in domestic flying, 2 weeks. (See p. 36.)

*Unionization.*—Flight engineers are represented on one air line by the Air Line Mechanics Department (UAW-CIO); on another by the Air Transport Employees' Union (UMW-AFL); and on two other lines by system associations. (See p. 40.)

### ***Navigators***

*Employment outlook.*—Few job opportunities can be expected in this small occupation. Furthermore, the oversupply of trained workers seeking jobs is great and will continue to be so indefinitely. There were about 35,000 navigators (including navigator-bombardiers) in the armed forces in the last months of the war. In contrast, the total number of navigators employed by the air lines is only a few hundred. This number will not increase as fast as air-line employment generally—in fact, is likely to decline—because of technological and other factors which even threaten to bring about complete elimination of navigators from flight crews.

*Duties.*—Navigators are employed only in international air-line flying. Their work includes preparing the flight plan and, after take-off, using all available navigational methods to determine the course. (See p. 15.)

*Qualifications.*—Air lines demand a comprehensive knowledge of navigation and related subjects and at least a high-school—preferably a college—education. Personal characteristics and flight experience are also emphasized in hiring. Strict physical examinations must be passed to enter and stay in the occupation. (See p. 16.)

*Hours.*—Flight time usually averages between 85 and 100 hours a month. Only a few additional hours have to be spent in ground duties. (See p. 32.)

*Earnings.*—The beginning salary for fully qualified men was typically \$325 a month in late 1945; the maximum, generally \$500. (See p. 34.)

*Vacations.*—One month's vacation with pay is usually given. (See p. 36.)

*Unionization.*—Navigators are represented by the Association of Air Navigators, a branch of the National Air Line Navigators' Association, on one air line; by a system association on another. (See p. 39.)

### **Flight Radio Operators**

*Employment outlook.*—This occupation also is a very small one, in which there will be few openings and an oversupply of job seekers indefinitely. Employment was in the hundreds in mid-1945. It is not expected to rise substantially—certainly not as fast as employment in most other air-line occupations. It may even decline. On at least one route, the position of flight radio operator was recently eliminated, and this is likely to be done increasingly. Since there were more than 50,000 flight radio operators in the armed forces during the last months of the war, the potential labor surplus is large, even though only a very small proportion of these men wish comparable civilian employment. There will also be competition for the few available jobs from persons trained for radio-operator work of other types and especially from air-line ground radio operators, for whom flight jobs represent a promotion.

*Duties.*—Flight radio operators are carried only on international air-line flights. Their duties include obtaining radio bearings, sending and receiving messages, making emergency repairs, and inspecting equipment between flights. (See p. 15.)

*Qualifications.*—A Federal Communications Commission radiotelegraph license of second grade or higher is necessary. Applicants must also meet other air-line requirements, particularly with respect to physical condition and personal characteristics. Periodic physical examinations must be passed to stay in this as in other flight occupations. (See p. 16.)

*Hours of work.*—Flying time usually averages between 85 and 100 hours a month. A few additional hours must be spent in ground duties. (See p. 32.)

*Earnings.*—Salaries usually ranged from \$250 to \$450 a month in late 1945, depending on length of service and whether the employee was a junior or a senior operator. (See p. 34.)

*Vacations.*—One month's vacation with pay is generally allowed. (See p. 36.)

*Unionization.*—Flight radio operators are not covered by an agreement on any line now employing such workers. (See p. 40.)

### **Flight Stewardesses**

*Employment outlook.*—There will be a good many job openings for flight stewardesses (or "hostesses") in the next few years. As of early 1945, the total number employed was in the neighborhood of 1,000. It may reach 5,000 or 6,000 by 1950. In addition, in this occupation openings frequently arise owing to turn-over. Competition for positions is likely to be keen, however.

*Duties.*—Hostesses are carried on most air-line passenger flights within this country and on some overseas flights. They are responsible for attending to passengers' needs and comfort while in flight—by serving meals and in other ways—and they also have to keep some records. (See p. 16.)

*Qualifications.*—Applicants must be unmarried girls, with a pleasing personality, in excellent physical condition, and within specified age, height, and weight limits. Some college

education is generally required unless the applicant is a registered nurse. (See p. 17.)

*Hours of work.*—Flight time averages around 85 to 100 hours a month. Very little time is spent in ground duties. (See p. 32.)

*Earnings.*—The beginning salary on domestic lines was about \$125 or \$130 a month as of late 1945; the top salary for experienced stewardesses, about \$165 to \$180. These rates have since been raised on some lines. (See p. 34.)

*Vacations.*—Domestic lines generally give hostesses 2 weeks' vacation with pay each year. International lines give them 1 month. (See p. 36.)

*Unionization.*—Stewardesses are covered by agreements only on one international line, being represented by the International Association of Machinists on one division of that line and by a system association on another division. (See p. 39.)

### **Flight Stewards**

*Employment outlook.*—There will be some openings for flight stewards, but the occupation will remain small. The total number of stewards employed was in the hundreds in early 1945, and will probably not rise by as much as 1,000 up to 1950. On the other hand, there is only a small group of present and former armed-forces personnel with duties comparable to those of air-line stewards—the enlisted flight clerks and orderlies, who numbered about 1,700 in the last months of the war. The great majority of these men probably do not want air-line employment. Those who do should receive preference for jobs and have a fairly good chance of finding work, if they have the necessary personal qualifications and are willing to live in one of the few localities (mainly seaboard cities) where flight stewards are based.

*Duties.*—Most flight stewards are employed in international air-line flying; some on domestic routes. The work includes serving meals while aloft, attending to the comfort of the passengers in other ways, and keeping records. In international flying, stewards generally have charge of the cargo. (See p. 16.)

*Qualifications.*—Stewards must have at least a high-school education and, for international flying, knowledge of a foreign language. Other

factors considered in hiring are personality, appearance, physical condition, height, and experience in handling food. (See p. 17.)

*Hours of work.*—Flight time varies but generally averages about 85 to 100 hours a month. Stewards have sometimes had to do considerable work between flights. (See p. 32.)

*Earnings.*—Pay typically ranged from about \$170 to \$235 a month in international operations late in 1945. (See p. 34.)

*Vacations.*—A month's paid vacation is generally allowed in international flying. (See p. 36.)

*Unionization.*—Stewards are represented by the International Association of Machinists (AFL) on one division of an international line; by a system association on another division of the same line. (See p. 39.)

### **Dispatchers and Assistants**

*Employment outlook.*—Air-line dispatchers (also known as "flight superintendents") get their jobs by promotion from within the company. Outsiders are sometimes hired as assistant dispatchers, but openings of this type are likely to be very few compared with the number of qualified applicants, at least for a year or two and probably longer. Only a few hundred dispatchers and assistants were employed early in 1945, and their number is not expected to be more than three times as large, at the most, by 1950. In contrast, there are thousands of potential competitors for assistant-dispatcher jobs—including many former air-force operations officers and still greater numbers of former pilots and meteorologists.

*Duties.*—Dispatchers' responsibilities include authorizing take-offs, following the progress of flights as reported by radio, and keeping the captains informed of changing weather conditions and other developments affecting their flights. (See p. 17.)

*Qualifications.*—A CAA certificate is required for work as a dispatcher though not as an assistant. Dispatchers are promoted from pilot, meteorologist, assistant-dispatcher, or other positions with the same line. For assistant jobs, college training, aviation experience, and personality count heavily. (See p. 19.)

*Hours.*—The normal workweek was usually 44 hours at the end of 1945. It has since been lowered to 40 hours on many lines. Daily hours are irregular and sometimes very long. (See p. 33.)

*Earnings.*—Licensed dispatchers earned from about \$250 to \$450 or \$500 a month on most lines in the latter part of 1945. Assistants generally earned less. (See p. 35.)

*Vacations.*—Two weeks' vacation with pay is usually given. (See p. 36.)

*Unionization.*—The Air Line Dispatchers' Association (AFL) has agreements with 10 air lines. (See p. 40.)

### **Meteorologists**

*Employment outlook.*—An oversupply of applicants for meteorologist positions in this country is likely for a few years, but job chances for qualified persons will probably improve later on. In overseas work, there are and may well continue to be some vacancies. Most meteorologists work either for the air lines or for the United States Weather Bureau. As of early 1945, the total number employed by the air lines was only a few hundred, and a tripling of this number is the largest increase that can reasonably be expected up to 1950. Openings with the Weather Bureau will likewise be few compared with the numbers of men who gained experience and training in the profession during the war. The field is not likely to be overcrowded in the long run, however, since the number graduated each year from college meteorology courses is normally quite small.

*Duties.*—Air-line meteorologists have the job of analyzing weather data and forecasting flying conditions for their sectors of the line. (See p. 19.)

*Qualifications.*—Thorough college training in meteorology and related technical subjects is generally required by the air lines. For senior positions, experience as a forecaster is necessary. Age limits are usually set. (See p. 20.)

*Hours of work.*—An 8-hour day and a 40-hour week is the usual work schedule. (See p. 33.)

*Earnings.*—Air-line pay was generally from \$150 to \$200 a month for junior meteorologists

and from \$200 to \$300 a month or slightly higher for senior positions late in 1945. (See p. 35.)

*Vacation.*—A 2-week paid vacation is usually allowed. (See p. 36.)

*Unionization.*—Meteorologists do not have union representation on any line. (See p. 40.)

### **Mechanics**

*Employment outlook.*—Competition for aviation mechanic jobs is keen in many areas, since applicants outnumber openings, taking the country as a whole. This situation will probably continue for at least a couple of years, although employment in the occupation is rising rapidly. By 1950, the total number employed—including radio, instrument, and other specialists as well as airplane and engine mechanics—may be as much as 40,000 or 50,000 greater than in 1945, and it is likely to rise still further thereafter. There were, however, 570,000 mechanics and specialists in the armed forces late in the war, of whom at least 85,000 hoped to stay in aviation, according to a War Department survey. Some of the many civilian mechanics employed by the Army, Navy, and aircraft factories are also competing for positions in air transportation. The chances of employment will be best for highly skilled, all-round mechanics, especially those with licenses. Totally inexperienced persons will, for several years, find it almost impossible to get trainee jobs.

*Duties.*—There are two main groups of air-line mechanics: (1) those assigned to "line maintenance," who service and inspect the air liners and make adjustments and minor repairs; and (2) those at the major overhaul base, who usually specialize in one division of the work, such as engine, radio, or instrument overhaul. In most fixed-base operations, mechanics' work is roughly comparable to that of air-line line-maintenance men. Most CAA personnel with mechanic training have jobs as inspectors. (See p. 20.)

*Qualifications.*—To qualify as a skilled mechanic or specialist, a 4-year apprenticeship or its equivalent is usually required. For many air-line jobs, a CAA mechanic certificate with an "A" or "E" rating or both is needed. Fixed-base operators frequently require both "A"

and "E" ratings. For CAA inspector positions, many years' experience and both "A" and "E" ratings are necessary. (See p. 24.)

*Hours.*—Air-line mechanics are generally on a 40-hour week. In fixed-base operations, the workweek varies but is often 48 hours. CAA employees have a basic 40-hour, 5-day week. (See pp. 33, 36, and 37.)

*Earnings.*—The wages of mechanics and specialists now start at \$1.20 or \$1.26 an hour on most major air lines. Mechanics in fixed-base operations are likely to make as much as this or more at least in the Northeast. Salaries of CAA inspectors range from \$2,469 to well over \$6,000 a year. (See pp. 35, 37, and 38.)

*Vacation.*—Air-line mechanics generally receive 2 weeks' vacation with pay. CAA employees are given 26 days of "annual leave" per year. (See pp. 36 and 38.)

*Unionization.*—Mechanics are organized on practically all air lines but are represented by several different unions. (See p. 40.)

### **Stock and Stores Clerks**

*Employment outlook.*—Some openings may be expected but probably also considerable competition for jobs. The air lines had in the neighborhood of 2,000 stock clerks in early 1945; this number may double by 1950. There will also be a few new jobs with fixed-base operators. Veterans with experience as aviation stock clerks in the armed forces will generally receive preference in hiring and a sizable proportion of those desiring jobs in the occupation should find openings — although many workers with experience as stock clerks in aircraft factories, other industries, and other branches of the armed forces may also be competing for the available jobs.

*Duties.*—Stock clerks are employed in air-line maintenance departments and in some large fixed-base operations, to receive supplies, issue these to mechanics and other personnel, keep records, and perform related tasks. (See p. 26.)

*Qualifications.*—A high-school diploma is required by some lines. Previous clerical experience, especially in aviation or automotive stock and stores work, is desired, and there may be age limits and other requirements. (See p. 26.)

*Hours of work.*—The usual work schedule with the air lines is a 40-hour week and an 8-hour day. (See p. 33.)

*Earnings.*—Typical wages of non-supervisory clerks ranged from 55 or 60 cents up to 95 cents an hour with the air lines in late 1945. When the workweek was cut from 48 to 40 hours, these rates were raised so as to maintain at least the same take-home pay. (See p. 35.)

*Vacations.*—A 2-week vacation with pay is usually given. (See p. 36.)

*Unionization.*—Stock clerks are organized on most air lines. They are represented by several different unions. (See p. 40.)

### **Ground Radio Operators and Teletypists**

*Employment outlook.*—There will be limited numbers of openings in these occupations—probably several thousands with the air lines up to 1950 and a smaller number with CAA. Competition for radio-operator jobs is marked in some parts of the country, only moderate or absent in others. However, the potential surplus of qualified operators is large; there were about 100,000 radio operators in the military and naval air forces toward the end of the war and many other men received radio-operator training in less directly related fields. So far, relatively few of the wartime trainees have applied for jobs in this occupation. But if pay scales were increased or other changes took place, the number seeking positions might rise rapidly and jobs become much more difficult to obtain. In the case of teletypists, applicants for positions will probably tend to outnumber openings.

*Duties.*—Radio operators working for air lines send and receive messages between flight crews and ground personnel and between different points on the ground, using radiotelephone, radiotelegraph, or both. Air-line ground communications are also handled by teletypists, who operate a machine with a keyboard much like that of a typewriter. The radio operators and teletypists employed as "aircraft communicators" by CAA collect and relay information on weather conditions and other matters affecting flights. (See p. 27.)

*Qualifications.* — For radio-operator positions with air lines, applicants must usually

have at least a second-class radiotelephone or telegraph license from FCC, ability to type, and specified educational and other qualifications. The chief requirements for teletypist jobs are with respect to typing speed and education. To qualify for trainee positions as CAA aircraft communicators, applicants must meet civil service requirements, including at least 1 year in aeronautical communications work or other specified experience. All permanent appointments to CAA jobs will be made on the basis of competitive civil service examinations. (See p. 27.)

*Hours of work.*—The basic workweek is 40 hours both with the air lines and with CAA. (See pp. 33 and 37.)

*Earnings.*—For air-line radio operators, typical earnings were about \$130 to \$245 a month and sometimes higher in the latter part of 1945; for teletypists, about \$125 to \$160 a month. The minimum salaries of CAA aircraft communicators range from \$2,168 to \$4,150. (See pp. 35 and 38.)

*Vacations.*—Air-line operators usually get 2 weeks' paid vacation. CAA employees receive 26 days of "annual leave." (See pp. 36 and 38.)

*Unionization.*—Radio operators are represented by the Air Line Communications Employees Association (ACA-CIO) on four lines and on one other line by a system association. (See p. 40.)

### ***Airport and Airway Traffic Controllers***

*Employment outlook.*—There will be some openings in both these occupations, though probably not enough in the next few years for all qualified applicants. About 1,000 airport traffic controllers were employed in early 1945, and this number will probably double or con-

ceivably triple by 1950. Several hundred new jobs for airway traffic controllers are also likely by 1950. In addition, there will probably be a good many openings in both occupations owing to turn-over. Veterans with experience as traffic-control-tower operators, as pilots, or in certain other aviation occupations will have the best chance for these jobs.

*Duties.*—Most airport traffic-control tower operators are now employed by the CAA's Federal Airways Service; the remainder, by the airports. All airway traffic controllers are CAA employees. Airport traffic controllers give directions regarding take-offs and landings and other instructions to planes within a specified "flight control area" around the airport. Airway traffic controllers regulate air traffic outside the flight control areas. (See p. 29.)

*Qualifications.*—Every traffic-control tower operator above the level of trainee must have a CAA certificate, good only for work at the particular airport. For all CAA jobs, applicants must meet civil service requirements, including, in the case of trainee applicants, at least 1 year in military aviation communications work or other specified experience. Permanent appointments to these as to other CAA jobs will be made on the basis of competitive civil service examinations. (See p. 29.)

*Hours of work.*—All CAA employees have a basic 40-hour week but airway traffic controllers often have to work 4 or 5 hours overtime in a week. (See p. 37.)

*Earnings.*—Minimum salaries range from \$2,645 to \$4,150 a year for CAA airport traffic controllers and from \$2,645 to \$4,526 for airway traffic controllers, depending on the grade of the job. (See p. 38.)

*Vacations.*—All CAA employees receive 26 days of "annual leave" per year. (See p. 38.)

