INDUSTRY OFFERS 5,400 TRAINING COURSES

Service Manuals Cut Weapon Maintenance Costs

Progress in reducing the overall cost of operating and maintaining air weapons is being made by the aircraft and missile industry through a comprehensive program of service manuals.

The Aircraft Industries Association, recognizing the important element of aircraft and missile manufacture, has a committee on service manuals made up of nearly 100 of the managers of service publications for major companies. The aircraft and missile industry publishes more "books" during a year than the largest publishing houses, but none of them ever reach the best-seller list.

These "books" are service manuals that describe to pilots, missile crew members and mechanics how to operate and maintain the complex aerial weapons being produced for the military services.

The cost for the manuals required to support all the aircraft of a single carrier-type model built during a four-year production run is approximately $7 million. The initial cost of producing the manuals—roughly $250—is about $500,000. However, as engineering changes are made throughout the production run to increase performance of the aircraft, revisions are made in the manuals—each original page is revised an average of nine times in the course of the four-year production run.

The basic manuals include handbooks on flight, maintenance, operations, structural repair, illustrated parts and inspection requirements. Missile handbooks differ in concept from manned aircraft. For example, one major missile manufacturer states that the checkout procedure for a missile requires a sequence of steps that must be coordinated among many technicians. The complete weapon and all of its support (See MANUAL, page 3).

$34 Million Spent During Year

by J. B. Cahill
Industry Planning Service, Aircraft Industries Association

The aircraft and missile industry is spending nearly $34,500,000 each working day on formal training programs to teach the wide variety of new skills and techniques required in the development and production of today's complex air weapon systems.

A survey of these extensive training programs, conducted by the Aircraft Industries Association, covered AIA member companies, employing 650,000 workers, the bulk of total industry employment during a single year. The survey did not include routine orientation or "on-the-job" training.

The industry-wide survey made by AIA revealed these dramatic facts on the scope and size of its training programs:

1. More than 5,400 different courses were offered during one year.
2. More than 330,000 course completions were recorded.
3. Approximately 12,000,000 man hours were devoted to the courses.
4. Cost of the training programs was more than $30,000,000.

These training programs covered factory skills, office skills, sub-professional skills, apprenticeships, management development, and engineering training. If on-the-job training had been included, the statistics would be substantially greater.

The balance of the survey covered courses of study in which the company reimbursed educational institutions for tuition and laboratory fees or paid for all or part of company-sponsored courses of study.

This part of the survey disclosed that 60,174 employees put in nearly 4,000,000 man hours in these courses at a cost of nearly $4,500,000.

The aircraft and missile industry is governed by a chain reaction of its expansive technological progress, unparalleled in the history of (See TRAINING, page 3)
Renegotiation Hearing Needed

By Orval R. Cook
President, Aircraft Industries Association

The present Renegotiation Act expires at the end of this year, and the Administration is seeking a two-year extension. If the Congress grants this extension, it will be the fourth since the original Act was passed in 1951. The intent of Congress in providing renegotiation legislation is sound: Deny clearly unreasonable, excessive and unconscionable profits from government contracts.

However, the Act is based on seven generalizations which permit great disparities in interpretation. The vital question of whether a company earned excessive profits is left entirely to the judgment of the five-man Renegotiation Board. They are not guided by any specific criteria for computing whether the earnings were excessive. The proof that the judgment of the Board must necessarily be arbitrary is demonstrated in several cases where the statutory Board in Washington differed sharply from the findings of its Regional Boards. In one case, the difference ranged from a determination made by a Regional Board of no excessive profits to a determination by the statutory Board that $10 million was excessive profits. And both Boards used the same figures and the same factors.

Renegotiation is tardy. As long as four years after the company and the contracting service have agreed upon prices, made their readjustments, the Renegotiation Board enters the picture for still another determination on earnings.

But probably the most deleterious effect of renegotiation is the strangling of contractor incentive to cut costs. The military services, during the past 15 years, have developed contract techniques that are admirably suited to the requirements of defense procurement. The contractual technique favored by the military buyers is the incentive contract by which the contractor is rewarded for reducing cost targets.

Lt. Gen. William F. McKee, vice commander of the Air Materiel Command, recently outlined the USAF viewpoint:

“Our own philosophy is that industry is entitled to a fair profit which will keep it in business—if it earns that profit. We do not believe that the award of a government contract should automatically guarantee profit or that we can afford to assume all of the risk all of the time. Both cost-plus-fixed-fee contracts and advance fixed-price contracts operate ultimately in accordance with policy of earned profit. We do feel, however, that more can be done in the use of incentive formula contracts which will place the highest possible premium upon the contractor’s own management skills.”

The aircraft and missile industry heartily supports this procurement philosophy.

