

R13.3:245 STATE COLLEGE LIBRARY Women's Bureau *il*

TRAINING FOR WOMEN REPORTS

**A Short-Term Training Program
in an
Aircraft Engine Plant**



U. S. DEPARTMENT OF LABOR ▲▲▲ WOMEN'S BUREAU
Martin P. Durkin, Secretary Frieda S. Miller, Director

Bulletin 245

SL

TRAINING FOR WOMEN REPORTS

**A Short-Term Training Program
in an Aircraft Engine Plant**

Bulletin of the Women's Bureau, No. 245

UNITED STATES DEPARTMENT OF LABOR
Martin P. Durkin, Secretary

WOMEN'S BUREAU
Frieda S. Miller, Director

Washington : 1953

CONTENTS

	Page
Letter of transmittal.....	III
Introduction.....	1
The training school.....	2
The schedule.....	4
“Indoctrination” or orientation training.....	6
Related classroom instruction.....	6
Shop training.....	7
Comparison with World War II program.....	8
Other training programs of related interest.....	9
Evaluation of single-purpose program.....	10

LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF LABOR,
WOMEN'S BUREAU,
Washington, January 23, 1953.

SIR: I have the honor to transmit a report describing a newly organized training program for machine tool operators established by a company to help meet its production requirements under the present defense program. The report is based on a Women's Bureau study, made in June 1951, of a training program conducted by an aircraft engine plant.

Since the Women's Bureau is concerned with encouraging equal training opportunities for women, it studies all types of training programs. The program described in this report was selected for two basic reasons: First, there are relatively limited opportunities for women in metalworking industries. The Women's Bureau is, therefore, interested in reporting, as far as possible, any activities which result in improving the position of women workers. Second, the program is an example of how to meet a need which arises primarily during times of national emergency; that is, adding large numbers of inexperienced workers to a plant's work force in a very short time. This problem arose in defense-expanded industries during World War II and again after June 1950.

The program is an example of one type of training. Many other types are conducted by industry, depending upon the needs of the specific plant, the training facilities available, and the general employment situation. Identical training needs can be met in a variety of ways by different companies or by the same company at different times.

This program offers a useful example of training women for production work. A high proportion of the trainees are women, and women as well as men act as instructors. A basic premise of the program is that the same procedures be used for men and women trainees. It combines training for a specific job with general orientation.

Grateful acknowledgment is made to the staff members of the company surveyed for their generous assistance and cooperation.

This report is the first of a series, "Training for Women Reports," which will be prepared in the Economic Studies Branch of the Bureau's Research Division. The report was prepared by Mildred S. Barber under the direction of Pearl C. Ravner, Branch Chief, and the general direction of Mary N. Hilton, Division Chief.

Respectfully submitted.

FRIEDA S. MILLER, *Director.*

HON. MARTIN P. DURKIN,
Secretary of Labor.



Figure 1.—Woman instructor checks trainee's gage reading.

A Short-Term Training Program in an Aircraft Engine Plant

Introduction

A major producer of aircraft engines is again, as during World War II, training large numbers of inexperienced women to be machine tool operators. The method used by this company in its current program of training women to operate machines such as grinders and turret lathes may be of considerable interest to other employers in the metalworking industry. The general practices and procedures used may interest all those concerned with training large numbers of women without previous experience in production work.

This report is based on a study made by the Women's Bureau in June 1951 shortly after the present training program was established. The company studied is an aircraft company devoted exclusively to the production of aircraft engines, both piston and jet type. Among its facilities are manufacturing plants, an airport, test and development facilities, overhaul shops, a receiving center for equipment, and a training school. All of these facilities are located in an eastern industrial State where legal standards for the employment of women and minors compare favorably with those of most other States.

Although the company has had well-organized training programs for apprentices and supervisors for many years, there has been no organized training for machine tool operators since World War II. Before the present training program was started, machine tool operators were learning their jobs while working in regular production, without the benefit of an organized training program. It was the company's feeling that accident and spoilage rates were too high and that too much of the foremen's valuable time was being taken up in this "hit-or-miss" training system. Work done in this company requires very close tolerances and, therefore, if machine operators are not carefully trained, they are apt to make costly mistakes. A slogan which is widely used by the company illustrates the importance of accuracy in their work: "99% Accuracy is 100% Scrap."