## Chapter 1.—Duties and Qualifications for Employment

Brief descriptions of the duties involved in all flight occupations and in many other operations, maintenance, and communications jobs are given in this chapter. The legal requirements for entry into each occupation and the additional standards followed by employers in hiring are discussed, and special attention is also paid to the usefulness of military and naval experience in applying for civilian jobs.

The main legal requirements for aviation jobs are contained in the Civil Air Regulations. These provide that, in order to work as an "airman," a person must get a certificate issued by the Civil Aeronautics Administration.<sup>1</sup> "Airmen" are defined to include pilots, flight engineers, navigators, flight radio operators, aircraft and aircraft-engine mechanics, dispatchers, and airport traffic-control tower operators.

Equally important are the standards set by employers in hiring workers for each type of job. The descriptions of employers' hiring standards and also of duties given in this chapter are based partly on published information;<sup>2</sup> partly on interviews with officials of certain air lines and other companies, of employer and employee organizations, and of the CAA; and partly on unpublished data made available by these agencies and by the U. S. Employment Service of the Department of Labor. In presenting this information, the aim has been to portray the typical situation in each occupation. It should be remembered in interpreting the data that even the relatively few major air lines differ to some extent in the way in which they divide duties between occupational groups and in their hiring specifications. Differences are even greater in the case of the many small

<sup>1</sup> The information regarding these certificates was obtained partly from the Civil Air Regulations and partly through interviews with CAA officials. Similarly, the information as to the Federal Communications Commission licenses, required for all personnel operating radio transmitters, came from the official publications regarding these licenses, supplemented by interviews with FCC staff members.

<sup>2</sup> Much use has been made throughout this chapter of the Dictionary of Occupational Titles, Part I (June 1939), and Supplement, Edition II (July 1943), prepared by the U. S. Employment Service, Washington; and An Educational Guide in Air Transportation, prepared by Ralph E. Hinkel and Leo Baron (1944), Transcontinental and Western Air, Incorporated, Kansas City, Mo.

enterprises engaged in nonscheduled commercial flying and related activities—among which there is as yet little standardization of employment policies.

Another thing to bear in mind is that the air lines' hiring standards are not rigid. Applicants who are outstandingly qualified in most respects have sometimes been hired even though they do not meet a certain specification (for example, the height limit in the case of pilots). On the other hand, having all the minimum qualifications for a job will by no means be a guaranty of employment during the next few years of labor surplus in aviation. In most occupations, only the most highly qualified individuals will have a chance of being hired in the near future.

This report discusses not only entry jobs but also those of higher grade in each occupation, to which men may be promoted. Thus, the section on pilots covers both co-pilots and captains; that on mechanics, all grades from apprentices through crew chiefs. On the other hand, jobs still farther up the ladder, which are essentially administrative or supervisory—such as those of chief pilot or shop foreman—have not been covered. The air lines follow a policy of promotion from within the company in filling positions of this type, but openings are few and only the most outstanding and experienced individuals can hope to be selected.

### Pilots

#### *Duties of Air-Line Pilots*

Piloting an air-line plane is an exacting, technical job, involving great responsibility for life and property. Although the work has become standardized—even routine, in many of its aspects—emergencies which critically test the pilot's judgment and skill are still a constant possibility.

During flights, the pilot's primary task is, of course, to operate the controls of the plane. Other typical flight duties include keeping close

watch on the multitude of instruments, and operating the radio. How these duties are divided between the captain (or first pilot) and the first officer (or co-pilot) is determined by the former, who has complete authority over the plane, crew, passengers, and cargo while in the air. The co-pilot acts as his assistant and is regarded as a "captain in training." A new co-pilot is generally permitted only limited responsibility, such as operating the controls in good weather over safe terrain. His responsibilities are gradually increased as he gains in experience and skill and approaches the point where he will qualify for a captain's job.

Both captain and co-pilot have extensive ground duties. Before each flight, they must study weather reports and maps for the region where they will be flying, in consultation with the company meteorologist, and prepare the flight plan detailing the route to be followed, in cooperation with the air-line dispatcher. The pilots also make a pre-flight check on the condition and loading of the aircraft and the functioning of engines and instruments. If the captain is not satisfied as to the "airworthiness" of the plane or as to weather conditions, the flight is cancelled, normally by mutual agreement between the captain and the dispatcher. However, if such agreement cannot be reached, the captain may refuse to take off, and, according to air-line custom, he may not be overruled in this decision even by the president of his company.

At intermediate stops, the pilot's duties are likely to include studying the weather again and supervising the loading and refueling of the plane. After each completed flight, detailed reports have to be made out. Other duties, to which captains as well as co-pilots are subject, include practice in instrument flying in the Link trainer and keeping up with changes in routes and with airport and airways procedures.

This description applies most closely to pilots flying two-motored planes in this country, with the usual crew of captain, co-pilot, and stewardess (or steward). The employment of additional crew members in international flying and, to some extent, on four-motored planes on domestic routes means greater specialization of work. Where there is a flight engineer, he takes over much of the responsibility for checking and

observing the functioning of the engines and operates some of the controls. Specialized flight radio operators and navigators of course handle most of the work in these spheres. It is also possible that, in the future, some extremely large planes may have captains who are in addition to the regular pilots and do none of the actual flying.

To insure that all pilots constantly meet the requirements with respect to flying skill and other matters, the air lines employ check pilots. At least one company rotates this assignment among its more experienced captains. Other lines designate one or more of the senior men as check pilots.

### *Duties of Airplane Pilots Outside the Air Lines*

Pilots employed outside the air lines—in fixed-base operations,<sup>3</sup> by business firms owning and operating their own fleets of planes, or by Government agencies—have a wide variety of jobs.

Most pilots who work for or are themselves fixed-base operators engage in several different types of flying services—generally flight instruction and either charter transportation of passengers and cargo or other special flight services (such as aerial photography and surveying, sky-writing, advertising-banner towing, crop dusting and spraying, and forest and other patrol work). Often flight instructors act also as demonstrator-salesmen. However, there are many pilots employed exclusively in flight instruction and smaller numbers of others employed only in charter or other work. In most of these types of services, much smaller aircraft are customarily used than in scheduled air transport; planes may have no radio; and little long-distance flying or flying by instrument is done. These statements do not hold true, however, for the rapidly growing group of men engaged in contract transportation of

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<sup>3</sup> "Fixed-base operations," as the term is used in this report, include all of the wide variety of commercial aviation services not conducted on a scheduled basis. Their activities include transportation of passengers, cargo, or both in charter, taxi, ferry, and sightseeing flight; instruction of student pilots; and specialized flight services of many types. In addition, many operators store, service, and repair planes belonging to others and have sales agencies for light pleasure-type aircraft.

passengers or cargo, who may fly planes as large as DC-4's and may even make trans-continental flights.

The ground duties of pilots employed by fixed-base operators are seldom extensive. Those doing transport work may be responsible for obtaining weather reports before take-offs (since the great majority of operations are too small to employ specialized dispatchers or meteorologists) and for some other tasks, such as filling out brief reports. Those engaged in flight instruction or in demonstrating and selling planes may have to interview prospective students or customers and keep some records. But the amount of time involved is likely to be small. The situation is very different, however, for the large number of pilots who have their own fixed-base operations. These men have business and managerial responsibilities similar to those of small businessmen in other industries. Also, operators who start in business on a small scale often have to perform, or at least supervise, the maintenance work on their planes.

In business flying, pilots often have the job of taking executives from place to place, in which case their duties are comparable to those of private chauffeurs. However, some men are assigned to quite different types of work—for example, pipeline inspections or transport of equipment and personnel to and from remote mining or construction operations.

Pilots on the staff of the Civil Aeronautics Administration, chief Government employer of civilian flyers, are engaged almost entirely in inspection work of various types. "Patrol pilots" patrol and inspect the air-navigation facilities of the Federal airways. Those with the title of "aeronautical inspector" examine applicants for pilot and other "airman" certificates; inspect civil aircraft, flying schools, and repair stations; investigate accidents to aircraft other than air-line planes; and perform other related duties. Those designated as "air carrier inspectors (operations)" are responsible for examining air-line personnel and investigating many other phases of air-carrier operations. They also investigate the facilities and functioning of the airways system and of airport traffic-control towers. A few CAA pilots

are not inspectors but do flight-testing of equipment at experimental stations and other work. While the CAA's pilot-training service was in existence, there were also many flight instructors on the staff.

### *Qualifications for Employment*

The qualifications for pilot jobs are established in part by legal requirements and in part by employers' even more stringent hiring standards.

#### *Legal requirements*

To take any plane off the ground in solo flight, a civilian must hold a pilot certificate issued by the CAA. No pilot may do flying which involves the transportation of persons or property for pay or any flying in connection with the operation of a business except for his own personal transportation, without a rating of "commercial" grade or higher. Before serving as co-pilot with an air line, a man must have not only a commercial rating but also an instrument rating (needed for all flying by instrument, whether scheduled or nonscheduled). He must also obtain at least a restricted radio-telephone operator's permit from the Federal Communications Commission, needed by all non-Government pilots flying planes with radio transmitters. A radio-operating authorization, to be issued by CAA may, however, be required in place of this permit in the near future. Air-line captains must have a CAA certificate with an air-line transport pilot rating. Finally, there is a special instructor rating, without which no one may give flight instruction. The requirements for the CAA ratings are summarized in table 1; those for the FCC license in table 2.

Commercial pilot ratings must be renewed every 2 years, and applicants must each time have passed a physical examination within the preceding 12 months. Air-line transport pilots must take a physical examination every 6 months. A man no longer able to meet the rigid physical standards loses his certificate, unless "his aeronautical experience, ability, and judgment compensate for his physical deficiency."<sup>5</sup>

<sup>5</sup> Civil Air Regulations, Part 29-2.

Table 1.—Major requirements for specified CAA pilot ratings<sup>1</sup>

Type of requirement	Commercial pilot rating <sup>2</sup>	Instrument rating <sup>3</sup>	Air-line transport pilot rating	Flight instructor rating
Citizenship.....	Loyal citizen of the United States or of a friendly foreign government which grants reciprocal privileges.	Same as for commercial pilot.	Same as for commercial pilot.....	Same as for commercial pilot.
Minimum age.....	18.....	17.....	23.....	18.
Education.....	Ability to read, write, speak, and understand English.	Same as for commercial pilot.	High-school graduate or equivalent. Ability to read and write English and to speak English without accent or speech impediment which would interfere with two-way radio conversation.	Same as for commercial pilot.
Physical standards.....	Excellent physical condition, meeting second-class standards set by CAR, Part 29.	Good physical condition, meeting third-class standards set by CAR, Part 29.	Very excellent physical condition, meeting first-class standards set by CAR, Part 29.	Same as for instrument rating.
Aeronautical knowledge.....	Must pass written examination covering meteorology, navigation, theory and practice of flight, maintenance of aircraft and engines, and Parts 43 and 60 of CAR on general operation and air-traffic rules.	Must pass written examination on use of instruments and other navigational aids. If a private pilot, must be able to meet knowledge requirements for commercial rating except those relating to maintenance of aircraft.	Must pass comprehensive written examinations covering many parts of CAR and such subjects as navigation, use of instruments, weather conditions and weather maps and reports, meteorology, air-navigation facilities, and influence of terrain upon meteorological conditions and relation thereof to flight operations.	Must pass theoretical and practical examination on competency to instruct students in flight.
Aeronautical experience.....	Minimum of 200 hours of solo flying, including 5 hours flown in past 60 days and at least 20 hours of cross-country flying.	Must be commercial pilot, or private pilot who meets experience requirements for commercial rating. Experience must include at least 40 hours of instruction and practice in instrument flying, including no more than 20 hours under simulated conditions.	Must have commercial pilot rating or equivalent, instrument rating, and at least 1,200 hours of certified solo flying within last 8 years, including 5 hours within past 60 days, and specified amounts of cross-country, night, and instrument flying.	Must be commercial pilot or private pilot who can meet experience requirements for commercial rating.
Aeronautical and radio skill <sup>4</sup> .	Must demonstrate ability to perform competently specified maneuvers, such as landings, spirals, on-ylon figure eights, and two-turn spins.	Must competently perform by reference to instruments such maneuvers as level flight, moderately banked turns, and a demonstration of estimating arrival time. Must also demonstrate radio skill, while flying solely by instruments, with respect to operating along a radio range leg, and other specified items.	Must demonstrate ability to pilot aircraft in specified maneuvers more difficult than those required for a commercial rating. In addition, must pass flight tests similar to those required for instrument rating, demonstrating ability to fly by instruments and also radio skill.	Must demonstrate ability to perform and teach flight maneuvers.

<sup>1</sup> The requirements listed are those for powered aircraft given in Parts 20, 21, and 29 of the Civil Air Regulations. Additional information on the requirements and how to secure certificates may be obtained from the Civil Aeronautics Administration, Washington 25, D. C., or any CAA regional office.

<sup>2</sup> An applicant who presents reliable documentary evidence that he is or was within the last 12 months a member of the armed forces of the United States or an allied country (or a civilian employee of the ferrying or transport services of such forces) and, as such, had solo flying status for at least 6 consecutive months will be deemed to have met the aeronautical knowledge, experience, and skill requirements for a commercial rating if he passes a written examination on the CAR, Parts 43 and 60. Aircraft type and class ratings will be granted for each type and class on which the applicant had at least 10 hours of solo flying time within the preceding 12 months.

<sup>3</sup> An instrument rating will be granted to a present or former forces pilot, in connection with a pilot certificate, if he holds an effective military instrument rating and if the requirements for this rating and the privileges authorized by it are not less than those involved in the CAA rating.

<sup>4</sup> A CAA pilot certificate permits the holder to pilot only such "types" and "classes" of aircraft as he has demonstrated his competency to fly. The CAA issues the following aircraft-type ratings of (a) airplane, (b) glider, (c) autogiro, (d) helicopter; and the following airplane-class ratings: (a) single engine land, (b) single engine sea, (c) multi-engine land, (d) multi-engine sea. An air-line transport rating is limited also to the range of horsepower in which the pilot has shown his competency. Men wishing to obtain ratings for types or classes of aircraft or for horsepower ranges not covered by their original certificates must take additional flight tests.

Table 2.—Major requirements for specified FCC radio-operator licenses<sup>1</sup>

Type of requirement	Radiotelephone			Radiotelegraph		
	Restricted operator permit <sup>2</sup>	Second-class operator license	First-class operator license	Restricted operator permit <sup>2</sup>	Second-class operator license	First-class operator license
Citizenship.....	Loyal citizen of the United States.	Loyal citizen of the United States.	Loyal citizen of the United States.	Loyal citizen of the United States.	Loyal citizen of the United States.	Loyal citizen of the United States.
Age.....	None.....	None.....	None.....	None.....	None.....	21.
Education and experience.	Ability to transmit and receive spoken messages in English.	Ability to transmit and receive spoken messages in English.	Ability to transmit and receive spoken messages in English.	None.....	Ability to transmit and receive spoken messages in English.	Ability to transmit and receive spoken messages in English. Must also have had 1 year of satisfactory service as a radiotelegraph operator manipulating the key of manually operated radiotelegraph station on board a ship or in a manually operated coastal telegraph station.
Written examination elements.	Basic law—provisions of Communications Act and FCC regulations.	Same as for a restricted permit. Also questions on basic radio theory and practice and on legal and technical matters of radiotelephone.	Same as for second-class license. In addition, questions on advanced radiotelephone, theory and practice applicable to broadcasting operation.	Same as for restricted radiotelephone operator. In addition, questions on legal and technical matters of radiotelegraph, including theory and practice, and on basic radio theory and practice.	Same as for restricted radiotelegraph operator permit. In addition, questions on advanced radiotelegraph, including theory and practice of wider scope, particularly with respect to ship radio matters.	Same as for second-class radiotelegraph operator license.
Code speed <sup>3</sup> .....	None.....	None.....	None.....	Transmitting and receiving code text of 16 code groups per minute. <sup>4</sup>	Same as for restricted radiotelegraph permit.	Transmitting and receiving code test of 25 words per minute plain language and 20 code groups per minute.

<sup>1</sup> The requirements listed are those given in Parts 9 and 13 of the Rules and Regulations of the Federal Communications Commission. Further information regarding the requirements and how to secure licenses may be obtained from the Federal Communications Commission, Washington 25, D. C.

<sup>2</sup> Operators with restricted radiotelephone and restricted radiotelegraph permits are prohibited from making adjustments that may result in improper transmitter operation.

<sup>3</sup> An applicant is required to transmit correctly in International Morse Code for 1 minute at the rate of speed prescribed for the class of license desired. He must receive same code by ear and legibly transcribe consecutive words or code groups for 1 minute without error at specified speed.

<sup>4</sup> Each five characters are counted as one word or code group.

**Employers' hiring standards**

In hiring co-pilots, the air lines set standards which are in many respects higher than those legally required. They demand far more than the 200 hours of solo flying needed for a commercial license. As of early 1946, most successful applicants for jobs were men who had had at least 2,000 hours on multi-engine aircraft.

