

COMPARATIVE STUDY OF PERSONNEL QUALIFICATIONS AND TRAINING AT AVIATION MAINTENANCE FACILITIES

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EXECUTIVE SUMMARY

This report is based upon an exploratory comparison of maintenance training and qualification processes between Code of Federal Regulations (CFR) 14, Federal Aviation Regulations (FAR) Part 121 air carriers, and Part 145 maintenance providers and repair stations. The focus is on differences in the training and qualification of technician personnel employed by repair station organizations, compared with that provided for air carrier's in-house maintenance staff.

Data was gathered during on-site visits, at industry conferences meetings and seminars, from industry association-conducted surveys, telephone interviews, and group and individual interviews. This report documents the findings of research conducted, without drawing conclusions nor providing recommendations.

The training and qualifications of maintenance personnel in the air transport industry varies. It ranges from high quality, state-of-the-art and highly effective training, with corresponding qualification processes, to the "minimum" acceptable levels of "chalk and talk" and "buddy system" on the job (OJT) training. While a majority of the industry's maintenance training and qualifications providers are performing at acceptable levels, there are limited areas where they are not. The best that the maintenance training community has to offer is only available at the original equipment manufacturers (OEM) and the larger, successful air carriers. There are only a few other elements within air transport where this "top of the line" training is provided on a consistent basis.

The 1997 ValuJet accident motivated increased surveillance and sharper focus on maintenance program requirements and airworthiness responsibilities between operators and the repair stations to whom they out source maintenance. There is heightened awareness within airlines relative to their responsibilities for airworthiness when their aircraft are being maintained by a third party. Certainly the repair station environment has become more conscious and aware of issues that can create safety breaches in the system. Given all of this, not much concern has been generated, nor has a great deal been done by the Federal Aviation Administration (FAA) to change the status quo in the areas of training and qualification. The consensus of industry opinion, gleaned from the information gathered for this research, strongly points out the need for the FAA to take serious and rapid action toward raising the standards for maintenance training and qualifications, especially the "minimum" standards.

In today's air transport environment, cost containment and improvement is a competitive requirement. Training and qualifications (an area where return on investment [ROI] justification is difficult to pin down) are not always viewed as value-added activities. Operators and maintainers alike will conduct any training that is "government mandatory" because it is a "legal" requirement. They will conduct low ROI value mandatory government regulated training, i.e., Hazcom, Right to Know, Hazardous Materials, [OSHA](#), etc. There are no specific [FAA](#) requirements for recurrent, refresher, or "refreshment" training for other than specifically mandated, or specific regulation(s)-required training. Aviation Maintenance Technicians (AMTs) have no annual recurrent training requirements beyond what is specified for a few with special task responsibilities. There is no system where the FAA can communicate with its [A&P](#) certificated mechanics to pass on pertinent regulatory information, recent safety issues, accident reviews, breakdowns in the system, or human factors issues that could adversely affect aviation safety if not remedied. When specific training is not mandatory, it may be considered as "optional," depending upon the position taken by maintenance management as to its value.

Fundamental maintenance regulations have been completely re-written, or have undergone substantive and essential revision over the past 10 years, yet none have been implemented. When asked, the [FAA](#) responds that action is pending, but does not commit to a time line for their implementation. The United States General Accounting Office October 1997 report⁹ recommends that the "Secretary of Transportation instruct the Administrator of the FAA to expedite the efforts to update the regulations and to establish and meet schedules for completing the updates." The "FAA agreed with the recommendations but did not indicate how or when they would be implemented." To date, no visible action has taken place and the regulations can be found on the so-called "B list" for action. This has been described as the "when they get around to it list" which carries relatively low priority.

The air transport industry has changed and continues to change at a rapid pace. Aircraft technology has transformed into digital electronics and integrated systems; the business climate is cost containment and profit driven; the amount of maintenance conducted by operators in house is declining; sending work to third party maintenance providers is on the increase. At the same time competition for qualified maintenance technicians is growing while the supply is dwindling, as more potential entrants into the industry go elsewhere for higher pay and better working conditions. Given all of this, the regulations under which aviation maintenance operates have remained essentially the same for the past 30 years.

There is growing concern in the aircraft maintenance industry over the lack of attention to known issues with potentially serious effects and consequences - issues that do not appear to be of high interest, nor as vigorously pursued by the regulator. Personnel qualifications and training at aviation maintenance facilities is one of these issues, the details of which will be found in the information that follows.