About 2 years before the training program was instituted, the management, in consultation with interested defense contract officials, decided that the company would have to set up a formal single-purpose training program for machine tool operators in order to meet

the production requirements of the defense program. A single-purpose program is one which is designed to teach a person how to perform a limited number of operations required by a specific job. The objective of this program was to teach inexperienced workers how to perform certain operations on specific machine tools. During the time that the training program was being organized, defense production developments were increasing the company's need for skilled labor, and the available supply of such labor was gradually diminishing. Because of this progressive tightening of the labor supply, the original plans for a training program had to be expanded repeatedly.

The actual training of workers in this program was begun early in 1951. At this time, the company employed approximately 20,000 workers, of whom about 20 percent were women. Also, by this time, both skilled and semiskilled production workers were being reported in short supply by the aircraft industry. Machinists were almost unobtainable; engine and turret lathe operators were frequently unavailable; and sheet metal workers, assemblers, inspectors, and various types of machine operators were in short supply. Yet, aircraft employment in all major centers was expected to increase.

The Training School

Original plans for the short-term, single-purpose training program contemplated "vestibule" training; that is, the setting apart of a separate section of the plant specifically for this training. However, when it became clear that increased production schedules in the plant would make this impossible, it was decided that the training would have to be done outside the plant. Since no suitable building could be found and the construction of a new building was not feasible, the company leased a building of five stories and contracted for its extensive renovation. Renovations were designed both to suit the specific needs of the training program and to simulate actual working conditions and surroundings in the main plant. Approximately one-third of the building contains classrooms, locker rooms, lavatories, a tool supply room, and a small lunch room; two-thirds of each floor contains the various kinds of machines which the trainees learn to operate. There is a small office staff on the premises as well as regular company guards to check employees (the trainees) when entering and leaving. Trainees punch "in" and "out" on time clocks just as they would in the plant.

The training school operates 3 shifts per day, 6 days per week. The shift hours are the same as in the plant:

First shift: 7 a. m. to 3:30 p. m.

Second shift: 3:30 p. m. to 12 midnight.

Third shift: 12 midnight to 7 a. m.

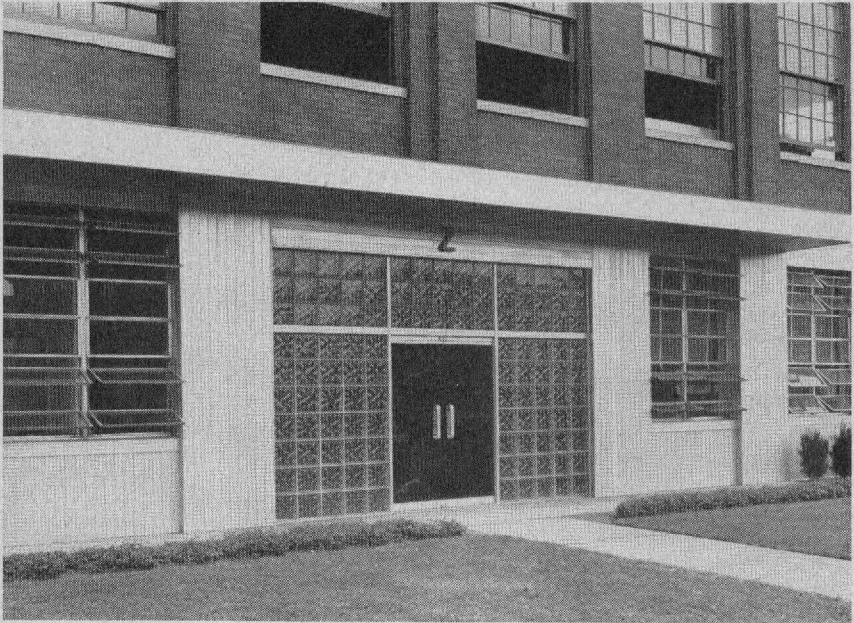


Figure 2.—Main entrance of aircraft machine training school.

Since trainees are considered full-fledged employees of the company, they are paid a regular hourly wage during this training period. Like the regular production employees, trainees on the second shift receive a 10-cent per hour premium, and those on the third shift receive a 7½-cent per hour premium and 8 hours' pay for 6½ hours' work. In June 1951, all trainees were paid at least \$1.25 per hour, not including shift differentials.