High-school graduation is another "must," and heavy preference is given to men with at least 2 years—in some cases, 4 years—of college education. It is also specified that men should be between certain age limits (frequently 21 to 29 years, though some lines have different standards, for example 22 to 32 years); over 5 feet 7 (or 8 or 9) inches tall and

under 6 feet 1 or 2 inches; in particularly excellent physical condition; and within a certain weight range, for example, 140 to 200 pounds. In addition, applicants' personality and appearance are considered, since ability to inspire confidence in passengers and work harmoniously with other crew members are important aspects of an air-line pilot's job.

Prospective co-pilots hired by the air lines go through a short training period—in the class room, in the Link trainer, and riding as an observer on the extra seat in the cockpit—before they are "checked out" as regular co-pilots. Men whose work is not satisfactory during this training period or later on, particularly during their first months of co-pilot service, are of course subject to dismissal.

Before being promoted to captain, a co-pilot must not only have obtained the air-line transport pilot rating legally necessary but generally must have had at least 2 years' experience with the particular air line. He must be certified as ready for promotion by the captains with whom he has been flying and must meet other tests. Co-pilots are given an opportunity to qualify for promotion on the basis of their pilot seniority with the particular line. Those failing to qualify within a reasonable time are not retained as pilots.

Fixed-base operators and other private employers outside the air lines seldom have formalized hiring qualifications in addition to the legal requirements. They place great emphasis on an applicant's flying experience and skill, since pilots engaged in charter and sightseeing work and flight instruction have an obvious responsibility for the safety of passengers and students, and some of the specialized services such as crop dusting require flying technique of a particularly high order. Personal qualifications often weigh heavily also, especially in the selection of flight instructors, charter and sightseeing pilots, and demonstrator-salesmen, whose jobs involve constant dealings with the public.

All CAA positions are civil service jobs and are being filled only on a temporary basis, until competitive examinations are held. To be admitted to the examinations for aeronautical inspectors and air carrier inspectors (operations), as well as to qualify for temporary appointments in these occupations, applicants will be required to have had very long and varied flying experience in either civilian life or the armed forces or both. They will also have to hold specified CAA pilot ratings—although military pilots will be permitted to take the examinations without such ratings under some circumstances, with the proviso that they must obtain the needed certificates before they are appointed to jobs.

#### *Relationship of military experience to civilian requirements*

Most pilots leaving the armed forces will be able to obtain commercial ratings without difficulty if they so desire. Men who have had at

least 6 months' solo flying status in the armed forces and who are still in the service or have been out for less than a year will, in general, need only to pass physical examinations and tests on certain sections of the Civil Air Regulations in order to qualify. They will, however, be granted ratings only for the types and classes of aircraft on which they have had at least 10 hours of solo flying time within the preceding 12 months.<sup>7</sup>

Instrument ratings are issued automatically to holders of effective military instrument ratings "if the requirements for the issuance of such rating and the privileges authorized by it are not less than the requirements of the Civil Air Regulations for the issuance of an instrument rating and the privileges authorized by such rating."<sup>8</sup> In practice, pilots with the highest grade of military instrument rating (those holding a "green card") can qualify automatically for CAA ratings. Those with military ratings of lower grade must take the written examination and flight test normally prescribed by the CAA. The air lines have in some instances hired veterans with lower-grade military ratings and allowed them to perfect their instrument-flying technique and take the specified tests while "co-pilots in training." However, the trend is toward requiring pilot applicants to have a CAA instrument rating prior to employment.

To qualify for civilian jobs, former armed-forces pilots must not only satisfy the legal requirements but also meet employers' hiring standards with respect to education, personal characteristics, and other factors discussed above. Other things being equal, the men best equipped for air-line employment are of course those who have been piloting multi-engine transport aircraft with the Air Transport Command, the Naval Air Transport Service, and other units, while those with experience on heavy bombers come next. Fighter and dive-bomber pilots rank high from the viewpoint of flying technique. However, for air-line jobs, they would in general require additional training in handling multi-engine aircraft with varying loads, in flying the airways, and in precision instrument work. They are likely to be

<sup>7</sup> See table 1, footnote 2.

<sup>8</sup> Civil Air Regulations, Part 20.561.

best adapted to flying services such as crop dusting, sky writing, aerial photography, and, in some instances, primary flight instruction.

## Flight Engineers and Flight Mechanics

### *Duties*

Flight engineers and flight mechanics are relative newcomers to aviation. Outside the armed forces, they are employed only by the air lines on four-engine planes and, so far, mainly in overseas flying.

Flight engineers' duties during flights include watching and keeping logs on engine performance and operating certain controls under direction of the captain. It is their job to make any repairs needed while in the air or at stops where there is no mechanic and to direct the servicing of the plane at intermediate stations where there are maintenance crews. They also oversee the loading of cargo and sign the "weight and balance sheet"; make pre-flight checks on the airplane, engines, and instruments; and perform other related duties.

On some four-engine planes, the controls are so arranged that they must all be operated by

The flight engineer of an overseas air liner noting dial readings on his log. His post is directly behind that of the co-pilot.

BY COURTESY OF AMERICAN AVIATION ASSOCIATES.



the pilots, and there is no station for a flight engineer. On such planes, a flight mechanic may be carried instead, especially if the engines can be reached from within the plane and engine repairs can therefore be made in flight. In addition, some lines are planning to carry both a flight engineer and a flight mechanic on extremely large planes. The professional aspects of the flight engineer's job would be increased under these circumstances, and the actual maintenance work would be given over to the mechanic.

### *Qualifications for Employment*

"Each flight engineer must be familiar with the model of aircraft to which he is assigned and must be competent to repair or to supervise repairs of all the major components of the aircraft, engines, propellers, and accessories," under the Civil Air Regulations.<sup>9</sup> A recent amendment to the regulations also provides for the issuance of flight-engineer certificates, but this provision is not yet in effect, since the requirements for the certificates are still being formulated. In the meantime, CAA inspectors (or other persons designated by the CAA) check the experience and other qualifications of all flight engineers. No legal requirements for flight mechanics are under consideration as yet. However, the air lines have made the holding of CAA aircraft ("A") and aircraft-engine ("E") mechanic ratings<sup>10</sup> a minimum qualification for this occupation, as well as for that of flight engineer.

The men now working as flight engineers have come mostly from the air-line maintenance departments. To qualify for such jobs, mechanics have generally been required not only to hold "A" and "E" certificates but also to have had at least 3 or 4 years of broad experience in aircraft maintenance and inspection and, sometimes, to hold a restricted radio-telephone operator permit (see table 2).<sup>11</sup> They must be in good physical condition and between about 22 and 32 or 35 years of age. Neatness of appearance, ability to meet the public, and

<sup>9</sup> Civil Air Regulations, Part 41.322.

<sup>10</sup> The requirements for these ratings are discussed on p. 25.

<sup>11</sup> This last requirement may be affected by the change in FCC regulations indicated for pilots. See p. 10.

at least a high-school education are insisted upon. It is likely that men with 2 to 4 years of college engineering training will increasingly be given preference, especially if the professional aspects of the job expand as anticipated. Hiring standards for flight mechanics are likely to be similar in many respects to those for flight engineers but to involve less emphasis on education and more on practical maintenance experience.

Openings in these occupations will be extremely limited during the next few years compared with the numbers of veterans at least *partially* qualified for the work. On the other hand, the proportion of military flight engineers and mechanics likely to be considered *fully* qualified for comparable civilian jobs is also very small. It is possible that a few individuals with particularly good experience on transport planes, engineering training, or other exceptional qualifications may meet the requirements for air-line flight jobs without further training. The great majority, however, will need a period of employment in air-line ground maintenance work before they can qualify for the few flight engineer and mechanic positions that will be available.

## Navigators and Flight Radio Operators

### *Duties*

Navigators and flight radio operators are employed only in air-line operations over international routes, where airways equipped with radio-range beams have not yet been established and the course must be determined by other means.

The navigator often has the title of "second officer," ranking after the co-pilot. Prior to departure, he prepares the flight plan for the captain's approval, based on a complex tabular flight analysis which takes account of ground speed, aircraft and engine performance relative to the expected weather conditions, and other factors that might influence the flight. Another of his duties is seeing that all needed navigational equipment is in good condition and aboard the plane. Once under way, he becomes responsible for knowing at all times whether the flight is progressing according to

plan and advising the captain as to revisions in routing made necessary by changing weather conditions or other unforeseen circumstances. In his work, he uses all available navigational methods—dead reckoning, celestial navigation, radio bearings, and pilotage. He also keeps the flight log, showing the courses flown, ground and air speeds, and numerous related items.

Because of the importance of the plane's radio direction-finding equipment in navigation, the work of the flight radio operator (who often has the title of "flight radio officer" or "flight communications officer") is closely related to that of the navigator. In fact, the employment of combined navigator-radio operators, in place of specialists in the two occupations, is now being considered by some lines. The operators' duties include obtaining radio bearings, sending and receiving weather information and other messages in International Morse Code or by radiotelephone, and listening in on the international distress-signal frequency twice an hour at the prescribed times. He makes all needed adjustments and emergency repairs on radio equipment while in flight

A navigator plotting a position—at his desk behind the pilots' cockpit in a trans-Atlantic air liner. Above his right shoulder is the radio altimeter, which indicates the exact height of the plane above the earth's surface.

BY COURTESY OF AMERICAN AIRLINES.



or at stops where no radio maintenance man is available. He also inspects and tests the equipment between flights.

### *Qualifications for Employment*

CAA certificates for navigators and flight radio operators are now provided for by the Civil Air Regulations. As in the case of flight engineers, this provision is not effective as yet, but it will be in force as soon as the requirements for the certificates are officially determined. In the interim, CAA representatives check the qualifications of employees in both occupations.

The air lines require navigators to be high-school graduates and prefer a college education. A comprehensive knowledge of radio and celestial navigation, pilotage, dead reckoning, and related subjects is necessary, and preference is given to men with actual flight experience.

Flight radio operators have, in many instances, been promoted from ground radio-operator jobs with the same air line. They are required to have a radiotelegraph license of second grade or higher from the FCC (see table 2). Among other specific requirements made by some lines are ability to send and receive 20 or 25 words per minute in Morse code, and thorough knowledge of the adjustment and maintenance of radio transmitters and receivers and of the use and maintenance of radio direction-finding equipment. Some knowledge of celestial navigation, dead reckoning, and meteorology may also be required.

Personal characteristics weigh heavily in the selection of navigators and flight radio operators, as in that of all other members of air-line flight crews. At least one line specifies that applicants for both positions should be between 21 and 35 years of age, in excellent physical condition, and between certain height and weight limits—for navigators, 5 feet 4 inches to 6 feet 2 and 120 to 200 pounds; for flight radio operators, 5 feet 7 inches to 6 feet 2 and 140 to 200 pounds.

Men who were navigators or flight radio operators in the armed forces may meet some or all of the indicated requirements for air-line jobs, but it must be emphasized that there will be very few openings in these occupations. The

number of opportunities will, in fact, be quite insignificant compared with the numbers of trained and experienced men likely to be seeking work.

## **Flight Stewards and Stewardesses**

### *Duties*

Stewardesses (often known as "hostesses") or stewards are carried on all but the very smallest air-line planes. Most lines employ only stewardesses in domestic operations. In international operations, stewards predominate, though women are being used increasingly on some routes.

Attending to the physical comfort of the passengers—by serving food (pre-cooked by ground personnel), giving minor medical aid, helping to adjust seats, and other means—is one important phase of the work. Another is answering questions—for example, regarding the plane, its schedule, and connecting air-line routes—talking with passengers, supplying them with reading matter, and even playing bridge or other games with them on request. There are also various reports to be made on such matters as passengers' ticket numbers, places of departure, and destinations; medications given; and lost and found articles. In addition, stewards in international operations generally have charge of the cargo and have to fill out the declarations and other forms with regard to it.

Part of this "paper work" is done while in flight, part on the ground. In addition, stewards have sometimes had to do a considerable amount of work of other types on the ground, especially helping to prepare the food and loading it on the planes. This has not been true of hostesses, however, and is becoming less and less true of stewards.

On very large planes which some lines now have on order, a number of service personnel will be carried, and there will be greater specialization of work than is here indicated. If, as expected, these planes have kitchen facilities, a cook will be carried. There will be a purser, in charge of all service personnel and responsible for the records with regard to passengers and cargo. It is likely that some of the

employees will be men and some of them women, the former handling the heavier work and the latter being particularly responsible for services to women and children among the passengers. Already, some planes carry both a steward and a stewardess, with this general division of work.

### *Qualifications for Employment*

No license is required for steward and stewardess positions. The air lines' main emphasis in hiring is on personal qualifications rather than special skills or previous experience, especially in the case of stewardesses.

Because the job involves constant contact with the public, a hostess must have a pleasing personality and appearance. She should also be between about 5 feet 2 inches and 5 feet 5 or 6 inches tall, between 100 and 125 or 130 pounds in weight, within specified narrow age limits (for example, 21 to 26, 21 to 28, or 24 to 28 years, according to different lines), and able to pass a rigid physical examination. All lines hire only unmarried girls. Graduation from high school is required, and generally also at least 1 or 2 years of college training unless the applicant is a registered nurse. Before the war, all hostesses had to be graduate nurses, but this requirement was dropped by practically all lines during the war and will probably not be generally resumed, though nurses may be given preference. For jobs in overseas operations, there are usually additional qualifications, such as knowledge of French or Spanish, ability to swim well, and at least 1 year of previous experience as hostess with another air line.

Stewards are also selected partly on the basis of their personality and appearance and must be in fine physical condition and not be too tall. High-school graduation is a minimum requirement, and some college education is preferred. As in the case of hostesses, knowledge of at least one foreign language is needed for overseas jobs, though during the war men were hired without it and taught the essentials of another language while on the pay roll. Also important is experience in handling food; many of the flight stewards now employed were formerly restaurant cooks or waiters.

The only group of present and former armed-forces personnel with duties directly related to flight-steward jobs are the comparatively small numbers who were trained and assigned as flight clerks and flight orderlies. These men should be able to obtain special consideration for air-line steward positions if they so desire, provided that they have the specified personal and educational qualifications.

## Dispatchers and Assistants

### *Duties*

An air-line dispatcher (or "flight superintendent") has control over all of his company's flights within his sector. Before each flight, the captain and co-pilot plan the flight in detail, in consultation with him and with the meteorologist. The plane may not leave until he has signed the flight authorization sheet and to do this, he must not only be satisfied as to weather conditions and the flight plan but must have obtained assurance that the plane is in perfect flying condition, serviced with gasoline and oil,

An air-line hostess serving lunch.

BY COURTESY OF CAPITAL AIRLINES.





BY COURTESY OF AMERICAN AIRLINES.

Assistant dispatchers at work in an air-line flight dispatcher's office—telephoning a CAA airways traffic-control center, entering the estimated time of arrival of a plane on the board, and reading a teletype report on weather conditions.

and properly loaded. It is also the dispatcher's job to follow closely the progress of each flight, as reported by radio, until it passes into an adjoining sector where another dispatcher takes over. He follows weather conditions and other factors affecting the safety or progress of the flight and keeps the captain informed of any developments which might make it necessary to depart from the original flight plan. In addition, the dispatcher is responsible for keeping records on the aircraft and engines available, on the amount of time logged by each, and on the number of hours flown by flight person-

nel based at his station. Crew members are notified when to report for duty by his office.

Assistant dispatchers and various grades of clerical employees aid in this work. Among the duties which may be assumed by an assistant air-line dispatcher are securing weather information, helping to keep track of the progress of aircraft in the sector, and handling communications with the planes.

A few of the largest nonscheduled flying services also employ dispatchers with duties generally comparable to those of air-line personnel.

## Qualifications for Employment

A CAA aircraft dispatcher certificate is required for work as a dispatcher, though not for work as an assistant. To qualify for this certificate, an applicant must be at least 23 years of age, a citizen of the United States or of a friendly foreign government which grants reciprocal privileges, and able to read and write English and speak it without any accent or speech impediment that would interfere with two-way radio conversation. The basic experience requirement for the certificate is *one* of the following:

(a) Two of the last three years in scheduled air-line or scheduled military operations as a pilot, a flight or ground radio operator, a flight navigator, a meteorologist in an aircraft dispatching organization, a technical supervisor of aircraft dispatchers, or an assistant in dispatching of scheduled military aircraft;

(b) Two of the last three years as an air-traffic controller;

(c) Any combination of the types of experience listed under (a) and (b), provided each was of at least 1 year's duration;

(d) One year within the last two as an assistant in the dispatching of scheduled air-line planes; or

(e) Graduation from an aircraft dispatcher course approved by the Administrator of Civil Aeronautics.

The applicant must also have been employed for at least 90 days within the last 6 months in connection with the dispatching of air-line planes under supervision of a certificated dispatcher. He must pass a written examination testing his knowledge of such subjects as the parts of the Civil Air Regulations relating to air-carrier operations and traffic rules, the characteristics of at least one model of aircraft, systems of collecting and disseminating weather data and of weather analysis, weather conditions adversely affecting flight operations and radio communications, air-navigation facilities and principles, and airway and airport traffic procedures. Furthermore, he must demonstrate his skill in weather forecasting and certain other operations involved in dispatching work.

