

# CONCLUSIONS AND RECOMMENDATIONS

Maintenance operations to support the U.S. air carrier fleet are demanding and costly. Newer aircraft are becoming increasingly complex; older aircraft are showing the effects of delayed retirement from the air carrier fleet. These changes place the aviation maintenance technician (AMT) very much in the spotlight. The AMT must do his/her job well if aviation safety standards are to be maintained or improved. The performance of the AMT is critical for the success of the air carrier maintenance industry, now an \$8 billion per year enterprise.

The proficiency of maintenance technicians and the entire maintenance workforce is impacted by many factors. Maintenance technicians must work within an organization that offers proper support. An appropriate supply of technicians must be available and they must be well trained and motivated. Necessary maintenance documentation must be at hand and in usable form. Physical facilities and maintenance equipment must be suitable for the demands of air carrier maintenance. The list goes on.

The purpose of this two-day meeting was to examine the aviation maintenance technician, to consider steps necessary to ensure a continuing workforce of high quality, and to review all variable that might have a positive or negative impact on technician performance. Phrased differently, the questions posed to meeting attendees were:

*What do we in the air carrier industry have to do to properly support the aviation maintenance technician?*

*How can we ensure that the industry has a well qualified and motivated workforce to meet air carrier maintenance demands in the 1990's?*

Attendees at this meeting represent all segments within the air carrier industry, including airline operators, manufacturers, members of the training establishment, regulators, manpower specialists, and others. Formal presentations given during the two days covered a variety of topics related to manpower planning and workforce support. Recommendations for maintenance management during the coming decade were offered during formal presentations, during ensuing discussions, and during a final panel session in which four attendees agreed to lead a discussion of the group recommendations. Members who graciously agreed to serve on the Discussion Panel include:

*John Goglia*

**USAir/IAM&AW**

*Rod Peters*

**Northwest Airlines**

*Richard Ulm*

**Embry-Riddle Aeronautical University**

*Richard Yeatter*

## **USAir**

The following recommendations represent a grouping and synthesis of broad topics considered important by attendees, with specific recommendations included within each topic.

### **Availability of Qualified Entry-Level Personnel**

Many indicators point to a basic problem likely to confront air carrier maintenance in the 1990's and beyond. There simply may not be a sufficient number of qualified AMTs entering the maintenance workforce to meet growing industry demands. Growth projections, both for the air carrier industry and for the national labor force, support this concern. There is little doubt that the industry itself will continue to grow. FAA forecasts predict over a 50 percent increase in the number of passengers to be carried by U.S. airlines by the end of this decade. The size of the air carrier fleet also will grow, although not at the same rate due to increasing use of wide-body jet aircraft. By the year 2000, almost 5,000 large jet aircraft are forecast to be in use, about a 20 percent increase over the size of today's fleet. Maintenance demands will increase accordingly.

A troubling fact is that, while the air carrier fleet grows robustly, the national labor force will grow modestly. Some sectors, in fact, may show a decline. Forecasts made by the Bureau of Labor Statistics, U.S. Department of Labor, show a slowing rate of growth for the total labor force. The 27 percent growth seen between 1976 and 1988 will drop to 16 percent between 1988 and the year 2000. Most troubling, however, is that both the 16 to 24 and the 25 to 34 year age groups are projected to show a decline in actual numbers by the year 2000. These are the age groups that provide entry-level technicians for air carrier maintenance.

The forecast of the Bureau of Labor Statistics also show changes in the makeup of the national labor force in the coming decade. The percentage of women in the labor force will continue to increase. By the year 2000, almost one-half of all workers will be female. Minorities in the workforce also will grow and, by the year 2000, roughly one-quarter of the labor force will be made up of persons of black, hispanic, and asian origin. These individuals certainly represent a possible source from which to meet future needs for maintenance technicians.

Another national change which impacts air carrier maintenance is the decrease in military maintenance technicians, a source that traditionally has served as a supplier for commercial needs. Many maintenance technicians, trained during their military service, have gone to work for airlines following their military tour. As the years pass, however, this labor pool is shrinking. In 1974, Department of Defense statistics show that well over 17,000 enlisted personnel were assigned to aviation maintenance within the military. By 1984, this number had dropped to just over 8,000, less than one-half the number a mere ten years earlier.