Trainees are selected from the regular applicants at the company's employment office. Employment office personnel determine from the job seekers' applications and interviews whether they should be sent to the training school, what jobs they should be trained for, and on what shifts they should work. Wherever possible, the applicant's job and shift preferences are taken into consideration. Prospective employees selected to go to the training school must complete the regular employment process, which includes a thorough physical examination. The physical examination provides for matching the physical requirements of the jobs to which the trainees are assigned against the trainees' medical records. Thus, trainees must be certified by the medical department as able to meet the physical demands of the jobs for which they are to be trained.

Whether or not the trainees are interviewed by the foreman of the department to which they will be assigned after completion of training depends entirely upon the individual foreman. Some foremen choose

to interview the trainees and show them around the department before they go to the training school; others do not.

When the trainees leave the employment office, they are given "put-on" slips which they turn in at the training school office when they first report there. The "put-on" slip gives the trainee's name and other personnel information, the day and shift on which she is due to start at the training school, and the specific job for which she is to be trained. So that trainees will become accustomed to their regular working hours, they usually attend training school on the same shifts on which they will work in the plant. Women trainees are assigned to all three shifts since in this State the Labor Commissioner may permit the employment of women in manufacturing establishments between 1 a. m. and 6 a. m., provided that the employer will comply with established regulations, and that adequate transportation is available for these workers.

The training school is run completely and independently by the company and its employees. The school has its own office staff, training director and staff, guards, and machine and classroom instructors—all employees of the company. Both men and women serve as instructors. Of 45 instructors in June 1951, 9 were women (6 women machine instructors and 3 women classroom instructors).

The school has a capacity of 600 trainees—200 per shift. The training course covers a period of 2 workweeks, and new trainees are admitted twice a week. No distinction is made between men and women trainees in the training procedures. In June 1951, after about 1 month's operation, 300 trainees had been graduated and about 160 trainees were in school. Approximately 38 percent of these trainees were women.

The Schedule

The 2-week (96-hour) training course is divided into 48 hours of machine instruction and 48 hours of related classroom instruction. The trainees' schedules are so arranged that on the first day at the training school they go to classes in the morning and to shop in the afternoon. Then, on the second day, they go to shop in the morning and to classes in the afternoon. This alternating of classes and shop on a half-day basis continues throughout the 2-week period. Plant training authorities find that this system relieves the tedium of sitting in a classroom a full day and provides a closer tie-in between machine operation and related classroom instruction. In addition, this system allows two training groups to use the school at the same time. While one group is using the machine shop, the other group is using the classrooms.

The sample schedule following shows how this arrangement works out in the case of an individual trainee.

TRAINEE SCHEDULE

Name: Mary Jones
 Clock No.: 1443
 Starting date: 6/7/51

GEAR GRINDER
 Shift: 2
 Division: 4
 Section: A

WEEK I

Period	Thursday		Friday		Saturday		Monday		Tuesday		Wednesday	
	Subj.	Rm.	Subj.	Rm.	Subj.	Rm.	Subj.	Rm.	Subj.	Rm.	Subj.	Rm.
1	Indoctrination	35	Shop		Small tools	33	Shop		Math	32	Shop	
2	Theory	34	Shop		Blueprint	31	Shop		Small tools	33	Shop	
3	Math	32	Shop		Theory	34	Shop		Blueprint	31	Shop	
4	Blueprint	31	Shop		Math	32	Shop		Theory	34	Shop	

Lunch

5	Shop		Small tools	33	Shop		Blueprint	31	Shop		Math	33
6	Shop		Math	32	Shop		Indoctrination	35	Shop		Blueprint	31
7	Shop		Blueprint	31	Shop		Math	32	Shop		Small tools	33
8	Shop		Theory	34	Shop		Theory	34	Shop		Theory	34

WEEK II

Period	Thursday		Friday		Saturday		Monday		Tuesday		Wednesday	
	Subj.	Rm.	Subj.	Rm.	Subj.	Rm.	Subj.	Rm.	Subj.	Rm.	Subj.	Rm.
1	Blueprint	31	Shop		Theory	34	Shop		Blueprint	31	Shop	
2	Indoctrination	35	Shop		Math	32	Shop		Math	32	Shop	
3	Math	33	Shop		Blueprint	31	Shop		Theory	34	Shop	
4	Theory	34	Shop		Small tools	33	Shop		Small tools	33	Shop	