According to the Civil Air Regulations, dispatchers must also be familiar with the routes over which they dispatch planes and with the weather conditions, terrain, and air-navigation facilities of the region. In line with this requirement, it is air-line policy to fill dispatcher positions only by promotions from within the company. Most present dispatchers were formerly employed as pilots or meteorologists by the same line and were selected as particularly adapted to dispatching work. However, outsiders are sometimes hired as assistant dispatchers and may be promoted to regular dispatcher jobs after they have had a training period of 1 to 3 years and have obtained their certificates.

For assistant jobs, 2 years of college is generally insisted on by the carriers, and men who have completed a 4-year college course—including training in mathematics, physics, chemistry, meteorology, and related subjects—are likely to receive preference. Experience in flying, weather forecasting, and business administration is particularly advantageous. Personality factors also count heavily.

A large number of men with armed-forces training and experience as pilots, meteorologists, and flight-control and other operations officers would no doubt be able to meet the minimum qualifications for assistant dispatcher jobs. But it must be reiterated, with respect to this occupation also, that the number of openings will be very limited during the next few years. The competition for these jobs is likely to be so great that only the most highly qualified men will be considered for employment in the near future.

## Meteorologists

### Duties

Meteorologists are employed in air-line operations departments to analyze weather data and forecast flight conditions for their sectors of the line. They must constantly study weather trends, revising their forecasts as necessary and providing up-to-the-minute information to captains, dispatchers, and other supervisory personnel responsible for controlling flights.



BY COURTESY OF AMERICAN AIRLINES.

An air-line meteorologist briefing pilots on weather conditions before a flight.

Their work is done in close cooperation with the United States Weather Bureau (which of course has many meteorologists on its own staff) and with the local CAA office.

### *Qualifications for Employment*

Since there are no licensing requirements for this occupation, air-line hiring standards are all-important in determining the qualifications needed.

In general, applicants must be 21 years of age or over, and some lines have an upper age limit—for example, 30 years for junior and 35 or 40 years for senior meteorologists. Before the war only men were hired, but during the war some lines accepted young women for junior positions.

The minimum educational requirement is generally 2 years of college, but some lines insist on 4 years. The courses taken should include mathematics through calculus, physics, chemistry, and many hours of meteorology and related technical subjects. Persons with this educational preparation were often hired directly from college during the war and put into

junior positions after a brief period of intensive training. Applicants with some experience in weather observation work, as well as the desired education, of course have an advantage.

Senior meteorologist positions are usually filled by promotion of junior men, although applicants with advanced training and experience have sometimes been hired directly for senior jobs. To qualify for promotion, at least 1 year's experience as a forecaster and 6 months' experience with the company is generally required.

Many Army- and Navy-trained meteorologists would qualify for the few air-line positions that will be open in the next few years. Those who completed certain college courses (the "A course") as part of their training are regarded as having the best preparation.

### **Mechanics**

Behind every airplane in flight stand the mechanics who serviced, overhauled, and inspected it, and certified that it was airworthy. They carry a responsibility much greater than that of mechanics working, for example, on motor vehicles, which can have break-downs without endangering either the driver or the public. Only on certain very large "air liners" can engine repairs be made in flight, and even a plane of this type would have to make a forced landing or crash if there were, for example, a major accident to the controls. For this reason, aviation mechanics' main function is not to make repairs but to prevent anything from going wrong with planes, their engines, and other equipment—through frequent, careful inspections and servicing and through very thorough overhauling at regular intervals. However, mechanics also make any necessary repairs and modifications in aircraft.<sup>12</sup>

### *Duties of Air-Line Mechanics*

Mechanics working for an air line are assigned either to "line maintenance" or to overhaul work.

<sup>12</sup> For a more detailed discussion of airplane mechanics' work, see *Aviation Mechanic*, by Carl Norcross and James D. Quinn (McGraw, Hill Publishing Co., New York City), 1941.

The term "line maintenance" was originally coined to cover the servicing and maintenance work that can be done on a plane at the "line" from which it takes off or at which it comes to a stop, although much of the work is actually done in a hangar. Before each flight, line-maintenance mechanics warm up the engines, watch the functioning of many controls, and check the radios and other items. They also tow or taxi the plane to the passenger-loading station. At every stop, a mechanic at least checks the gasoline and oil and inspects the plane externally for damage that might have been done in landing or in the previous take-off. At the end of every 8 or 10 hours of flying, the plane receives a "routine check" covering well over 100 items. The engines are started and their operation is carefully observed. Landing gear, tail, and heating, ventilating, and electrical systems are carefully gone over; the fuselage is inspected inside and out; and a detailed check is made on the controls and instruments in the cockpit. At specified longer intervals—for example, every 50 hours—checks are made which are still more thorough. New spark plugs are then installed; many parts not covered in the more frequent checks are oiled or greased; cabin floors are removed for cleaning and to facilitate inspection; and so forth.

Line-maintenance crews not only handle these checks but make any relatively minor repairs and adjustments which they find to be needed or which are called for to remedy troubles reported by a captain at the end of a flight or at an intermediate stop. They also remove engines and other parts to be sent to the main base for major repairs or for overhauling and install overhauled or new equipment in their place.

Most line-maintenance men are all-round aircraft and engine mechanics, who may be called on to work on any part of the aircraft, engines, and accessories. However, some carriers employ separate crews of engine mechanics and of aircraft mechanics at their larger service stations to work respectively on power plants and on other parts of the aircraft. In addition, line-maintenance crews sometimes include a few specialists, such as electricians and radio and instrument mechanics.

At specified intervals, usually after every

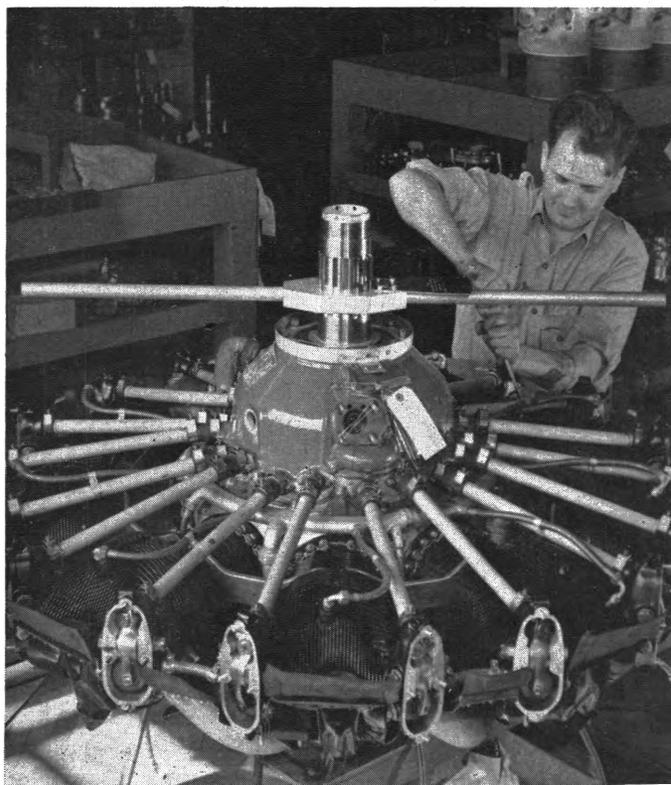
500 or 600 flying hours, the engines and many other parts, such as pumps, starters, light switches, and instruments, are removed from the plane and sent to the company's maintenance base for overhauling. At still longer intervals, usually after 3,000 to 4,000 flying hours, the ship itself goes in for a general overhaul. Equipment requiring major repairs before the time for its regular overhaul is of course sent to the base at once. Any modifications needed, such as the refitting of planes released to the air lines by the armed forces, are handled there also.

In contrast to the situation in line maintenance, overhaul bases are highly departmentalized. The number of departments and shops varies from one company to another, but a typical large air line would be likely to have about the following divisions of work: Engine overhaul; machine shop; propeller; hydraulics, wheel and brake; electrical; radio; instruments; battery and plating; sheet metal, riveting, welding, and tubing; fabric and dope, and paint shop; upholstery.

Within the scope of this study, it is possible only to suggest very briefly some of the types of work done in these departments. When an

An engine mechanic reassembling an air-line engine, which had been torn down for overhauling.

BY COURTESY OF AMERICAN AIRLINES.



engine comes into the base, it is of course routed to the engine shop. There, the first step is to dismantle it completely. Each separate part is then very carefully cleaned and inspected. If it is found to be at all defective, it is either repaired or replaced (often by a new part manufactured in the machine shop). Frequently, cylinders must be rebored, valves ground, and new piston rings fitted. After all parts are in satisfactory condition, the engine is reassembled, given a test run on a testing stand, and inspected and adjusted once more.

The same meticulous care is used in overhauling the plane and other equipment. In the case of the plane itself, wings, tail surfaces, cabin chairs, and flooring are removed. Cleaning is most thorough, and all parts subject to wear are carefully inspected. Scores of parts are replaced; often, sections of the plane's aluminum skin have to be removed and new ones, which have been cut and formed in the sheet-metal shop, have to be riveted into place. Planes are so thoroughly rebuilt with each overhauling that, for all practical purposes, they never wear out.

Mechanics at the base usually specialize in engine or in airplane overhaul, or in some other division of the work, such as radio or instrument overhaul. However, men may know and be called on to perform several types of related work in addition to their primary specialty. For example, an upholsterer may help to sew the fabric covering on rudders and elevators and to spray this fabric with "dope" (in order to tighten and protect it). Besides welding, men often do sheet-metal work and riveting and sometimes also tube-bending. On the other hand, there may be specialization within departments. In many large instrument shops, for example, the skilled men spend all their time in repairing and adjusting a few of the many types of instruments or in installation work. This contrasts with the situation in small shops, where a single mechanic may overhaul all types of instruments and also handle installations.

Radio mechanics assigned to the overhaul base thoroughly test and repair airborne radios and may install them in place after they have been overhauled. In addition, as already noted,

line-maintenance crews often include men in this specialty. Still another type of work done by air-line radio mechanics is maintenance and repair of the companies' ground transmitting and receiving equipment.

In both engine and aircraft work and in all the different specialties, mechanics with widely differing degrees of skill and responsibility are employed. The classifications of mechanics are by no means uniform from line to line, but most companies distinguish between apprentices, junior mechanics, mechanics (or specialists), and various higher grades ranging from senior mechanic to crew chief.

Apprentice mechanics work under close and continuous supervision, with the instruction and work experience so arranged as to provide for steady progression to more and more responsible tasks. Sometimes they are rotated through various sections of the maintenance and overhaul departments in order to give them a broad knowledge of both aircraft and engine mechanics' work, and sometimes they are allowed to specialize in one or more divisions of the trade. Junior mechanics, designated also as "assistant mechanics" or "mechanic's helpers," likewise work under close supervision. In degree of productiveness, they generally fall between all or most of the apprentices and the full mechanics. With a number of lines, the junior classification is permanent. In fact, some companies transfer apprentices to this category during their fourth year of training. On many other lines, however, junior mechanics have been employed only as a temporary stop gap until skilled men are available either directly or through apprentice-training programs.

Men classified as mechanics or specialists are skilled workers requiring only occasional supervision. Senior mechanics, the next grade on some lines, are regarded as having a higher degree of skill and ability to assume greater responsibility. In many instances they are responsible for instruction of apprentices and junior men, and they may also do planning and lay-out work of various types. Still higher grades are "lead mechanics" (who work as leaders of small groups of less skilled men), "master mechanics" (a classification used only by certain air lines, to include a small number of very highly skilled men with varied duties),

“inspectors” (who inspect aircraft, engines, radios, and accessories before and after overhaul and after maintenance repairs and certify to the airworthiness of the equipment in accordance with the Civil Air Regulations), and “crew chiefs” (who are working foremen).

### *Duties of Aviation Mechanics Outside the Air Lines*

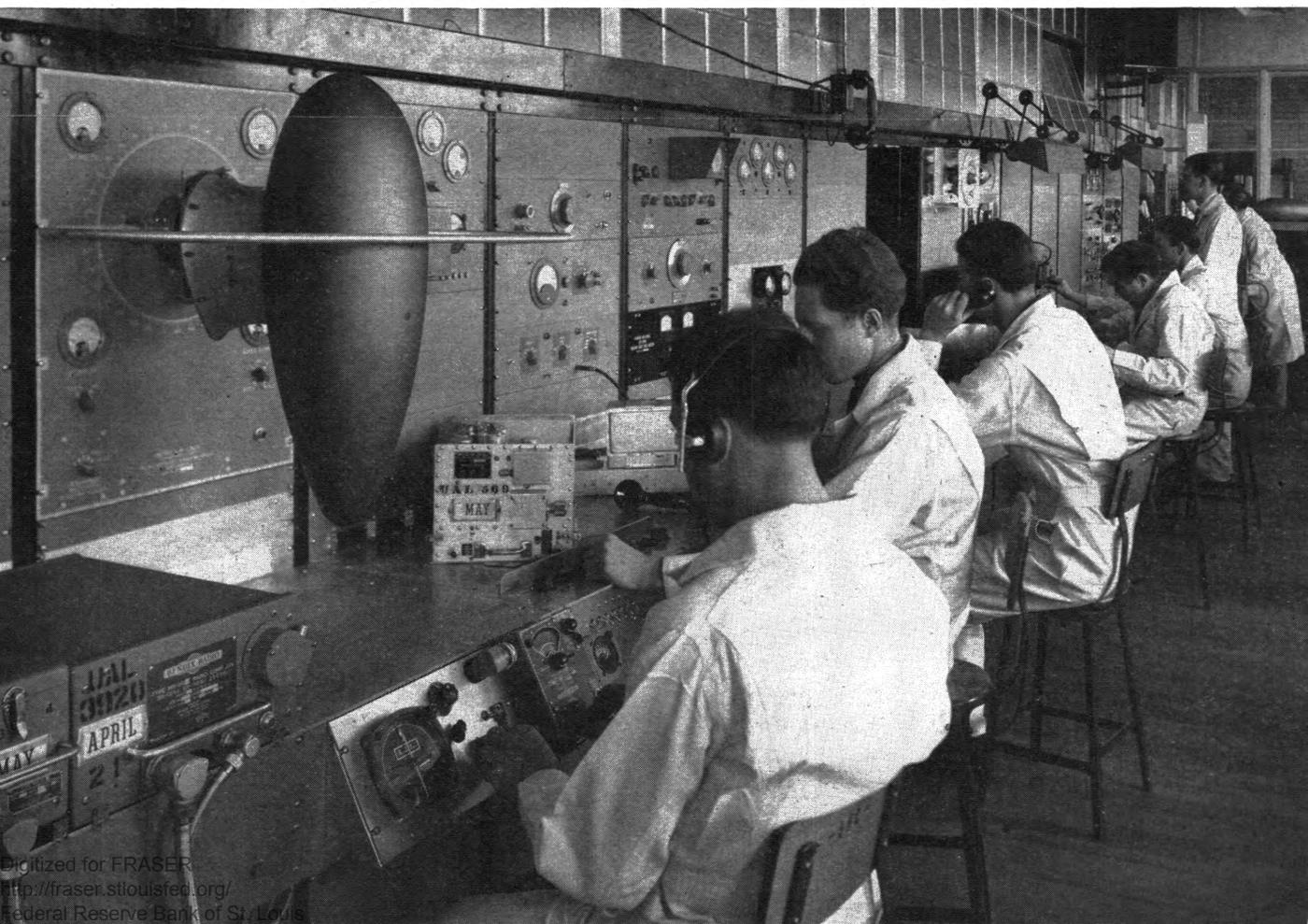
Outside the air lines, aviation mechanics work mostly for nonscheduled or intrastate flying services, flying schools, repair shops, and other fixed-base operators, and for aircraft manufacturers. A few are employed by large companies owning fleets of planes and some by Government agencies, notably the CAA. A small number of others are instructors of aviation-mechanic courses.

As a rule, in commercial flying services and schools and also in most operations which sell, garage, and service private planes, the mechanics' work is roughly comparable to that of air-line “line maintenance” men. A few large charter operators, contract cargo lines, and flying schools have repair shops equipped to handle overhaul work or major repairs, but the majority of fixed-base operations are too small for this. When a plane needs major repairs or overhauling, they either send it back to the manufacturer or take it to a repair shop specializing in such work, if there happens to be one in the neighborhood.

Inspections—including pre-flight warming-up tests, routine “daily flight checks,” and still more thorough periodic inspections—are an important part of maintenance mechanics' work in fixed-base operations, as of air-line

Radio mechanics testing a radio compass and other equipment in the radio-electrical department of an air-line overhaul base.

BY COURTESY OF UNITED AIR LINES.



line-maintenance work. In addition, both groups handle adjustments and minor repairs.

The differences between air-line and non-air-line work are perhaps greater than the similarities, however. Planes handled by mechanics in nonscheduled flying services and other fixed-base operations are very small compared to air liners (with a few exceptions, especially on cargo lines). Often they have only a few comparatively simple instruments, a fixed-pitch propeller (without any of the elaborate control mechanism that goes with the adjustable-pitch propeller used on all air-line planes), and no radio. These and other factors greatly reduce and simplify the work of inspecting and servicing the planes in comparison with that required on air liners. A single mechanic, instead of a large crew or several crews, usually handles the entire job with little supervision. Moreover, he is likely to have to work on many different types of planes and engines, whereas an air-line mechanic generally works on only one—or, at the most, two or three—types of aircraft.