If there is to be a shortage of maintenance technicians in the immediate future, one might expect those technical training schools that award the A&P certificate to be experiencing the bow wave of the shortage at this time. Indeed, this is the case. One well known training facility, which offers a number of programs in maintenance technology, had over 1,000 students ten years ago. At the present time, the enrollment is about 600, with the majority of these students in four-year degree programs. A number of these graduates will not go directly to airline employment as an aviation maintenance technician but, rather, may be employed by competing industries. The conclusion, in any event, is that training institutions are not operating at full capacity due to a decline in applications for technical training.

One reason put forth by those involved in maintenance training for the failure to attract an abundance of applicants is the "image" problem. Too much of the world views an AMT as simply a mechanic, one who turns wrenches and works under harsh environmental conditions. To combat this perception, some airlines have begun programs under which descriptive materials and discussions are presented to local high schools. Representatives of the airlines work directly with interested students and may even introduce them to the operations of a maintenance facility. Such public relations actions represent a positive step toward improvement for the AMT image. However, the fact remains that the flow of applicants to technical training schools needs to be improved.

All of the above signs point to a deficit of qualified maintenance technicians in the 1990's and beyond. Several attempts have been made to estimate the extent of the manpower shortfall for air carrier maintenance over the next ten years. For example, the Future Aviation Professionals of America (FAPA) estimates the industry will need 46,000 technicians in the next ten years. Based on Department of Education numbers, there will be slightly over 22,000 training completions during this period. This would indicate a shortage of 24,000 technicians. Other estimates place the shortage at over 40,000 technicians. Whatever the extent of the shortage, first effects will be felt by regional/commuter carriers since they represent the beginning of the technician career pipeline. The effect rapidly will move to the major carriers since the regional/commuters will be graduating fewer technicians for the majors.

## Recommendations

1. The likelihood of a shortage of qualified entry-level personnel for air carrier maintenance in the next decade needs better definition. Some organizations such as the Professional Aviation Maintenance Association (PAMA) or the Future Aviation Professionals of American (FAPA) should undertake, with blessings from the FAA and financial support from the airline industry, a detailed manpower modeling study of the aviation maintenance technician occupation as it is likely to change over the next decade. Factors which cause or which might serve to mitigate such changes should be documented.
2. The airline industry must begin a sustained program to draw women and minorities into maintenance. Problems, such as language, physical strength, etc., which might accompany greater use of these people should be identified early and corrective action taken before the numbers of these workers grow.

3. Efforts started by some airlines to increase the understanding of aviation maintenance by students in elementary and secondary schools are worthwhile and should be expanded. These programs should aid in improving the image of the aviation maintenance technician and should encourage young students to consider airline maintenance as a career.

## Applicant Qualifications

Many voices during the meeting were heard decrying the level of preparation of applicants for training in aviation maintenance. Basic skills in reading/writing, mathematics, and physics frequently are found wanting. These are the skills necessary for success in training and for later on-the-job performance. As the complexity of aircraft grows, as exemplified in the Airbus A-300 and the Boeing 757/67 series, the requirement for skills in communications and in science will increase in step. New aeronautical vehicles are extremely sophisticated and aviation maintenance as a profession must enlarge its capabilities. The requirement for basic skills will become more critical.

One well-known technical training school reports a 25 percent failure rate in its A&P program. This is attributed to a lack of requisite skills on the part of those entering the program. This failure rate occurs even though remedial training courses for these skills are offered by the schools. The lack of initial preparation is such that even intensive remediation is not successful.

Considerable blame for the quality of technical school applicants has been placed on the U.S. public educational system. While this blame might be justified, it does nothing to solve the immediate problem. Some means must be found to improve the average applicant's basic skills in reading, math, and physics. Certainly, the requirement for these skills in aviation maintenance will not go away.

One corrective effort that has been considered is to add another semester to the academic schedule of technical training schools to provide extensive instruction in basic skills. There are two obvious problems here. One is that the time required to obtain the A&P certificate increases. The other is that the training becomes more costly.

One suggestion was that airlines be drawn more into the issue of applicant qualifications. With financial support from a coalition of airlines, arrangements might be made with community colleges or with high schools to offer special preparation courses in the basic skills required for aviation maintenance. These courses would be offered without charge to those expressing a serious interest in aviation maintenance as a career. The airlines could consider the funding for such programs as an investment in the quality of their maintenance operations in coming years.