Lunch

5	Shop		Math	32	Shop		Theory	34	Shop		Blueprint	31
6	Shop		Small tools	33	Shop		Blueprint	31	Shop		Math	32
7	Shop		Theory	34	Shop		Math	33	Shop		Theory	34
8	Shop		Blueprint	31	Shop		Small tools	35	Shop		Indoctrination	35

The 48 hours of classroom instruction which each trainee must take are divided as follows:

Indoctrination: 4 hours.
Small tools: 8 hours.
Blueprint: 12 hours.
Mathematics: 12 hours.
Theory: 12 hours.

“Indoctrination” or Orientation Training

The first class which every trainee attends is “Indoctrination.” At this meeting, the trainees introduce themselves and complete certain necessary papers. After this is done, the instructor tells them about the company and the training program. The trainees are shown about the school and its facilities and are informed of the various rules and regulations. The shifts, shift hours, and lunch hours are explained, and the trainees learn how to punch their time cards. Rules on such things as smoking, parking and transportation facilities, and the treatment of cuts and bruises are explained.

The second hour of indoctrination is devoted to wage and salary administration. The company’s job evaluation and employee performance rating plan as well as night-shift premiums, holidays, pay-days, promotions, and all other matters relating to wages are explained to the trainees. In addition, trainees are told about the services available to them through the company’s staff of personnel advisers.

In the third hour of indoctrination, which is given early in the second week of training, health and safety are discussed. Fire and other hazards and the procedures to be followed in cases of emergency are explained. Health, sanitation, the group hospitalization plan, and medical care provided by the company are explained. Safety devices and safety clothing and why they are required or suggested are discussed. Employee social groups and activities are described.

The fourth hour of indoctrination is the last class which every trainee attends. This meeting is devoted to a review of company policy and the most important items on wages, health, and safety. Quality control and loss through scrap are emphasized. In addition, the trainees are asked to raise any questions, doubts, or “gripes” which they may have and to evaluate their experience at the training school.

Related Classroom Instruction

Almost half the trainee’s time is spent in the classroom attending classes in “Small tools,” “Blueprint (operation sheets),” “Mathematics,” and “Theory.” The classes in blueprint are designed to

teach the trainees how to read and use the blueprints and operation sheets necessary for their work. The classes in mathematics cover fractions and decimals used on the job. Small-tools classes provide instruction in the use and care of micrometers and gages of various kinds. Theory classes deal with elementary theory of cutting tools, grinding, and inspection.

Certain classrooms are equipped with projection facilities, and related motion pictures and strip films are used throughout the training course. For example, a film, "How to Run a Drill Press," is shown in the theory class early in the training program and again after the trainees have almost completed the course. By seeing how much more they understand during the second showing of the film than during the first, trainees gain self confidence.

Shop Training

The 48 hours of machine instruction are given in the shop sections of the training school. Here, the trainee is assigned to an instructor who has been chosen by the company from among experienced machine operators in the plant. These instructors are chosen not only because of skill in operating their machines but also because they have some ability to teach others. Over the period of training, the trainee learns how to operate one machine and how to perform certain basic operations on it, using the necessary parts, blueprints, and tools. Also, the various parts of the machine and the care necessary for its satisfactory operation are explained.

The trainee (man or woman) may be taught how to operate any one of the following machines:

Engine lathe.	Gear tooth grinder.
Turret lathe, horizontal.	Thread grinder.
Speed lathe.	Miller, vertical.
O. D. grinder.	Miller, horizontal.
I. D. grinder.	Drill press.
Gear tooth shaper.	

Instead of machine operation, some trainees, both men and women, are taught one of the following two jobs:

Inspection	Burr bench
------------	------------

Because the company considers that the physical demand is too great for women, instruction on the following two machines is limited to men:

Turret lathe, vertical	Radial drill
------------------------	--------------

On first introduction to their machines, women trainees receive safety glasses and a cap or bandanna and are instructed as to necessary health and safety precautions. Numerous reminders on health and safety are provided throughout the training period.