But the incentive technique is largely negated by the current actions of the Renegotiation Board in its earnings determinations.

The Aircraft Industries Association believes that the appropriate Congressional committees should schedule early hearings on the request to extend the Renegotiation Act, hear testimony from the military services that do the actual procurement, hear testimony from the Renegotiation Board on its interpretation of the Act, and hear testimony from industry representatives.

With these facts at hand, the Congress will be able to amend the Act, provide more specific instructions to the Renegotiation Board that will eliminate confusing shifting interpretations and replace arbitrary determinations with factual findings.
Training Reduces Production Costs

(Continued from page 1)

manufacturing. Aggressive research programs of the industry consistently produce revolutionary concepts for aircraft and missiles that require new materials, new production methods, and, of course, new skills.

Providing these skills is the goal of the aircraft industry's training program. Without these skills, the most advanced designs would remain only "paper" projects, incapable of being handled or maintained by the operating units of the military services. And there is no reservoir of talent to draw upon—the aircraft and missile industry must provide these skills through resourceful, comprehensive training programs.

Computers Cause Change

Typical of the technological changes the industry must cope with to meet performance and production requirements is in the computers used in airborne electromechanical guidance systems. Until recently, the analog computer was used in the system, but a major technological change caused the replacement of analog computers with digital computers. The change was due to the fact that it is much cheaper to produce a very accurate digital computer than an equivalent analog computer.

First, engineers designing equipment for digital computers had to be trained. Second, project engineers assigned to include the digital computers in the system would benefit from the training, and technicians assembling, testing and maintaining the computers required instruction. Training courses were arranged, lasting from 40 to 120 hours.

The company estimated that the training course contributed greatly in meeting production schedules and that the training costs were minor compared with the saving in engineering conference and study time that would have been necessary without organized digital computer courses.

Variety of Courses

The courses available range from learning to operate a motor scooter to the great skills involved in assembling or servicing the inertial guidance system of an intercontinental ballistic missile. Entrance requirements to the courses are geared to the subject to be studied. Courses are available for the lowest and highest skilled employees.

One airframe company made a detailed survey of several job classifications which graphically illustrates the benefits that accrue to employees participating in training programs. Every fourth name was selected from a payroll sheet and the employee's record was checked from his first day of employment. In the sampling

Manual Changes Made Quickly

(Continued from page 1)

port, including personnel, are thought of as one system, not as separate pieces of equipment.

The publications unit of the missile manufacturer handled the production of manuals in this fashion: Source material is furnished to the technical writers by the project supervisors. As the blueprints, specifications and engineering data are converted into manuscripts, requirement of 33 senior toolmakers, it was found that all but two had been trained by the company, and these two men had received their training at other aircraft companies. Twenty-three of the group were unskilled when hired and had progressed through 113 labor grades to reach the top skill. In the category of senior plaster pattern makers, 70 per cent gained their top experience at the airframe company; among maintenance machinists, 69 per cent were hired as beginners or in semi-skilled jobs; all of the flight line crew chiefs had been hired as beginners or in semi-skilled; and had attained their status through company training.

Increased Production

A related study showed that graduates of a company-sponsored machine shop training school were promoted six to nine months earlier than employees who did not have the formal machine shop training. The training program is a two-way street: the company has the services of more skilled, productive employees and the employees gain the benefits of substantially higher wages for their new skills. The training programs have been a major contributor to increased productivity at economical costs which, in turn, permit wage increases.

New Aircraft Yearbook

Completely Re-Styled

The 39th edition of The Aircraft Yearbook, featuring a pictorial and written record of the top aviation events in 1957, has been completely re-styled.

Page size of this official publication of the Aircraft Industries Association has been increased to 8 x 11 inches, and photographs and artwork have been used liberally in the new format designed for easy reading.

Included in this 432-page, fully indexed annual are reviews of individual company activities; two-view drawings and specifications of all planes and engines in production; a comprehensive pictorial report on all missiles in development and production; aviation activities associated with the air force, defense and other government agencies; research and development progress during the year in military and civil aviation; a summary of airline activities; the general aircraft and helicopter picture for the year; a complete bibliography of aviation books published in 1957; historic and current chronologies; and a listing of official records established during the year.

The 1957-58 Aircraft Yearbook can be purchased for $6.00 from American Aviation Publications, Inc., 1001 Vermont Ave., N.W., Washington 5, D. C.

SAC Fuels 'em

A squadron of tanker planes in the Strategic Air Command transfers more fuel in air-to-air refueling operations in a 16-day period than the average auto service station would pump in three years.
Engineers Duplicate Landings in Rain

Engineers at an aircraft company have devised a system to duplicate the conditions faced by a Navy pilot flying aboard an aircraft carrier on a rainswept night. A shower, heavy rain and even a cloud burst can be produced by the flick of a switch. The secret of the storm-producing is in a vertical bar at the end of a 65-foot open circuit wind tunnel. The bar houses six "needles," each with a small opening through which water passes under pressure.