As mentioned above, some large flying services and flying schools have repair shops that do overhaul work. There are also some independent repair shops, belonging in most instances to mechanics who have gone into business for themselves and who have, as a result, many business and administrative duties to handle in addition to any mechanic's work they may do. Though both engine and aircraft overhaul is done by certain comparatively large repair stations, it is more usual for a shop to handle only one of these two types of work. In addition, there are about a dozen shops in the country which specialize in instrument overhaul and repair.

That some instrument specialists are employed in shops handling only this work goes without saying. The larger general repair shops also may have on their staffs a very few specialists of this type and perhaps some others, such as radio mechanics, propeller mechanics (if they handle planes with adjustable-pitch propellers), machinists, and sheet-metal workers (although sheet-metal work has much less relative importance in connection with small planes, many of which are fabric covered, than with air liners). However, the great majority of

mechanics employed at non-air-line repair stations must be able to handle all phases of engine or of aircraft work and frequently of both. Even shops that do only aircraft overhaul are likely to require some of their mechanics to be skilled also in engine work, so that they can install engines overhauled in other shops.

With respect to levels of skill, there are naturally no such elaborate gradations in fixed-base operations as in the air lines' vastly larger maintenance departments. The proportion of skilled men is high in the general repair and specialty shops just discussed and probably still higher in the inspection and maintenance work described in earlier paragraphs. However, helpers are employed in all but the very smallest operations, and even small shops may have some apprentices.

In the CAA, most men with mechanic training are employed as inspectors. Those known as "aircraft inspectors" have such duties as inspection of civil aircraft (other than air-line planes) and of commercial repair stations and mechanics' schools and investigation of accidents to non-air-line aircraft. The work of "air carrier maintenance inspectors" includes periodic checks on the air lines' maintenance personnel and facilities and inspections of their aircraft. The CAA also employs some mechanics as factory inspectors and some others to handle the maintenance work on its own planes.

## *Qualifications for Employment*

### *Legal requirements*

Under the Civil Air Regulations, all maintenance, overhaul, and repair work on aircraft, aircraft engines, propellers, and instruments must be performed either by mechanics holding CAA certificates with appropriate ratings or under the direct supervision of such workers.<sup>13</sup> In addition, only licensed mechanics (or CAA inspectors) have authority to certify to the airworthiness of planes, as required before a new, overhauled, or repaired plane may be flown.

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<sup>13</sup> Certificated repair stations having the proper rating and the manufacturers of the particular type of aircraft or parts to be repaired are also authorized to perform these functions.

All applicants for mechanic certificates must be at least 18 years of age, citizens of the United States or a friendly foreign government, and able to read, write, speak, and understand English.<sup>14</sup> Separate ratings are given for aircraft, aircraft-engine, and factory mechanics.

Requirements for the aircraft mechanic ("A") rating include at least 1 year of practical experience in the construction, inspection, maintenance, or repair of aircraft and aircraft appliances. Knowledge of aircraft structure and rigging—including their inspection, maintenance, and repair—and of certain parts of the Civil Air Regulations which deal with aircraft airworthiness and maintenance is also required. For aircraft-engine ("E") ratings, applicants must have a year's experience in work on aircraft engines, propellers, and appliances, and must have knowledge of these types of equipment as well as of certain parts of the Civil Air Regulations. For both "A" and "E" ratings, applicants must show they have the required knowledge by passing written, oral, and practical tests. No such examinations are required for factory mechanic ratings, however. These are issued to mechanics who are shown to be competent by their experience and employment record and are designated by a manufacturer as in direct charge of inspection, maintenance, overhaul, or repair of aircraft, engines, or parts produced by that particular company.<sup>15</sup>

In addition, limited mechanic certificates with a propeller or aircraft appliance rating are being issued—so far, on a temporary basis only—to applicants who are directly in charge of the inspection, overhaul, or repair of propellers or aircraft appliances in CAA-approved repair stations or factories.<sup>16</sup> An additional requirement is that instructors of courses for mechanics at approved aviation ground schools must hold not only mechanic certificates but also special "ground instructor" certificates

<sup>14</sup> The requirements with respect to knowledge of English may be waived in the case of air-line mechanics employed outside the United States.

<sup>15</sup> Information on how to secure certificates may be obtained from the Civil Aeronautics Administration, Washington 25, D. C., or any CAA regional office.

<sup>16</sup> Special Civil Air Regulation No. 340. This regulation will expire on December 31, 1946, unless further extended.

with ratings for each subject in which instruction is to be given.

### *Employers' hiring standards*

The standards used by the air lines in hiring mechanics of course depend on the grade of job to be filled. For apprentice positions, applicants should usually be 20 to 30 years of age. Most lines require a generally rigid pre-employment physical examination, though waivers are allowed in some instances. A high-school or trade-school education—including such subjects as mathematics, physics, chemistry, and machine shop—is a great advantage, when not a definite requirement. Experience in automotive repair or other mechanical work is also helpful. In addition, it is customary for apprentices to own or rapidly acquire a sizable kit of tools. For junior positions, previous training or experience in aircraft mechanical work or in jobs involving closely related skills is insisted on; otherwise, the requirements are similar in most respects to those for apprentices.

A man can qualify as a "mechanic" or "specialist" through a 4-year apprenticeship (2 years on a few lines) or its equivalent in experience and training. For air-line maintenance work, skilled mechanics generally need at least an "A" or an "E" rating from the CAA and usually both. An "E" rating is usually required also for skilled work in an engine overhaul shop; an "A" rating, for work in a sheet-metal shop and in some other departments of an overhaul base. Men may, however, be fully qualified for jobs in the radio, electrical, instrument, or propeller departments without holding a certificate. It is generally preferred and sometimes required that radio specialists have at least a second-class radiotelephone operator license from the FCC (see table 2). Often, competence must be shown by passing trade tests. In addition, mechanics have to own kits of tools considerably larger than those required of apprentices.

Positions above the level of mechanic are generally filled by promotions from within the company. In many instances, senior mechanics are required to have both "A" and "E" ratings. Lead mechanics and inspectors are usually "A" and "E" men also, unless their work is limited

to the engine shop or some other overhaul department, in which case they may hold only one rating.

Fixed-base operators also demand a high degree of skill for full-fledged mechanic jobs. Applicants generally have to be "A" and "E" men, except for work in specialized repair shops. Often, some air-line experience is necessary. Where a radio mechanic is employed, he may need a second-class radio operator permit. For apprentice positions, hiring standards are seldom if ever formalized, but applicants with the types of qualifications desired by the air lines would no doubt be given preference.

As with pilots, all mechanics on the CAA staff are civil service employees. To be admitted to the competitive examination which will be held for aircraft inspector positions or to qualify for temporary jobs in the interim, applicants must have had at least 5 years of broad and varied experience in aircraft and engine maintenance and overhaul (according to tentative standards drawn up by the Civil Service Commission). For air carrier maintenance inspector positions, the suggested minimum requirement is 10 years of experience. Applicants for either position will probably be required to have held both "A" and "E" ratings for at least 5 years—except that veterans who are otherwise qualified may be admitted to the examinations without such ratings, although they must obtain them before being appointed to jobs.

#### *Relationship of military experience to civilian requirements*

Most mechanic veterans who never had any civilian experience or training in the trade will probably find that they cannot qualify for skilled jobs or for CAA mechanic certificates without further experience or training. This is due partly to the much greater specialization of work in military aircraft maintenance than in air-line maintenance departments, and partly to other differences. The additional training needed can be obtained by working for a time as a junior mechanic, helper, or advanced apprentice; by attending a mechanics' school; or, in the case of many AAF mechanics, by taking brief intensive courses given by the AAF in cooperation with the CAA. Only thoroughly

trained and experienced military airplane and engine mechanics are admitted to these courses. Men who have completed them have usually been able to qualify immediately for CAA certificates, often with both an "A" and an "E" rating. Many have obtained skilled jobs with air lines or fixed-base operators. It should be remembered, however, that competition for mechanic positions is likely to be stiff at least in the next few years.

## **Stock and Stores Clerks**

### *Duties*

Most stock and stores clerks are employed by the air lines, in the store rooms at the main overhaul bases and, to a less extent, at "service stations" where line-maintenance work is done. Their duties include receiving and unpacking the tremendous numbers of different parts and supplies, issuing these to the mechanics and other personnel, packing and shipping materials and equipment, and keeping records and inventory controls. In the larger stock rooms, different groups of clerks may specialize in different phases of the work.

In general, there are three grades of clerks: (1) those variously designated as apprentice, helper, or junior clerk; (2) senior clerks; and (3) the supervisory group, with titles such as lead stock clerk or station storekeeper. The first two groups perform the same tasks but work under varying degrees of supervision. Employees in the third category must also be able to perform these duties but are responsible, in addition, for supervising one or more sections of the stock and stores department.

There are also a few stock clerks in the larger nonscheduled flying services and other fixed-base operations. The general nature of the work is very similar to that in air-line stockrooms, but since the operations are on a much smaller scale, there is likely to be little if any specialization of work or distinction between grades of clerks. Often only one clerk is employed.

### *Qualifications for Employment*

There are no legal requirements for work in this occupation, and the standards used in hir-

ing junior clerks vary considerably from one carrier to another. Some air lines require a high-school diploma; others do not; and still others prefer applicants with some college or business-school education. Ability to read and to write legibly is always essential. The minimum age limit is usually 18; the maximum may vary from 35 to 50. On a few air lines, passing of a physical examination is necessary. Previous clerical experience, especially in aircraft or automotive stock and stores work, is always an asset, sometimes a prerequisite for the job. In general, positions above the level of junior clerk are filled by promotions from within the company.

Outside the air lines, there is even less standardization of hiring policies. Men with the education, experience, and other qualifications outlined will no doubt have an advantage in applying for jobs in fixed-base operations as well as with the major lines.

Veterans who were aviation stock clerks in the armed forces will receive particular consideration for comparable civilian work, if they are qualified in other respects. Already, a number of men with this background have been hired by the air lines for stock and stores jobs.

## Ground Radio and Teletype Operators

### *Duties*

Practically all ground radio operators and teletypists in the field of aviation are employed either by the air lines or by CAA.

Radio operators working for the air lines send and receive messages between the aircraft and the ground and also between different stations and offices of the particular air line. They may use radiotelephone, radiotelegraph, or both. Messages received are usually typed and a log is kept of them in accordance with Government regulations. Senior operators are generally required to do routine servicing of equipment and make necessary adjustments.

In air-line ground communications, radiotelegraph is being replaced more and more by teletype. Operators of this kind of equipment use a machine which has a keyboard very similar to that of the typewriter and which is electrically connected to a machine of the same kind

at another sending and receiving point. To send messages, the worker operates the keyboard just as in regular typing. Receiving communications merely involves arranging in letter form the strips of paper bearing the messages.

The CAA employs considerable numbers of radio operators and teletypists in "aircraft communicator" positions. The radio operators relay to aircraft information on weather conditions, location, and other factors of interest to pilots of planes flying over the airways. The teletypists handle ground communications on the same subjects. In the higher-grade aircraft-communicator positions, employees may also be called upon to do work in compiling and interpreting data which involves some knowledge of navigation, meteorology, and air-traffic-control methods.

### *Qualifications for Employment*

#### *Air-line positions*

For air-line radio-operator positions, applicants must usually have at least a second-class radiotelephone or radiotelegraph license from the FCC. Table 2 gives the requirements for these licenses. Many lines also insist on a typing speed of 40 or 45 words a minute. High-school graduates are preferred, and ability to spell correctly is essential. For positions involving use of radiotelephone—as do practically all air-line radio-operator jobs—clear and correct speech and normal hearing are additional "musts," and all would-be operators have to know or be able to learn CAA, FCC, and company rules and regulations pertaining to their work. In general, only men are hired, and age limits are frequently set, though these vary widely. One line, for example, specifies 21 to 35 years of age; another, 18 to 50.

The chief requirements for teletype operator jobs are with respect to typing ability and education. Typing speeds required by most of the carriers range from 35 to 45 words per minute. A speed of not less than 10 words per minute in reading teletype tape is likely to be demanded also, either as a hiring requirement or after 6 months' service. Often, 2 to 4 years of high school is a prerequisite. Both men and women



BY COURTESY OF UNITED AIR LINES.

Teletype operators in an air-line communications center.

are hired. With respect to age, there are no uniform standards, but some lines set a minimum of 18 to 21 and a maximum of 35 or thereabouts.

### CAA positions

Aircraft communicators, like other CAA employees, have civil service jobs. To be admitted to the competitive examinations which will be held for these positions or to qualify for temporary appointments in the meantime, applicants should be between 18 and 40 years of age, although these age limits may be waived in the case of veterans.<sup>17</sup> The most important physical requirements are good vision and hearing (meeting specified standards) and clear speech. These requirements are never waived.

Newcomers to aircraft communicator work are usually hired as trainees but sometimes directly for higher-grade jobs. The Civil Service Commission requires *one* of the following alternative types of experience for admission to the examinations for trainee positions or temporary appointments at this level: (1) 1 year of aeronautical communications or air-

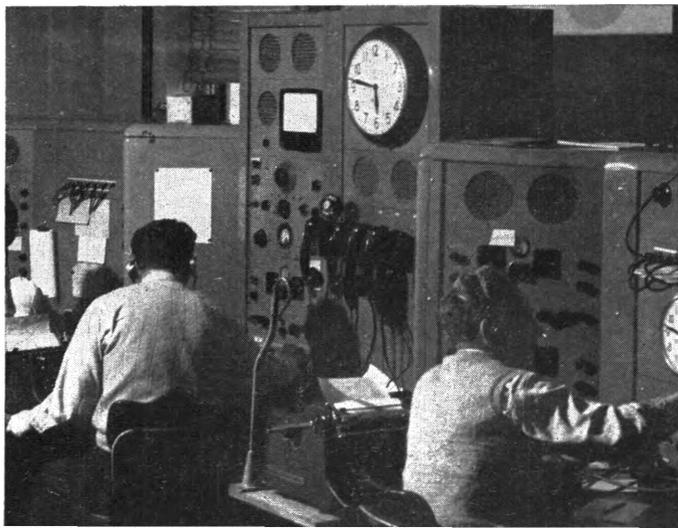
<sup>17</sup> This and following information regarding requirements for aircraft-communicator jobs is based on Civil Aeronautics Administration, *Outline of Aircraft Communicator Examination Specifications*, CAF-4 and CAF-5. Washington, November 1, 1945. Mimeographed.

traffic-controller experience, military or commercial; (2) 18 months of non-aeronautical radio communications experience; (3) 6 months of dispatcher experience, military or commercial; (4) 150 hours of flight radio operation; (5) 100 hours of flying time as a pilot, co-pilot, or navigator, military or air line, or a valid pilot certificate of commercial or higher grade; (6) 6 months' study of aeronautical meteorology or navigation at an approved school; (7) successful completion of a War Training Service ground course—elementary, secondary, and cross-country; or (8) 2 years' study at a recognized college or university.

For higher-grade positions, experience of any one of these same types except the last is acceptable, but it must be of longer duration. For example, 18 months in aeronautical communications work are required for "assistant" jobs as against 1 year for trainees. Moreover, applicants must not only meet the experience requirement but be able to send and receive Morse code at a speed of at least 15 words per minute and have a minimum typing speed of 35 words per minute. They must also take a code test and a written examination covering such subjects as fundamentals of airway weather reports and weather-reporting instruments, the Civil Air Regulations, radiotelephone procedures, and navigation principles. For jobs above the level of assistant, a CAA certificate is required, and openings are practically always filled by promotions from within.

Radio operators at work in a CAA communications center.

BY COURTESY OF CIVIL AERONAUTICS ADMINISTRATION.



### *Relationship of military experience to civilian requirements*

Army- and Navy-trained radio operators and teletypists will generally be able to meet the requirements for air-line jobs, provided that they have the needed typing skill. Most of them can also qualify for CAA aircraft-communicator positions, at least as trainees and sometimes as assistants. The CAA definitely invites persons with physical handicaps which do not involve vision, hearing, or speech defects and which they think will not affect their work performance to apply for such positions. It must be emphasized, however, that openings both with the air lines and the CAA may be fewer than the numbers of radio-operator veterans seeking work. In the case of CAA jobs, there will of course be additional competition from persons with the other types of experience listed.

## **Airport and Airway Traffic Controllers**

### *Duties*

#### *Airport traffic controllers*

Most airport traffic-control tower operators are now employed by the CAA's Federal Airways Service though assigned to particular airports. The remainder are on airport pay rolls.

It is the responsibility of these operators to supervise all flights within a carefully defined "flight control area" around their airport. They issue directions by radio to planes taking off, landing, and flying within the area, including instructions as to course and flying levels as well as when to take off and land. Planes without radios are signalled by means of electric-ray guns or flags. Other tasks include giving weather and position information to planes in the vicinity and keeping records of messages received from aircraft for inspection by the proper authorities.