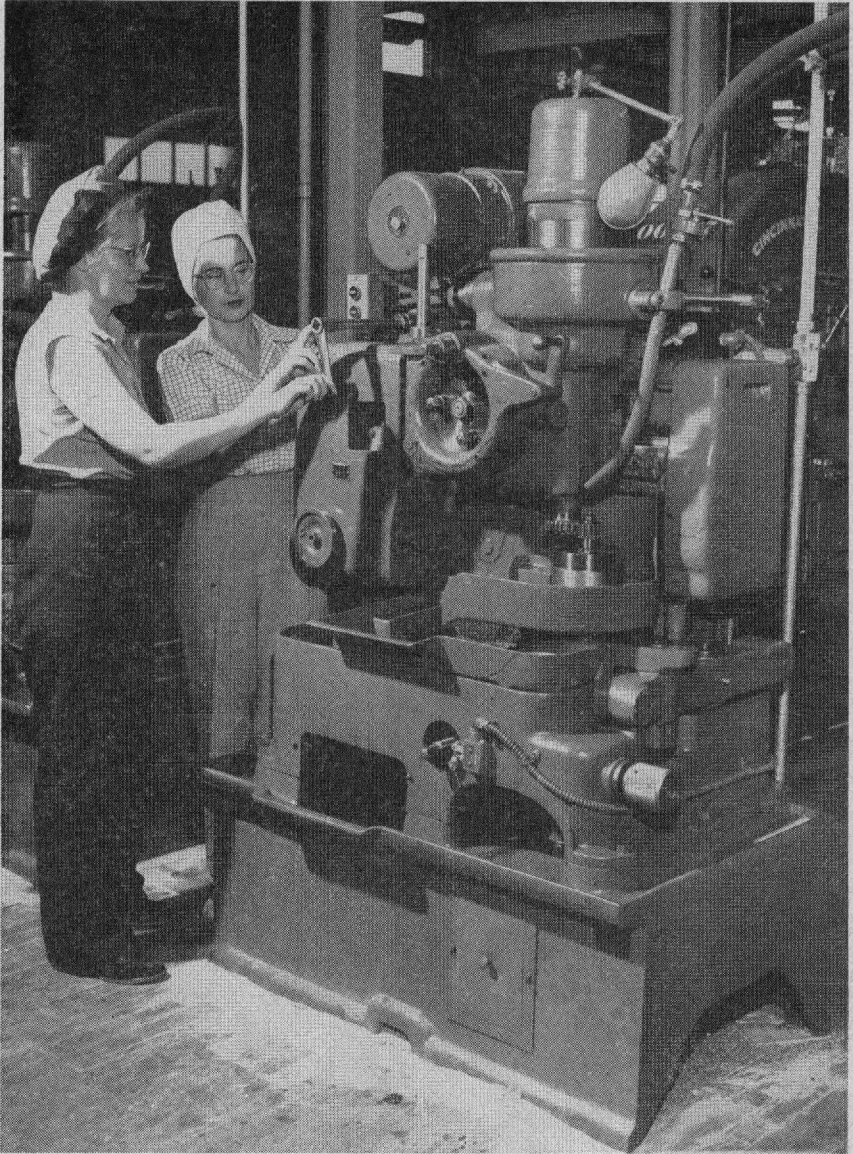


Figure 3.—Instructor at right demonstrates controls of a gear shaper to trainee.

Comparison With World War II Program

Although this company did an extensive amount of training of single-purpose machine operators during World War II, the present training program is in certain respects quite different. For example, during World War II, training was done under the supervision of the

production departments. At the present time, however, training is under the control of the personnel department.

During World War II training was not conducted entirely by the company; some of the training was done by outside public and private institutions. In addition, some trainees were not paid while in training. Training is now conducted entirely by company personnel, and trainees are employed and paid while in training. The company feels that this arrangement is much more successful than the old system; company employees are better able to coordinate training with company requirements and trainees prefer being paid employees. Company spokesmen say that if a training program is worth while they are willing to pay for it.

Mechanical aptitude tests were given to prospective trainees during World War II, but this practice has been discontinued. Applicants are now screened by the employment office on the basis of their employment applications and interviews. The foreman of the department to which the trainee will be assigned may, if he chooses, also approve the selection of prospective trainees. Company training authorities feel that after the trainees have spent 2 or 3 days in the training school they can usually tell whether or not they will be successful. They regard this as a better test than the aptitude tests.