The flow of water from the needles is directed toward a windshield at the end of the tunnel. Behind the windshield a 200 horsepower fan "pulls" the water toward the wind shield.

The system devised by the aircraft industry permits utilizing the best windshield designs and rain removal methods before an aircraft is delivered for fleet use.

Aerial Grooming Includes Close Shave

A close shave is part of the grooming that goes into the manufacture of today's aircraft and missiles.

Aerodynamic smoothness is a must if drag is to be reduced to a minimum. Rivet heads, for example, must be shaved to very close tolerances. The heads of driven rivets protrude .010 to .012 inches. This is too far for aerodynamic purposes which demand a protrusion of less than .002.

Aluminum rivets present no problem since they can be shaved with a standard tool. However, titanium and steel are being used in today's aircraft, and the industry has developed a tool to do the job of shaving rivets of these tougher materials. Tests show the new tool to be highly satisfactory and more than 1,000 titanium alloy fasteners were shaved before it required re sharpening.

X-ray Techniques Check Quality of Vital Parts

The x-ray has moved onto the flight line, providing a new method of checking costly overhauls as well as an added safety factor.

Radiography machines have been used in the aircraft industry for several years in quality control checks of parts before they are assembled as part of the aircraft.

However, parts sometimes show signs of fatigue failure after exposure to flying stresses and strains such as the impact of constant landings.

The x-rays give certain warning of a possible failure long before it could occur, and replacements are made. Any part having a defect of one to two per cent of its total depth (roughly equivalent to a one-inch part showing a 1/100th of an inch fissure) is revealed by the x-ray.

Pictures are taken just as medical x-rays. Sensitized film is placed back of the part, and electromagnetic waves are shot through the part and recorded on film. Negative sizes range from dental plate size to more than a square foot. The film is specially cut to photograph oddly shaped parts or those in difficult positions.

Plans call for cataloging the results to show which parts to keep under surveillance and frequency of examination.

The new utilization of the x-ray technique is expected to yield rich dividends in lower overhaul and maintenance costs and a higher percentage of aircraft use.

Painting Time Cut

A new painting technique, developed by aircraft workers in a Western aircraft plant, cuts painting time for small parts from one hour to three and a half minutes. The heart of the new device is a wire-cage drum which revolves, somewhat in the manner of a cement mixer. A paint spray gun is aimed at the drum which evenly coats the parts as the drum revolves.

American Airlines

1957 in Millions of Passenger Miles

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Six scheduled airlines are among the ten largest intercity rail and air carriers, based on passenger miles traveled, with four of the airlines ranking as the top carriers. Domestic and international carriers last year flew 31.2 billion passenger miles, an increase of 13 per cent over 1956.

Small Firms Take Big Missile Role

Small business firms are playing a major role in the ballistic missile program.

Recent studies show that of the $1 billion paid to prime contractors engaged in ballistic missile work as of Jan. 1, 1958, more than $267 million went to small business subcontractors. This is 21 per cent of the total payments, and the figure is more significant since the program to date has emphasized research and development and only now is generally moving into the production phase.

A further breakdown shows that associated contractors in the ballistic missile program—manufacturers of power plants, guidance systems and nose cones—have paid out to small businesses nearly 50 per cent of the total funds involved in these items.

One missile engine manufacturer, in a detailed study of subcontracting, revealed that during 1955, 40 per cent, or almost 18 per cent went to small business firms on a first tier subcontracting basis. In addition, $13 million was subcontracted to second, third and fourth tier small business firms by large businesses holding first tier subcontracts.

Another large company manufacturing auxiliary power supply for an ICBM reports that it has subcontracted 62 per cent of all work to small business concerns, distributing these subcontracts to 709 different firms.

A major aircraft and missile manufacturer stated that 23 per cent of his overall contract for a large ballistic missile went to small business concerns.

The aircraft and missile industry has established a comprehensive program of aiding small concerns, which has paid off in lower costs for national defense.

It Takes A Little Longer To Pay It

Tax time took little time for an electronic computer developed by a major aircraft component manufacturer.

The average time for calculating individual federal income tax returns was 17 seconds, a demonstration of the speed of modern computers which are widely used in operating modern aircraft and missiles.

The individual's tax information—status as single or joint taxpayer, number of exemptions, total income, wage and salary tax, Social Security tax, interest, dividends, contributions and medical expenses—was fed into the computer.

The computer even "decided" for the taxpayer whether he should take the standard deduction and automatically prevented him from exceeding prescribed percentages.