INTRODUCTION

Training and qualification of all individuals working within the aircraft maintenance industry is both essential and critical. While all industry parties, including regulators, operators, and maintainers agree that technical qualifications based upon maintenance training is a critical element, essential to aviation safety, its adequacy has been questioned. Recent aviation accidents and incidents have given rise to a number of concerns. Is qualification and training within all elements of this industry in full compliance with Federal Aviation Administration (FAA) regulations and standards? Is there a difference in the qualification and training of maintenance staff at major air carriers versus those certificated repair stations that perform major maintenance and alterations on air transport category aircraft? Are the personnel who perform aircraft maintenance as temporary staff, provided by fourth tier aviation maintenance support contractors, properly trained and qualified? Do the FAA field operations and inspection personnel understand the basic elements and quality factors that are necessary to ensure satisfactory maintenance qualification and training programs?

The focus of this research was to gather data relative to these and other similar questions, and then to evaluate and report on these initial findings. Conclusions will not be drawn, nor recommendations developed as a result of this effort. The primary objective is to develop an objective overview of the topic and prepare this phase report based on the specific data gathered. Continuing and more in depth research on this subject, and other elements relating to third-party maintenance, are underway by both the [FAA](#) and the National Transportation Safety Board (NTSB). These efforts will continue through at least the remainder of 1998 and 1999.

Information and data for this report was gathered through site visits to both airlines and certificated repair stations, telephone surveys, interviews with mechanics, inspectors, technicians, technical support staff, maintenance management personnel, and questionnaires sent out by aviation industry associations. Those participating were promised complete confidentiality in order to obtain candid information, personal opinions, and unrestrained comments. The report provides a “snap-shot” of where the industry stands relative to maintenance training and qualifications at the air carriers, compared to the high growth area of “contract maintenance” at the transport aircraft level certificated repair stations.

Aviation Maintenance Facilities - Parties Performing Maintenance, Repairs and Alterations

Aircraft are in a process of continual maintenance, from a basic pre-flight “walk around” inspection that takes only minutes, up to major overhaul and alteration that can require months and thousands of labor hours. Maintenance is performed at various facilities, ranging from the passenger terminal ramp for en route repairs and daily and minor overnight checks to large fixed base facilities where heavy checks, major inspections, alterations, and modifications are conducted over extended time periods.

Along with these multiple levels of maintenance work is a corresponding range of needs and requirements for maintenance personnel. The day-to-day operational maintenance requires persons who are generalists -- Airframe and Powerplant certificated (A&P) mechanics with the knowledge and skills necessary to ensure aircraft operational safety and the qualifications required to return planes to service as maintenance actions have been completed. Maintenance requirements that are completed while aircraft are out of service -- the heavy checks, detailed inspections, major repairs and alterations -- are most often completed by specialists. Although the majority of these specialists are A&P certificated, many are uncertificated and perform work at airline maintenance bases, or certificated repair stations, under the supervision of certificated individuals.

The air carriers, especially the “major” carriers, have tended to accomplish major maintenance in house. This is divided into three major functional areas: 1) line maintenance for the day-to-day operational environment, 2) base maintenance for heavier airframe inspections and major modification work, and 3) shop maintenance for engines, accessories, and components. The majority of airline mechanics are [A&Ps](#), with only a comparatively small number of uncertificated specialists working in base and shop maintenance. The air carriers operate under [FAR](#) Part 121, which has specific requirements for certification, training, and qualification of maintenance personnel.

Over the past several years, the state of aircraft maintenance has undergone a great deal of change. Several relatively small, so-called “low cost” carriers have emerged. Many of these carriers don’t have the size to justify -- and in several cases the desire to accomplish -- their own heavy or “base maintenance” work. As a result, several large certificated repair stations, operating under [FAR](#) Part 145, have emerged or have grown to handle major maintenance for these carriers. There is also a trend developing for the larger air carriers to contract heavy maintenance that is either in excess of their capacity, a specific aircraft type of which few are in operation, or for a number of specific major repairs and alterations (modifications or mods) to certificated repair stations -- the so-called third-party maintenance organizations.

Operating under [FAR](#) Part 145, these major repair stations do not have the same level of specific and detailed requirements for certification, training, and qualification of maintenance personnel as do the air carriers who operate under FAR Part 121. The maintenance staff significantly differs from the air carriers, in that the majority of those working in repair stations are specialists, of whom slightly over half are [A&P](#) certificated. Another element of repair station staffing, due to the fluctuating nature of workloads, is the emergence of a large pool (estimated to be in the range of 3,500 to 4,500) of maintenance personnel who work for temporary placement organizations (“fourth party”). These organizations supply technician staffing to the repair stations, allowing them to meet peak workload demands. These “contractors” move from one organization to another as needed, and have become a significant work force within the third party maintenance environment.

The basic elements of aircraft maintenance have changed little over the years. However, where maintenance is accomplished and by whom has changed, and will continue to change. Mix this fact with fleets of aging aircraft that require more heavy maintenance and inspection along with the emergence of new fleets of aircraft with advanced design, digital electronics, and integrated systems. One may conclude that there is good reason to examine how effectively training and qualification is being accomplished.