## Recommendations

1. Lack of basic skills in reading, math, and physics on the part of applicants for maintenance training has been noted on a number of occasions and obviously is of real concern. A meeting should be convened to address this problem exclusively. Representatives of the Federal Aviation Administration, the Department of Education, the technical training schools, and the airlines should attend. Objectives of the meeting should be to describe the extent of the problem more clearly and to consider paths leading to improvement.

## **Role of the Aviation Maintenance Technician**

The work of the aviation maintenance technician obviously is vital to the safety and economic viability of airline operations. Aviation safety must never be compromised by inadequate maintenance; aircraft must be kept in service as schedules dictate. The AMT is indispensable for each of these objectives. Yet, while the contribution of the AMT is quite clear cut at these broad levels, on a day-to-day basis his/her role is less well defined. Decisions concerning maintenance are made at a higher level. Someone else may sign off on completed maintenance, thereby making the AMT not accountable for his/her own work. The working environment of the AMT may be less than it could be. Finally, all too frequently the AMT is treated as low man on the totem pole.

Anything that improves the role and stature of an AMT correspondingly should improve his productivity. A multi-year experiment conducted by the Air Force Tactical Air Command demonstrated that changes in organizational structure can affect the role of the maintenance technician and can produce measurable improvements in maintenance performance. In this experiment, the structure of TAC was changed to a more decentralized form in which decisionmaking and responsibility were moved more directly to those doing the work. Several new levels of leadership were established, with authority and responsibility at each level. Goals and performance standards were set up. The objective was to provide a unity of purpose between individual and organizational goals. Maintenance teams were established so that each team member was personally affected by the team's success or failure. Superior performance was recognized and rewarded.

Results of the changes in maintenance organizational structure and operations were measured over a 12 year period. Although some difficulties were encountered initially in changing to a new organizational structure, all indices ultimately pointed to genuine improvements in productivity. The number of Sorties flown per aircraft per month increased. Measures of aircraft readiness showed improvement. The percentage of aircraft repaired and returned to flight status within a fixed period time also increased. In all, the impact of the new organizational structure on maintenance productivity was significant.

The experiment conducted at the U.S. Air Force Tactical Air Command indicates organizational factors can be very important in maintenance. However, those who conducted this experiment are careful to note that what was appropriate for TAC may not be appropriate for other organizations. Their structure certainly could not be transferred on a one-to-one basis. However, they point out that every organization should review its structure to determine if it is organized to provide best support to those working within it.

One part of organizational structure concerns the relative importance given to persons working at each organizational level. Comments from some airline maintenance managers indicate that maintenance technicians often are not treated as being particularly important. All agree that this is unfortunate. However, management attention frequently is on other problems.

From the vantage point of the maintenance technician, requests for support from management are nominal and rational. One individual indicated during the meeting that his needs include a clean, orderly and well-lit working place; a decent seat on which to rest when tired; good manuals available at the worksite; a computer to provide an immediate maintenance history of the airplane; and a parts support system that will deliver parts in a timely manner when working under less than optimum conditions. This technician indicated he is not looking for pampering. All that he requires are the facilities and tools to do the job and the opportunity to take pride in a job well done in a timely manner.

The above comments from a senior maintenance supervisor illustrate the importance of a good working environment, proper equipment and parts, and management support as necessary. Many features of a working environment can operate either to facilitate or degrade performance. The working environment of maintenance technicians warrants study in its own right.

## **Recommendations**

1. Airline managers should review carefully the report of the Air Force Tactical Air Command (TAC) experiment in changing organizational factors to enhance aviation maintenance. While this military model certainly could not be adapted directly to a commercial organization, many features of it might be employed to advantage in airline maintenance operations.
2. Each airline should look to itself to determine if its working corps of maintenance technicians is given proper respect, opportunities, and management support. Enhancing the "image" of the aviation maintenance technician certainly starts within the organization.
3. Under FAA auspices, a meeting should be convened to consider the working environment of the aviation maintenance technician. This meeting should attempt to identify variables which enhance or detract from maintenance productivity. Recommendations for improvements in the working environment should be generated.