During World War II the training of single-purpose operators was spread over 6 to 8 weeks. The present program takes 2 weeks. The company found it unnecessary for trainees to know as much of the complicated blueprint and theory as they were being taught; therefore, some of this instruction has been eliminated from the present course. Also, since there were not enough machines to go around during World War II, most trainees watched an operator run a machine instead of running the machine themselves. This meant that it took the trainee longer to learn how to operate the machine. The present program provides a machine for each trainee, thereby shortening the learning time. This is controlled by proper scheduling.

Other Training Programs of Related Interest

Other training programs of this company are related in certain ways to the training of women machine-tool operators. For example, part of the foreman-training program is devoted to orienting the foremen to supervision of women employees. The company's adviser on policies relating to the employment of women meets with the foremen during their training program and talks with them about the integration of women employees into their departments. She provides the foremen with information about the differences between the attitudes of men and women workers, the physical limitations of women, their

home responsibilities, and other pertinent matters. Suggestions are offered on how to get the best cooperation from women employees and how to help them with their personal as well as their work problems.

In addition, a training course is provided for the company's staff of personnel advisers. As in the case of the foremen, the adviser on women employees gives a talk to personnel advisers in which she informs them about the special problems of women employees and how to deal with them. In this talk, emphasis is placed on the dual responsibility of many women employees—their job at the plant and their job at home. Information is given the personnel advisers on child-care problems, community agencies, State labor laws, and other items of special importance to women.

Evaluation of Single-Purpose Program

Although this training program has been operating very successfully, there are still a few problems to be solved. For example, it has been found that some trainees are dissatisfied after they get to the plant. By contrast with the school, the plant seems noisy and crowded. Also, trainees do not get as much attention in the shop as they did in the school, and, in some cases, they are not treated with as much understanding. Since the training school has specially selected personnel, some reactions of this type were expected; and although a completely satisfactory solution does not seem likely, training authorities are working on the problem.

In addition, the training school has had some trouble with women trainees quitting even before they complete their training. The most frequent reason given by the women is the need to care for their children. The company, through its special adviser on women, is attempting to lessen this problem somewhat by working with community social-welfare agencies to encourage the community to provide more and better facilities for child care.

Another difficulty in the program arises from the fact that in certain departments the work is of such a nature that an operator is not usually on the same job for more than 1 or 2 days a week. Since these operators must be more versatile than the average, foremen in these departments think that the trainees should be given more varied training than is provided by the single-purpose program. This is, of course, a technical training problem, and the training-school authorities are working on its solution. It is their opinion that the needs of these departments are special and should be met by a different and longer training program than the one described here.

Since the final test of training is made in the production departments, plant foremen are asked to report on the trainees after they

have been placed in the plant. Reports of the foremen's opinions of trainees are prepared regularly by a member of the staff of the training school after consultation with the foremen. The report for June 1951 states:

At the present time I have contacted 34 foremen on all three shifts who have had trainees for a period of 3 days or more. The foremen on the whole are very well pleased with these people and feel there is no comparison between them and green help from outside.

It is the general opinion of the foremen that these people have a good understanding of the machine. Many of these operators have been left alone on their new jobs their second and third day over here.

The majority of these people have an excellent attitude. They are interested, eager to work, and open to suggestions. This is quite a contrast to the new hires from outside.

The foremen feel that the indoctrination and classwork is very valuable to them. They do not have time to give new help this sort of thing in a comprehensive manner and consequently the trainees have a much more well-rounded understanding of general shop procedures, safety, etc., than a new hire can acquire over a considerable length of time.

It has been necessary for several foremen to put trainees on machines other than the ones on which they are trained. They have taken this in stride and have come along very well on these new jobs.

In Department . . . and in Department . . . the foremen feel that the trainees need more time on the machines. The work is such in these departments that an operator is not usually on the same job for more than 2 or 3 days. As a result of this the trainees should, in the foremen's opinion, be more adaptable to varying jobs than the single-purpose operators that are being trained in the school.

On the whole, plant authorities and company executives feel that the single-purpose program is a success.