"Senior operators" have responsibility for all aspects of the work. "Junior operators" (considered to be in training for senior positions) assist them in specific duties. In their supervisory capacity, the senior controllers are also responsible for seeing that all airport light-

ing and all communications and other facilities are kept in good condition and that information regarding flights is regularly obtained from and relayed to airways traffic-control centers in the vicinity.

#### *Airway traffic controllers*

All workers in this category are CAA employees. They operate "control centers" located at strategic points on the airways, which regulate air traffic outside the flight-control areas around airports. The controllers do not communicate directly with planes but constantly receive information regarding the progress of flights and related matters from air-line dispatchers, airport traffic controllers, other control centers, and CAA communications stations. In return, instructions, advice, and information are given as to the conditions under which flights may be commenced or continued and as to the progress of flights under way. Telephone, interphone, and teletype equipment is used in transmitting these messages.

### *Qualifications for Employment*

#### *Legal requirements*

All traffic-control tower operators, whether employed by CAA or by an airport, must have a CAA certificate, good only for duty at the particular airport specified therein. To qualify for a certificate, an applicant must be at least 21 years of age, a citizen of the United States or a friendly foreign government, and able to read and write English and speak it clearly. He must also pass a rigid physical examination, meeting second-class standards prescribed by Part 29 of the Civil Air Regulations. To hold his certificate, he will have to pass an equally strict physical examination once every year thereafter.

Both junior and senior ratings are issued, the former authorizing the holder to control air traffic only under supervision of a senior operator (except in emergencies). For a junior rating, there are no experience requirements. However, the applicant must take a written examination given by CAA, covering such subjects as airport and airway traffic and radio

procedures, weather observation, pertinent FCC rules and regulations, certain provisions of the Civil Air Regulations, the rules of the airport for which the rating is sought, the tele-type symbols and weather sequences of the airways converging on it, and aircraft operations in the area.

The examinations for a senior rating cover all the subjects required for one of junior grade and in addition test the applicant's knowledge of instrument approach and departure procedures at the given airport, of air-navigation facilities within a 200-mile radius of it, and of airway traffic-control procedures in the area. Moreover, persons seeking a senior rating must have had satisfactory experience of *one* of the following types: (1) 6 months as a senior operator at any airport; (2) 6 months as a junior operator at the particular airport; (3) 6 months as a Federal air-traffic control trainee; (4) 1 of the 2 years preceding application as a junior operator at another airport or at a landing area under military or naval jurisdiction. Finally, the applicant must give a practical demonstration of his ability to supervise all activities of his airport control tower.

#### ***Employer standards***

Information on hand permits a discussion only of Federal Civil Service Commission standards for CAA traffic-controller jobs, but airports employing control-tower operators are likely to have similar requirements.

For admission to the civil service examinations for trainee positions in either airport or airway traffic-control work or for temporary appointments of this type, the minimum experience requirement is *one* of the following: (1) 1 year's service in military aeronautical

meteorological or communications work or as an air-crew member in the armed forces; (2) 9 months as a dispatcher at a military base; (3) 200 hours of flying time, plus a currently effective pilot certificate (except when the flying time was acquired in the armed services); or (4) 1 year of college credits.

For the assistant classifications, there are similar requirements except that the experience must have been longer. For example, 2 (instead of 1) years' service in aeronautical meteorological work is needed to qualify for assistant airport traffic-control jobs, and 3 years for assistant airway controller positions. Jobs at grades higher than "trainee" and "assistant" are filled mainly by promotion from within, though sometimes by direct appointment. In any case, no person may hold a status in airport work higher than that of trainee without the CAA rating previously discussed.

As in the case of aircraft communicator jobs, there are age limits and requirements respecting physical condition for all traffic-controller positions.

#### ***Relationship of military experience to civilian requirements***

Men trained as air-traffic control-tower operators in the armed forces will generally be able to qualify as civilian airport and airway traffic controllers at one level of responsibility or another. The duties of military and naval operators are very similar to those of the civilian operators, as was recognized in establishing the specifications for civil service jobs cited above. It should be noted, however, that men with many types of aeronautical experience besides traffic-control work may also qualify for these jobs.

## Chapter 2.—Hours of Work, Earnings, and Vacations

What earnings and working conditions can a man expect as a pilot or in some other aviation occupation? This will depend first of all, on who his prospective employer is. The present chapter is therefore divided into three major sections, dealing with the air lines, with nonscheduled flying services and other fixed-base operations, and with the CAA, the main Government employer of nonmilitary aviation personnel.<sup>1</sup>

Wages and working conditions with the air lines have been considerably standardized through collective bargaining, legal controls over the working hours of some groups, and wartime wage stabilization policies, aided by the fact that this is a relatively small and closely knit industry. It is therefore possible to give a reasonably good over-all picture of the conditions applying to air-line personnel, even though no comprehensive statistical study of this subject has been made in recent years. The major sources relied on are unpublished data compiled by the Railway Labor Panel in connection with its administration of the wage-stabilization program, union contracts, and interviews with company and union officials.

To provide a basis for sketching the much less standardized working conditions and earnings of fixed-base operators and their employees, visits were made to a small number of operations in northeastern metropolitan areas. The information thus obtained was used to supplement the meager data available with regard to this segment of aviation activities. Statements as to the salaries and other working conditions of CAA personnel come from published and unpublished information made available by that agency.

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<sup>1</sup> Working conditions of aviation personnel employed by other Government agencies, by private companies not in an aviation business, and by aircraft manufacturers are not discussed. However, as indicated in the previous report (Bulletin No. 837-1), none of these fields will offer a substantial number of job opportunities for flight or ground personnel during the next few years.

### Air lines

#### Hours of Work

##### Pilots

The flight-hours of air-line pilots have been legally restricted in the interest of public safety since 1931, when the air-transport industry was but 5 years old. At that time, a flight-time limitation of 110 hours a month was put into effect for captains in domestic operations. In 1934, 85 hours of flying became the monthly maximum for both pilots and co-pilots on domestic routes,<sup>2</sup> and this has remained the peacetime standard ever since.

During the war (in April 1942), the act was amended to allow 100 hours of flying per month and also, with CAB authorization, whatever time is necessary "to complete a particular flight for military purposes." However, this amendment remains in force only until 6 months after the official termination of hostilities, and even during the war the air lines took advantage of the 100-hour provision only to the extent that wartime emergency conditions made necessary. Many company officials, as well as the Air Line Pilots' Association, believe that if flight time exceeds 85 hours a month, the pilot's efficiency is likely to be adversely affected. Actual flying hours are generally even fewer—seldom over 80 hours a month in normal times; in order to stay within the 85-hour limit, it is necessary to stop short of the maximum in assigning pilots to flights.

In international operations also, pilots' flying hours are unlikely to average more than 85 a month in the future, although they were often much longer than this during the war, especially in military contract operations. How-

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<sup>2</sup> Under Decision 83 of the National Labor Board and later under the Civil Aeronautics Act of 1938. The phraseology of Decision 83 does not clearly include co-pilots, but such was the intent and it was so construed and acted upon by the air lines.

ever, there will no doubt continue to be irregularity in hours from month to month. In this branch of the industry, men frequently fly more than 85 hours in 1 month in order to complete a long trip and then have correspondingly shorter hours later on.

The Civil Air Regulations make allowance for such irregularity, particularly when a relief crew is carried. Under provisions which are being reexamined and may perhaps be revised, no monthly limit is placed on the hours of pilots in aircraft having at least 3 pilots and either a flight engineer, a navigator, or a flight radio operator. However, in such circumstances, a pilot may not fly over 350 hours in any 90 days, nor over 1,000 hours in a year (1,200 hours during World War II and for 6 months thereafter). When only 2 pilots and an additional crew member (other than a steward) are carried, the pilot's flight time may not exceed 120 hours in any 30 days, 300 hours in any 90 days, nor 1,000 hours a year (with certain exceptions during the war period). Still more rigid limits are provided if the technical flight crew consists only of 1 or 2 pilots.<sup>3</sup>

Legal limits are also placed on daily and weekly flying hours. According to the Civil Air Regulations, a pilot in domestic operations may not be scheduled to fly more than 8 hours during any consecutive 24 without a rest period. If he exceeds this limit, as may easily happen when a flight is delayed owing to adverse wind conditions or when he has to spend a long time "in the stack" over an airport waiting for his turn to land, he must be given at least 24 hours of rest before being assigned any flight or ground duty. On a weekly basis, his flight-hours may not exceed 30, and he must be allowed at least 1 day of rest in every 7. In the case of pilots in international operations, rest periods are likewise required and limits are set on daily flying hours under some circumstances; but these requirements are more flexible than those applying to the domestic branch of the industry, especially when more than two pilots are carried.

No up-to-date statistics are available regarding the number of hours pilots have to spend on duty on the ground, either handling the

tasks outlined in the preceding chapter or waiting to take off when weather is bad or plane repairs are needed. Estimates of the amount of time thus consumed were, however, obtained from a number of company and trade-union officials. These ranged from "less than half as many hours as are spent in flight" to "close to an hour for every hour in the air."

#### *Other flight personnel*

The flying hours of flight engineers, navigators, and flight radio operators in international operations—in which all such workers except a few flight engineers are found at present—are governed by provisions already cited with respect to pilots. For all navigators, flight time is limited to 350 hours in any 90 days and 1,000 hours in a year (1,200 hours until 6 months after the war). These standards apply also to flight engineers on planes carrying two or more crew members in this occupation, and to flight radio operators under the same circumstances. When there is only one flight engineer or flight radio operator on the aircraft, his flight time is limited to 120 hours in 30 days, 300 hours in 90 days, and 1,000 hours in a year (with certain relaxations until 6 months after the war). In addition, specified rest periods must be given.

As these provisions suggest, workers in these occupations—like the pilots with whom they fly—tend to have irregular working hours, sometimes flying long hours 1 month and being permitted extra time off duty later on. Most men apparently average between 85 and 100 flying hours a month under peacetime conditions. In all three occupations, ground duties are less extensive and time-consuming than those of pilots. It has been estimated that navigators, for example, do only about 50 to 100 hours' work on the ground during a year.

There are no legal controls on the flight-hours of stewards and stewardesses, whose functions are not significantly related to flight safety. However, the flying hours of these workers appear to be very similar to those of the other flight personnel just discussed—about 85 to 100 hours a month, on the average, with some variation from 1 month to another. Stewardesses, as a rule, spend very little time in

<sup>3</sup> Civil Air Regulations amendment 41.0. Effective, September 1, 1945.

ground duties. This is true also of many stewards, although, as noted in the preceding chapter, men in this occupation have sometimes had to do considerable work between flights.

### *Ground personnel*

Until after the war ended, all ground personnel covered by this study, with the exception of dispatchers, were on an 8-hour day and a 48-hour, 6-day week throughout the air transport industry. In late 1945 and early 1946, however, the industry changed to a 40-hour week.

Mechanics and stock and stores employees, like all other personnel paid on an hourly basis, receive time and one-half for overtime above 40 hours, as they did for work above 48 hours under the old schedule. They are also paid time and one-half for work above 8 hours a day and, on some lines, double time for work above 12 hours and for any work on the seventh day in a week. These provisions have the effect of restricting overtime, which, even during the war, was the exception rather than the rule in air-line maintenance departments. For mechanics in domestic operations, overtime is further limited by the requirement of the Civil Air Regulations that they must have at least one full day (24 consecutive hours) off duty every week.

The normal workweek for dispatchers was usually 44 hours, in some instances 48 hours, at the end of 1945. It was subsequently lowered to 40 hours on a number of lines. Dispatchers have, however, an irregular workday; they are often on duty 9 or 9½ hours and sometimes even 10 to 12 hours. Although compensatory time off is given for overtime by some companies and extra pay by others, still others make no such provision. The requirements of the Civil Air Regulations with regard to dispatchers' working hours are very flexible and apply only to domestic operations. If a dispatcher in this branch of the industry is scheduled to be on duty more than 10 hours out of any 24, he must be given a rest period of at least 8 hours (with exceptions in emergencies). In addition, dispatchers must have the equivalent of 1 day of rest out of 7, which may be given at any time during the calendar month.

## *Earnings*

### *Pilots*

Air-line captains are the most highly paid of the occupational groups covered by this study.

The pay of captains in domestic operations, like their flight time, is still governed by Decision 83 of the National Labor Board, issued in 1934. The wage scale which this decision set up, and which was made the legal minimum for such captains by the Civil Aeronautics Act of 1938, consists of four elements: (1) "Annual base pay," beginning at \$1,600 and increasing \$200 with each year of service up to a maximum of \$3,000; (2) additional "hourly pay," which varies with the speed of the plane and is higher for night than for daytime flying; (3) additional "mileage pay"; and (4) on a few lines only, certain further differentials in hourly or mileage pay for flying over hazardous terrain.<sup>4</sup>

Typical earnings under this wage scale were about \$600 to \$850 a month in domestic flying at the end of 1945. In general, new captains earned about the minimum amount; those with long experience and therefore greater base pay approached the maximum. Though some variations occurred in earnings between men with the same length of experience—as a result of differing hourly or mileage pay—these were not of great importance for several reasons. Most captains were flying about the same number of hours a month; practically all the planes then in use were two-engine aircraft in the same speed class; and it is the policy of each air line to share the more remunerative night flying as evenly as possible among its captains.

This situation has been changed, however, by the introduction of four-engine aircraft on domestic routes. Since these planes are in

<sup>4</sup> Decisions of the National Labor Board, Part II, April 1934–July 1934, In the Matter of the Air Line Pilots' Wage Dispute, No. 83, decided May 10, 1934 (pp. 20–21). In July 1946, an emergency board (created by the President under the Railway Labor Act) found that the formula of Decision 83 was still an equitable method of computing pilots' pay. However, the board recommended that the speed brackets used in computing hourly pay be revised so as to provide higher pay for pilots flying very high-speed planes. An increase in mileage pay under certain circumstances was also recommended. When this bulletin went to press, the recommendations had not been put into general effect.

higher speed classes than the DC-3's and other two-motored air liners, their pilots receive higher hourly pay. In addition, the Air Line Pilots' Association is seeking a general upward revision in wage scales for pilots of four-engine planes and is in process of obtaining some increases.

Captains employed in overseas operations have, as a rule, higher earnings than those in the domestic branch of the industry, although the only legal requirement with regard to their pay is that it must be "not less, upon an annual basis, than the compensation required to be paid" for comparable service within the continental United States.<sup>5</sup> In late 1945 and early 1946, these men generally earned \$850 to \$1,100 a month<sup>6</sup> and their pay will probably be raised in the near future.

Co-pilots' pay, which represents the entry wage for all air-line pilot work, is only a fraction of the salary these men may expect to receive as captains. Under the salary schedules in effect in domestic flying at the end of 1945, co-pilots generally started out at \$220 a month (after completion of initial training, when pay was considerably less). An increase of \$20 a month was given every 6 months up to a maximum of \$380. However, many co-pilots never made this top figure as they were promoted to captain positions before the end of the 4 years required to reach it.

Pay scales of co-pilots, as in the case of captains, are generally higher and also much less standardized in international than in domestic operations. For example, late in 1945 one international carrier paid its new co-pilots \$250 a month and increased their salaries by \$25 every 6 months, up to a maximum of \$500. On another line, co-pilots received base pay of \$200 to \$360 a month, plus \$2.50 per flight-hour—which would, of course, mean monthly earnings of \$412 to \$572 for 85 hours of flying. These salaries and those of co-pilots flying four-motored planes on domestic routes are likely soon to be increased, along with the pay of captains on the same aircraft.

Pilots are often away from their home bases

<sup>5</sup> Civil Aeronautics Act of 1938, Title IV, section L (2).

<sup>6</sup> The figures quoted do not apply to pilots flying two-motored planes in Latin American service, who have about the same salary range as captains in domestic operations.

on duty at meal times or over night. On such occasions, the cost of their board and room is paid by the company, and they may be allowed \$1 a day for tips and other incidental expenses. Those stationed abroad receive special bonuses, varying in amount from company to company. To illustrate, one line gave a bonus of 15 percent of the pilots' salary for foreign service in 1945; another line, one of 10 percent. Still another varies the bonus according to the cost of living at the station and pays extra if the location is particularly undesirable.

#### *Other flight personnel*

Typical monthly earnings of other technical flight personnel late in 1945 were as follows: Navigators, \$325 to \$500; flight engineers, \$250 to \$500; and flight radio operators, \$250 to \$450.

The lower figures represent in each case the usual beginning salary of a fully qualified worker; men in training received still lower salaries in some instances. The higher figures represent the usual, though not the universal, top salary in the occupation. Workers in each of these occupations (like pilots) receive regular salary increases. In addition, a distinction is generally made between junior and senior employees or other grades, each category having a separate salary range within the broad range of earnings indicated.

Stewards and stewardesses have considerably lower earnings than do the other, much more highly skilled members of the crew. In the latter part of 1945, stewards in international operations, in which the great majority of men in this occupation are employed, generally had an initial salary of about \$170 a month and received regular increases up to a maximum of about \$235 after several years on the job. Stewardesses in overseas flying had much the same beginning salary, but they could not look forward to such large increases. For the much larger number of stewardesses on domestic routes, the starting salary was only about \$125 or \$130 late in 1945; the top salary, reached after several years of service, about \$165 to \$180. After that time, however, some domestic air lines, especially the larger ones, raised the minimum rate for hostesses to about

\$140 or \$150; the maximum, to about \$200 or slightly more.

In addition to their salaries, all these employees receive bonuses for foreign service and have their living expenses paid when they are away from base of duty. Such provisions are the same as those for pilots, discussed above.

#### *Dispatchers and meteorologists*

Dispatchers are the most highly paid of the various groups of ground personnel covered by the study—as would be expected in view of their heavy responsibility for safe and efficient flight operations and the extensive training and experience which is necessary for their jobs. The usual beginning salary of licensed dispatchers was about \$250 a month late in 1945, with provisions for regular increases up to a maximum of \$450 or \$500. Assistant dispatchers earned somewhat less.

Meteorologists are classified as junior and senior employees. The usual salary for the junior classification was \$150 to \$200, depending largely on length of experience; for the senior group, \$200 to \$300 or slightly more was paid.

Dispatchers occasionally have to be away from their domiciles on duty. Under such circumstances they receive their living expenses, as do flight personnel. Those stationed abroad likewise receive foreign-service bonuses.

#### *Mechanics, stock clerks, and ground communications operators*

Air-line maintenance employees are paid on an hourly basis. At the end of the war, typical hourly wages for the various grades of mechanics were as follows: Apprentices and junior mechanics or helpers, 60 to 90 cents; mechanics and specialists, \$1.00 to \$1.10; senior mechanics, \$1.10 to \$1.20; master mechanics, \$1.20 to \$1.30; inspectors and crew chiefs, \$1.25 to \$1.35. In each of these classifications, employees without previous experience at the given grade started at the bottom rate and received increases on a "longevity" basis. Weekly earnings for a 48-hour week—the standard workweek at the time these rates

were in force—were \$28.80 to \$43.20 for apprentices and helpers, \$48 to \$52.80 for mechanics and specialists, up to \$60 to \$64.80 for inspectors and crew chiefs. As already indicated, however, the industry has since then changed to a 40-hour week. This change was accompanied by an increase in wage rates to maintain at least the same weekly pay. The mechanics' unions are urging still larger rate raises and have in many instances already obtained such increases. The beginning wage for apprentices, for example, is now 72 to 78 cents an hour or slightly higher on most major lines; the usual starting rate for mechanics and specialists is \$1.20 or \$1.26 an hour.

Stock and stores clerks, who are also in the maintenance departments, are likewise paid on an hourly basis. As of VJ-day, the typical beginning wage of a junior clerk was 55 to 60 cents an hour, and the usual top figure for nonsupervisory employees was 95 cents. Supervisory personnel earned more, averaging about 10 cents higher than senior clerks. Based on these rates, the earnings of nonsupervisory clerks for the prevailing 48-hour week ranged from \$26.40 to \$45.60. Currently, their weekly wages are at least as high as this for a 40-hour week, owing to recent compensatory rate raises like those received by mechanics; on some lines, the weekly wage for beginning clerks is now \$31.20. Moreover, the pay of stock and stores employees is often included in the unions' current efforts to secure higher wages for maintenance personnel.

Last among the groups of air-line employees covered by this study are ground communications operators. Radio operators employed on the ground earn only about half as much as flight radio operators—from about \$130 to about \$245 a month and sometimes higher in the latter part of 1945. This range included the salary scales for both junior and senior operators. Supervisors were not covered but had earnings well above the indicated maximum.

Monthly earnings of teletype operators began at a slightly lower figure than the entry rate for radio operators. The typical range was from about \$125 to about \$160, depending on length of experience, and extra compensation was given for supervisory duties.

Since maintenance and ground communications personnel are not generally required to be away from their domiciles on duty, the problem of living expenses when away from base does not arise. However, some employees in these departments are stationed abroad, in which case they receive the same bonuses for foreign service as are given to the other air-line employees previously discussed.

### ***Vacation and Leave Provisions***

Among the benefits of air-line employment are relatively liberal vacation-with-pay and leave policies. These vary from carrier to carrier and job to job. For all occupational groups in domestic operations, the most common provision is 2 weeks' paid vacation after 1 year of service. In international operations, however, flight and foreign-based personnel usually receive a month's vacation. Other illustrative provisions are 1 or 2 weeks after 6 months of service, 1 day for each month of continuous employment, or 2 weeks after 2 years of service.

Vacations may usually be taken when desired, if conditions permit. Vacations that are not taken during the year are not cumulative, unless postponed at the request of the employer. Sometimes, extra pay in lieu of vacation may be granted.

In addition to paid vacations, employees are customarily given holidays off with pay. When holiday work is required, employees paid on an hourly basis are generally compensated at double-time rates. Provision is usually made also for some sick leave with full or part pay and for leaves of absence under specified circumstances. Even very prolonged leaves-without-pay may sometimes be taken without loss of seniority.

### ***Fixed-Base Operators***

Pilots and mechanics taking jobs in non-scheduled flying services and other fixed-base operations will find relatively informal employer-employee relationships. These enterprises are, in general, the "small business" activities of aviation. Much self-employment exists, and there is little standardization of wages and working conditions. For these rea-

sons and also because the statistical information available is very limited, only a few highlights can be given with regard to employment conditions.

### ***Hours of Work***

"This is a 7-day week business if ever there was one," according to one fixed-base operator. In the typical small operation catering to the general public, the owner has to be on hand to receive customers at any and all hours convenient to them. His hours of peak activity are usually in the late afternoons and evenings and over week ends, especially if his business includes flight instruction but also if he garages and services private planes, has a sales agency, or takes passengers on taxi and sightseeing flights. At other times, his business may be light; nevertheless he often has to be at the airport to oversee work that is going on and to attend to many business details.

Pilots on the staff of nonscheduled flying services and flying schools are also likely to spend long and very irregular hours at the airport, although usually not as many as do the operators themselves. Under the Civil Air Regulations, a flight instructor may not give more than 8 hours of dual flight instruction a day nor more than 36 hours a week. There is no legal control over working hours in other types of nonscheduled flying, and the pilots often have to spend considerable time at the airport waiting for work. On the other hand, they frequently have one or more days off in bad weather, especially during the winter.

For mechanics, the most usual workweek in fixed-base operations appears to be 48 hours, although in 1945 their weekly working time varied from 40 to 56 hours or more in several northeastern metropolitan areas. Usually they receive 1 day off a week—generally on a weekday, since in most operations their work, like that of the pilots, is heaviest at the week-end peak in private flying. This does not hold true, however, for repair shops specializing in overhaul work and major repairs, where the men often have Sunday off. When overtime is necessary, the mechanics may receive compensatory time off or straight-time pay. Premium pay for overtime appears to be less common in fixed-base operations than with the air lines.

## Earnings

The pilot who starts his own flying service and the mechanic who opens a repair shop take risks typical of small business ventures of all types. Some sustain losses and may even be forced out of business. Others make substantial profits. Many factors influence an operator's chances of success—among them, the amount of capital invested, the type of operation, its location with respect to population centers, the individual's business and technical abilities, and how many hours of work he is willing to put in.

In 1940, fixed-base operators had, on the average, a net revenue for the year of \$3,148.<sup>7</sup> However, this is a national average and hides the differences in income among individual operators. That the variations are wide is illustrated by 1945 data for certain operators in northeastern metropolitan areas who reported a net monthly income of from \$300 to \$1,500 (the top figure representing earnings from operations at two different airports).

Some operators pay the pilots on their staffs a monthly salary. Others pay them an hourly rate, which was generally \$3 for flight instructors and \$4 to \$6 for "charter" pilots in the flying services for which 1945 data were obtained. Before the war, pilots' yearly earnings were estimated to range from a minimum of \$960 up to many times that amount.<sup>8</sup> In 1945, the range of pilots' earnings in the establishments surveyed was about \$3,000 to \$5,000 a year; it was reported that in some other operations pilots were making much more. Earnings vary with the location and prosperity of the enterprise and, for men paid an hourly rate, the policy of the operator as to the number of pilots employed. Some operators believe that continuous use of a small number of pilots and planes is more profitable, while others hold that it is better to divide the business among a greater number of employees and aircraft. Whatever the merits of each policy from the viewpoint

<sup>7</sup> U. S. Civil Aeronautics Board, Docket No. 857: Local-Feeder-Pickup Air Services, Statement of Economic Bureau, by Raymond W. Stough, September 28, 1943, Appendix 5.

<sup>8</sup> Follett, Ben: *Careers in Aviation* (Waverly House, Boston, Mass.) 1945, p. 76.

of profits, to the pilot the former practice means, of course, more work and higher earnings.

Mechanics employed in fixed-base operations are generally paid hourly rates as in the air lines; a few receive monthly salaries. For apprentices and helpers, wages ranged from 50 to 75 cents an hour in 1945 in the operations surveyed. Mechanics received about \$1.20 to \$1.40 an hour, and foremen still more—in the few operations large enough to have an employee in this category. The rates reported for skilled mechanics were higher than those paid by the air lines in 1945 to "senior mechanics" and, in some instances, even above those then paid to air-line "master mechanics," inspectors, and crew chiefs. Often, the smallest operations, with only one or two mechanics, paid the highest wages, since they had to have men who were skilled enough to handle work on any part of a plane and its equipment and on many different types of aircraft.

## Civil Aeronautics Administration

Like other Federal employees, CAA personnel now have a basic 40-hour, 5-day week. However, longer hours are sometimes necessary. Aircraft communicators and airway traffic controllers in field offices, for example, often have to work 44 or 45 hours a week. Overtime beyond this point is rare under peacetime conditions. Although there is a legal restriction on working hours only for airport traffic controllers this restriction is far from rigid. Under the Civil Air Regulations, an airport traffic-control tower operator must not work over 10 hours consecutively and must be given at least 1 full day off out of every 7, except in emergencies.

It is estimated that aeronautical inspectors usually spend 17 to 21 hours a week in flying, the remainder of the 40 hours in work on the ground. CAA pilots other than inspectors fly anywhere from 60 or 70 up to 100 hours a month, depending largely on the season of the year.

Minimum annual salaries in the occupations covered by the study are as follows:

	Minimum annual salaries <sup>1</sup>	
	Lowest grade	Highest grade
Aeronautical inspectors .....	\$4,526	\$5,905
Air carrier inspectors (operations) ..	4,150	5,905
Airplane pilots .....	4,902	(2)
Aircraft inspectors .....	4,150	5,905
Air carrier inspectors (maintenance)	4,150	5,905
Aircraft and engine mechanics.....	2,469	3,397
Aircraft communicators .....	2,168	4,150
Airport traffic controllers.....	2,645	4,150
Airway traffic controllers.....	2,645	4,526

<sup>1</sup> Figures are rounded to nearest dollar.

<sup>2</sup> There is only one grade of airplane pilot.

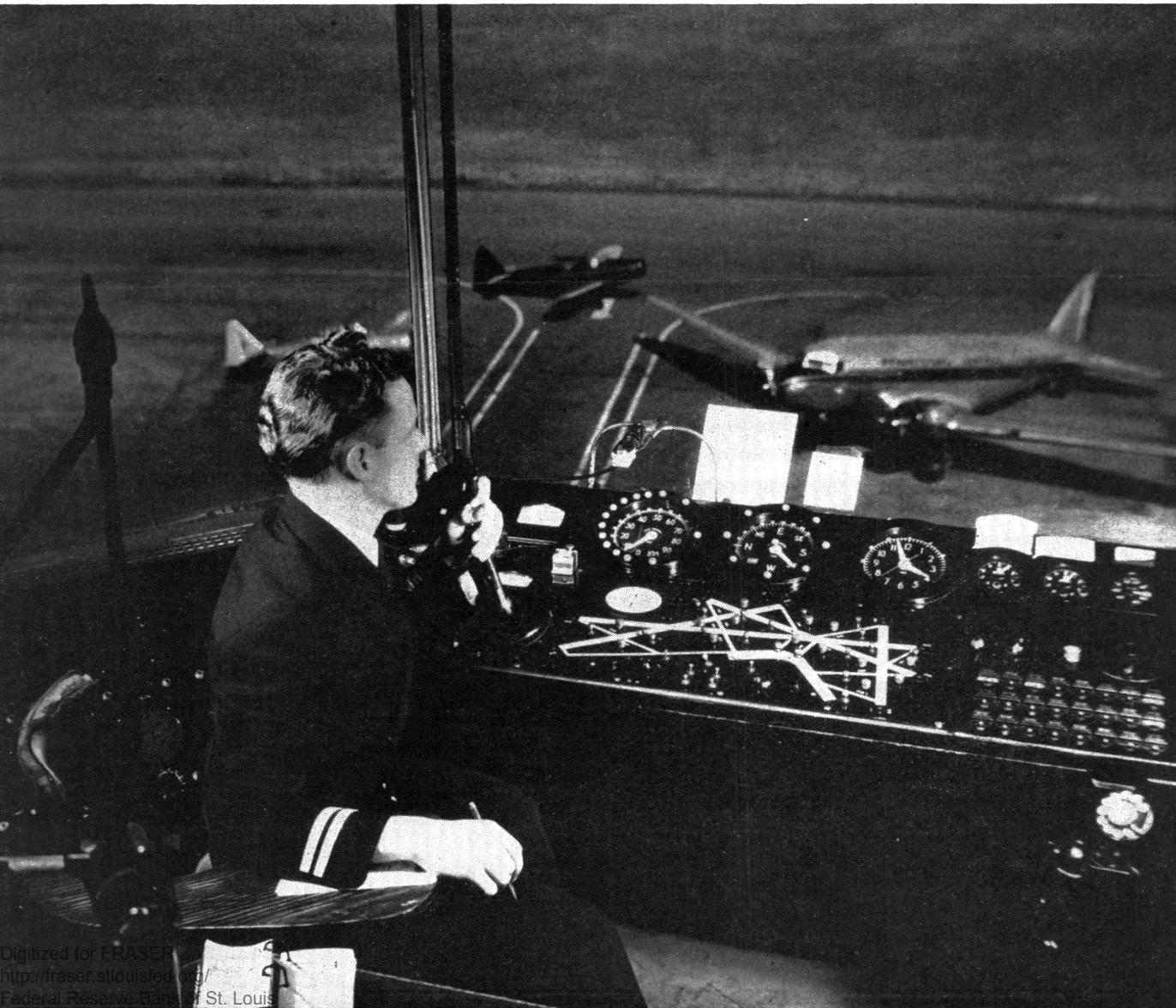
For men with pilot experience (the first 3 groups), minimum salaries range from \$4,150 to \$5,905 a year, depending upon the grade of position; for men with mechanic experience

(the next 3 groups), the range is from \$2,469 to \$5,905. The largest number of aircraft communicators are in a grade with a starting salary of \$3,397. In addition, "within-grade increases" of \$75 to \$239 a year are given every 12 or 18 months, depending on the grade, to these as to all civil service employees. Extra pay is given also for overtime above 40 hours.

Other Government employment policies include 8 legal holidays, 26 days of "annual leave" and 15 days of sick leave per year, all with pay. Both annual and sick leave may be cumulated from year to year up to certain limits. Leave without pay may also be given for justifiable reasons.

An airport traffic controller giving instructions to a pilot by radiotelephone.

BY COURTESY OF CIVIL AERONAUTICS ADMINISTRATION.



## Chapter 3.—Labor Organization

Air-line pilots and mechanics are highly organized. Their unions have negotiated collective-bargaining agreements with all the interstate and international carriers except one small mail and cargo line. Virtually all the other groups of air-line employees covered by the study are organized to some extent. In non-scheduled flying and related aviation services, however, there is as yet little or no labor organization.

All employees of air lines engaged in interstate or foreign commerce or in transporting the United States mail are guaranteed, by a 1936 amendment to the Railway Labor Act, the right to organize and bargain collectively through representatives of their own choosing. By June 30, 1937, only two air lines had signed union contracts (covering mechanics and radio operators). Since that time, unionization and collective bargaining in the industry has increased steadily. On the other hand, the Railway Labor Act is officially interpreted as forbidding closed-shop agreements on the air lines, as on the railroads. This means, of course, that some employees covered by union contracts may not be union members.

The union agreements, for the occupational groups covered by this study, in effect on each air line are summarized in table 3. Pilots, as the table shows, are represented exclusively by the Air Line Pilots Association (AFL). To qualify for membership in this union, the applicant must be a person of lawful age and good moral character who has served for at least a year as a pilot or co-pilot on scheduled air-carrier aircraft in intrastate, interstate, overseas, or foreign commerce.<sup>1</sup> The great majority of eligible pilots, belong to ALPA.

Organization of other flight personnel is much less widespread. Stewards and stewardesses are covered by agreements on only one line, being represented on one division of the line by the International Association of Machinists (now technically unaffiliated) and on another by a system association (made up of employees of that particular line only). Navigators have a union of their own, the National Air Line Navigators Association, unaffiliated. On one line, navigators are covered by an agreement with a branch of this association;

<sup>1</sup> Constitution and By-Laws of the Air Line Pilots' Association.

Table 3.—Collective labor agreements and employee representation on principal air lines, for selected occupations<sup>1</sup>

Air line	Pilots and co-pilots	Other flight personnel	Mechanics	Stock and store employees	Dispatchers	Ground radio operators
American.....	ALPA	ALMD <sup>2</sup>	TWU	TWU		ALCEA
American Overseas.....	ALPA	SA <sup>3</sup> , AAN <sup>4</sup>	ALMD	ALMD	ALDA	ALCEA
Bruniff.....	ALPA		ALMD	ALMD		
Colonial.....	ALPA		IAM	IAM	ALDA	
Chicago and Southern.....	ALPA		ALMD	ALMD		
Continental.....	ALPA		ALMD		ALDA	
Delta.....	ALPA		ALMD			
Eastern.....	ALPA		IAM	IAM		
Inland.....	ALPA		ALMD		ALDA	
Mid-Continent.....	ALPA		ALMD	ALMD	ALDA	ALCEA
National.....	ALPA		IAM	IAM		
Northeast.....	ALPA		IAM		ALDA	
Northwest.....	ALPA		IAM	ALMD	ALDA	ALCEA
Pan American.....	ALPA	SA <sup>3</sup> , IAM <sup>4</sup> , SA <sup>4</sup>	TWU	IAM		
Pennsylvania-Central (Capital).....	ALPA		IAM	ALMD	ALDA	
Transcontinental and Western.....	ALPA	ALFEA <sup>2</sup>	IAM	SA		SA
United.....	ALPA	SA <sup>3</sup>	IAM	ATEU	ALDA	
Western.....	ALPA		ALMD		ALDA	

<sup>1</sup> Based upon unpublished data from the National Mediation Board. Information as of April 1, 1946, except in the case of mechanics on American Airlines who have been represented by TWU only since July.

<sup>2</sup> Flight engineers.

<sup>3</sup> Navigators.

<sup>4</sup> Stewards and stewardesses.

AAN—Association of Air Navigators, a member council of the National Air Line Navigators Association  
 ALCEA—Airline Communications Employees Association (ACA-CIO)  
 ALDA—Air Line Dispatchers Association (AFL)  
 ALFEA—Air Line Flight Engineers Association (AFL)  
 ALMD—Air Line Mechanics Department (UAW-CIO)

ALPA—Air Line Pilots Association (AFL)  
 ATEU—Air Transport Employees Union (UMW-AFL)  
 IAM—International Association of Machinists  
 SA—System Association  
 TWU—Transport Workers Union (CIO)

on another, by an agreement with a system association. Flight engineers are represented on one air line by the Air Line Mechanics Department (UAW-CIO); on one by the Air Line Flight Engineers Association (AFL); and on two lines by system associations. Flight radio operators are not covered by an agreement on any line now employing such personnel.

Among the mechanics, organization is as widespread as among the pilots but several different unions are involved. The Air Line Mechanics Department (UAW-CIO)<sup>2</sup> has system-wide agreements covering mechanics on eight air lines. The International Association of Machinists has agreements with eight carriers. In addition, as a result of recent elections, mechanics on two lines are represented by the Transport Workers Union (CIO). These unions take into membership all grades of mechanics, from apprentices and helpers through crew chiefs, and in addition may organize many other occupational groups in the maintenance and other departments. Stock and stores employees are represented on six lines by the ALMD, on three by the IAM, and on three others by three different labor organizations—the Transport Workers Union, the Air Transport Employees' Union (a division of District 50, United Mine Workers, AFL) and a system association.

The Air Line Dispatchers Association, another AFL affiliate, has negotiated con-

tracts with 10 lines covering both licensed and assistant dispatchers. Of the other occupations studied, meteorologists do not have union representation on any line. Radio operators, on the other hand, are represented on four lines by the Air Line Communication Employees Association (now affiliated with the American Communications Association, CIO) and on another by a system association. The ALCEA contracts usually cover not only radio operators but also teletypists and sometimes radio mechanics assigned to work on ground transmitting equipment. On the other hand, radio mechanics working on air-borne equipment are generally represented by the mechanics' unions.

Judging from recent experience, there will, in the next few years, be increasing organization of the groups not now covered by collective-bargaining agreements on all lines. In addition, competition for membership is strong, especially among maintenance personnel, with both AFL and CIO unions and the IAM showing marked interest in the organization of air-line employees.

Initiation fees and dues required for membership in a number of the unions were recently as follows:<sup>3</sup>

	<i>Initiation fee</i>	<i>Dues</i>
<b>Air Line Pilots Association:</b>		
First pilots .....	\$100.00	\$100.00 per year
Reserve pilots .....	50.00	60.00 per year
Co-pilots .....	25.00	28.00 per year
Air Line Mechanics Department.....	12.00	21.50 per month
Air Line Communication Employees Association.....	5.00	1.00 per month
<b>International Association of Machinists<sup>3</sup>:</b>		
Mechanics and specialists .....	5.00	2.00 per month
Helpers .....	3.00	1.50 per month
Apprentices .....	2.50	1.25 per month
Transport Workers Union.....	3.00	41.75 per month
<b>Air-Line Dispatchers Association:</b>		
Dispatcher .....	30.00	50.00 per year
Junior dispatcher .....	20.00	530.00 per year

<sup>1</sup> Minimum.

<sup>2</sup> Members earning 71 cents per hour or over pay dues of \$1.50 per month. For those making only 70 cents or less, the dues rate is \$1.25.

<sup>3</sup> When a new local is being organized, the usual \$5 initiation fee for journeymen is replaced by a special \$3 organizing fee. Dues cited are those most often required; some locals have higher dues and some have lower ones.

<sup>2</sup> Before its affiliation with the United Automobile Workers (CIO) in 1945, this organization was known as the Air Line Mechanics Association.

<sup>3</sup> Based on information compiled by the Bureau's Industrial Relations Division.

<sup>4</sup> For members earning 77 cents per hour or more dues are not less than \$1.75 per month; for members earning less than 77 cents per hour dues are at least \$1.25.

<sup>5</sup> Dues are \$20 per year for junior dispatchers not covered by contract.

## Chapter 4.—Occupational Hazards and Related Problems

### Accident Hazards

During the 20 years since they began commercial operations, the air lines have had marked success in increasing flying safety. In the 3 years 1927–29, the average number of miles flown per pilot fatality was only 1.2 million; in 1943–45 it was 39.0 million.<sup>1</sup> The industry is “safety conscious” to a notable degree and makes constant efforts to reduce injury rates among both flight and ground personnel. Nevertheless, some air-line jobs still involve at least a moderate accident risk.

For all air-line occupations, the injury frequency rate (the number of disabling injuries per million man-hours of employment) was 19.01 in 1944, according to statistics compiled by the National Safety Council (table 4). The standard severity rate for the industry (the number of days lost per 1,000 man-hours of employment, including allowances for fatalities and permanent injuries, in accordance with a standard scale of time charges) was 2.29. Of the 39 industries for which the National Safety Council computed rates for 1944, only 11 had higher frequency rates and 8 had higher severity rates. Injuries were found to be less frequent but, on the average, more severe in air transport than in the “transit” industry (railroad, bus, and trolley transportation), which had an average frequency rate of 24.33 and an average severity rate of 1.88. These comparisons are of course based on the experience in only 1 year, the most recent for which rates are available, but are believed to be reasonably representative of the situation in the air-transport industry.

As would be expected—and as table 4 shows—severity rates are very much higher among flight personnel than other groups of air-line employees, because of the heavy time charge

<sup>1</sup> These figures exclude co-pilots and are for domestic operations only. It should be noted that plane speeds rose between 1927 and 1944 and that, as a result, the number of hours of exposure to hazard decreased somewhat relative to miles flown.

for each fatal accident. On the other hand, accidents resulting in temporary or permanent partial disabilities are most frequent among personnel in the line-maintenance and overhaul departments. Injuries to such personnel are often caused by the handling of heavy or bulky aircraft parts or equipment. Other causes of accidents include falls from ladders or stands used in working on the planes or from wings or catwalks; blasts of air from propellers, from which eye injuries may occur when employees neglect to wear goggles; and working near a plane and its moving propellers, which involves especial danger of head injuries.

Table 4.—Industrial injury rates in scheduled air transportation, by department <sup>1</sup>

Department	1943		1944	
	Frequency rate	Severity rate	Frequency rate	Severity rate
All departments.....	21.86	2.70	19.01	2.29
Flight personnel.....	10.13	12.12	16.85	21.06
Maintenance personnel <sup>2</sup> .....	38.01	.90	37.42	.75
Station employees <sup>3</sup> .....	12.26	.62	8.80	.09
General office and traffic personnel <sup>4</sup> .....	5.90	.53	4.55	.06

<sup>1</sup> Source—National Safety Council, *Accident Rates in the Transportation Industries 1943*, p. 15 (Chicago, 1944) and unpublished data for 1944.

<sup>2</sup> Takes in all personnel in line-maintenance departments and at overhaul bases, including supply departments.

<sup>3</sup> Includes all employees at locations on routes, such as restaurant workers, ticket agents, cargo handlers, and baggagemen.

<sup>4</sup> Includes executives, clerks, traffic managers, and similar occupations.

With regard to accident hazards in commercial aviation activities outside the air lines, little quantitative information is available. It is impossible to say, for example, whether injuries to flight personnel occur more often, relative to the number of flight-hours, in non-scheduled commercial and instructional flying than in air-line operations; but with regard to the number of miles flown, injuries are apparently more frequent in the former than in the latter type of flying. This comparison, however, is not a good measure of accident risk because air-line planes are so much faster than the small aircraft generally used in other aviation services. It is significant, nevertheless, that

most plane accidents outside the air lines have always resulted from errors on the part of flight personnel—such as disobedience of Civil Air Regulations, poor flying technique, carelessness or negligence, and mistakes in judgment—which are minimized by the rigorous training of personnel and systematic checking on all phases of operations insisted on by the air lines.

Injuries to ground personnel are both less frequent and less severe in fixed-base operations than with the air lines, according to the persons interviewed in connection with this study. The main reason given for the difference was that the planes and equipment on which mechanics work are so much smaller and lighter in the former operations than in scheduled air transport. The lack of a vigorous safety program such as is conducted by the major lines may, however, be somewhat of a counteracting factor in many small fixed-base operations.

## Health Problems

There are no special health problems in the ground occupations covered by this study. This was the unanimous opinion of the company and union officials interviewed. However, a number of persons emphasized the physical and nervous strain of flight jobs, especially with air lines. It was pointed out that, during flights, crews are exposed in varying degrees to constant vibration, noise, glare, poor ventilation, and rapid temperature changes. At high altitudes, they find even slight physical exertion (as in the serving of food) fatiguing. It was also stated that flight personnel tend to be subject to colds and, at least as beginners, to air-sickness. Illness among air-line employees is probably more quickly noticed and better recorded than among most other groups of workers, because of the attention paid by the carriers to their employees' health.

The air lines endeavor to provide clean and sanitary working environments and proper eating facilities. All flight personnel are given rigid physical examinations at regular intervals. In addition, workers are encouraged to take sick leave whenever needed. On some lines, men are retained on the pay roll for long periods of time while recuperating, particularly

in the case of occupationally incurred illness or injury.

In small fixed-base operations, health programs are in general much less highly developed and working conditions are likely to be less satisfactory than with the air lines; for example, some of the hangars cannot be closed up tightly and are not well heated in winter. Nevertheless, there is bound to be some emphasis on health at least for pilots, who have to pass periodic physical examinations in order to hold their certificates.

## Problem of Physical Disqualification

Men who are considering whether to choose flying as a vocation should not overlook the possibility of being disqualified for employment at some future date when they may fail to pass the required physical examinations. The problem of disqualification has not become acute as yet, because most men in aviation occupations are still comparatively young and because the air lines have been expanding so rapidly that they have not had much trouble finding ground jobs for men disqualified for flight work. However, this favorable situation will not continue indefinitely.

Air-line captains have been the group most affected so far. Physical standards are higher for work in this occupation than in any other aviation job. It must be remembered, however, that all commercial pilots and other flight personnel and certain groups of ground personnel, notably air traffic-control tower operators, also have to meet rigid physical requirements.

No satisfactory information is available on the number of years men are able to work in these occupations before being disqualified. Certainly, the period varies greatly from one individual to another. A few captains now employed by the air lines began as air-mail pilots right after the First World War and have been flying, year in and year out, since that time. A considerable number are over 40 years of age. On the other hand, it is unlikely that most men will be able to hold pilot or other flight jobs until the normal retirement age of 60 or 65. For many who wish to continue working until that age, a change in occupation will be necessary. This may involve reduced earnings and other difficult adjustments.

## ***Where to Apply for Jobs and Obtain Information on Openings***

Applications for air-line jobs should be sent to the personnel managers of the lines at the following addresses:

- Alaska Airlines, 501 Fifth Avenue, New York, N. Y.
- All American Aviation, Inc., 210 Greenhill Avenue, Wilmington 99, Del.
- American Airlines, Inc., 100 East 42d Street, New York 17, N. Y.
- American Overseas Airlines, Inc., 25 Broadway, New York 4, N. Y.
- Braniff Airways Inc., Love Field, Dallas 9, Tex.
- Capital Airlines Corporation, Washington National Airport, Washington 25, D. C.
- Chicago and Southern Air Lines, Inc., Memphis Municipal Airport, Memphis 2, Tenn.
- Colonial Airlines, Inc., New York Municipal Airport, Jackson Heights, Long Island, N. Y.
- Continental Air Lines, Inc., Stapleton Airfield, Denver, Colo.
- Delta Air Corporation, Atlanta Municipal Airport, Atlanta, Ga.
- Eastern Air Lines, Inc., 36th Street Airport, Miami 30, Fla.
- Inland Air Lines, Inc., Cheyenne Municipal Airport, Cheyenne, Wyo.
- Mid-Continent Airlines, Inc., Waltower Building, 102 East 9th Street, Kansas 6, Mo.
- National Airlines, Inc., Municipal Airport, Jacksonville, Fla.
- Northeast Airlines, Inc., Commonwealth Airport, Boston 28, Mass.
- Northwest Airlines, Inc., 1885 University Avenue, St. Paul 4, Minn.
- Pan American Airways, Inc., 135 East 42d Street, New York 17, N. Y.
- Pan American-Grace Airways, Inc., 135 East 42d Street, New York 17, N. Y.
- Transcontinental and Western Air, Inc., 101 West 11th Street, Kansas City 6, Mo.
- United Air Lines, Inc., 5959 South Cicero Avenue, Clearing Station, Chicago 38, Ill.
- Western Air Lines, Inc., Lockheed Air Terminal, Burbank, Calif.

Men interested in setting up their own flying services or repair shops should consult State aviation commissions and local chambers of commerce. Those wishing jobs with fixed-base operators should contact the operators in their areas or the local offices of the U. S. Employment Service. Information as to locations of air fields, repair stations, and flying schools can be obtained from the Office of Aviation Information, Civil Aeronautics Administration, Washington 25, D. C.

For information regarding CAA positions, address the Civil Aeronautics Administration or the Civil Service Commission, Washington 25, D. C., or any regional office of either agency.

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## Occupational Outlook Publications of the Bureau of Labor Statistics

This bulletin is one of a series of reports on employment trends and opportunities in the various occupations and professions, for use in the vocational guidance of veterans, young people in schools, and others considering the choice of an occupation. The reports describe the long-run outlook for employment in each occupation and give information on earnings, working conditions, and the training required.

Reports are usually first published in the *Monthly Labor Review* (subscription price per year, \$3.50) and are reprinted as bulletins. Both the *Monthly Labor Review* and the bulletins may be purchased from the Superintendent of Documents, Washington 25, D. C. Following is a list of other bulletins in the series, with their prices and with the dates of the publication of articles in the *Monthly Labor Review*:

*Employment Opportunities for Diesel-Engine Mechanics.*

Bulletin No. 813 (1945), price 5 cents. (*Monthly Labor Review*, February 1945.)

*Occupational Data for Counselors: A Handbook of Census Information Selected for Use in Guidance.*

Bulletin No. 817 (1945), price 10 cents. (Prepared jointly with the U. S. Office of Education.)

*Postwar Employment Prospects for Women in the Hosiery Industry.*

Bulletin No. 835 (1945), price 5 cents. (*Monthly Labor Review*, May 1945.)

*Employment Opportunities in Aviation Occupations. Part 1.—Postwar Employment Outlook.*

Bulletin No. 837-1 (1945), price 10 cents. (*Monthly Labor Review*, April and June 1945.)

*Employment Outlook for Automobile Mechanics.*

Bulletin No. 842 (1945), price 10 cents.

*Employment Opportunities for Welders.*

Bulletin No. 863 (1946), price 10 cents. (*Monthly Labor Review*, September 1945.)

*Postwar Outlook for Physicians.*

Bulletin No. 863 (1946), price 10 cents. (*Monthly Labor Review*, December 1945.)

*Employment Outlook in Foundry Occupations.*

Bulletin No. 880 (1946), [in press]. (*Monthly Labor Review*, December 1945 and April 1946.)

*Factors Affecting Earnings in Chemistry and Chemical Engineering.*

Bulletin No. 881 (1946), price 10 cents. (*Monthly Labor Review*, June 1946.)