THE REQUIREMENTS

It is a primary [FAA](#) requirement that all persons who perform maintenance in the aviation industry be qualified on any task or tasks they perform. The Federal Aviation Regulations are very clear on this requirement as it relates to maintenance training and personnel qualifications. Since information relative to maintenance qualifications and training is found in several parts of the regulations, the amount and complexity of the contents is not readily apparent. There is no place in the regulations where specific topics may be viewed in digest form. The purpose of this section is to provide an overview of these related regulatory elements. Shown in the sub headings that follow are pertinent segments of the regulations, along with comments and discussion. Seldom, if ever, does one view these elements of the [FARs](#) displayed together.

Regulatory Compliance - Surveillance and Inspection

How the industry views the [FAA](#)’s level of attention to training and qualification surveillance and inspection is expressed through the comments and points of view obtained during the data gathering phase of this research. These comments are presented in [List 1](#) and have been edited for consolidation purposes.

List 1. Comments about FAA

- There are so few FAA inspectors and even fewer who really know what is going on, or where to look for problems. It seems that training and qualification is almost a side issue. Inspectors are primarily interested in documentation, job sign-off, adherence to the maintenance plan, contractor/operator relationships -- the more direct maintenance and subjective issues. These inspectors have a tough job and are basically out there on their own, trying to make sure the operation is both safe and compliant with the regulations.
- The FAA inspectors usually don’t know much about requirements for good training and qualification programs.
- About all that inspectors check are training records and that special task qualifications are signed off.

• An unspecified “minimum standard” for training seems to be acceptable. As long as an aircraft introduction (“General Familiarization or Gen. Fam.”) course is 40 hours in the classroom, there are no questions. “Chalk and talk,” with some black and white transparencies taken from the maintenance manual, meets with approval. If the materials are 20 years old, taught by an instructor who has never worked the aircraft, presented in a manner “similar to listening to the reading of last month’s public utilities bills,” that’s OK too.

• Inspectors don’t audit classes very often. When they do, it is usually for only a few minutes in any one class. It seems that if the instructor is understandable and the people in the classes are somewhat attentive, it is acceptable. Many instructors, some with over 20 years of teaching, will state that they have never had an [FAA](#) Airworthiness Inspector observe one of their classes.

• If you have your training presented by an outside training provider, inspectors don’t often question the course content and instructional quality. They seem to be interested in making sure that the mechanics have had the usual 40 hours of training.

• Any [OJT](#) seems acceptable. No one ever asks for task content analysis, check lists, or proof of competence of those who are trained. Very little time is spent out on the floor gathering information from the mechanics and technicians about their training and qualifications.

• Inspectors seldom, if ever, ask about such things as course objectives, task analysis, behavioral objectives, course outlines, course content, training materials, testing and competence measurement. They don’t have much training in evaluating the maintenance training and qualifications process.

• The [NASIP](#) team inspections are not very detailed in the training and qualifications area. All the inspectors seem to be interested in is the paper work. If the records are up to date and the requirements for special tasks such as RII, Category I, II, and III, and winter operations (those elements covered in the regulations) look good, there is no problem. Little reference or investigation into training and qualifications program’s development processes, content, quality, and trainee’s post training performance is made.

Regulatory Change and Action Pending

As discussed in the introduction, a great deal has changed in aviation maintenance over the last 15 to 20 years, yet the regulations have remained basically the same for almost 30 years. Several major factors have significantly influenced the industry:

- Cyclical fluctuations in the economy have created significant impact.
- Major changes in the governance of air transport route and fare restrictions have dramatically changed its competitive basis and business structure.
- Air carriers have gone out of business, some merged with others who merged again.
- Small, lower operating cost carriers have emerged, a few becoming major forces in the industry.
- Fleets of aircraft are aging, operating well beyond what was expected when they were built the 1960s and 1970s, creating a new set of challenges for the maintenance community.
- New aircraft with new technology, requiring new knowledge and skills for their maintainers, are emerging. The new technology aircraft, while replacing some of those that are aging, represent the main area of growth in the industry.

- Where maintenance work is being accomplished and by whom also has changed, and is continuing to change as the industry continues to adapt.

These factors were recognized and action began to take place on the modification of Federal Aviation Regulations about 10 years ago. The objective of the [FAA](#) was to catch up with, and then to keep pace with, the changes and technological developments in the industry. The Aviation Rulemaking Advisory Committee (ARAC) process was developed and put in place. Representatives from aviation industry associations, labor unions, and the industry at large were convened in specific ARAC groups to focus on specific rules that were deemed in need of revision, rework, or total change.

One of these [ARAC](#) groups was responsible for developing and recommending changes to the rule that applies to the certification, training and qualification of aviation maintenance personnel: [FAR](#) Part 65 - CERTIFICATION: AIRMEN OTHER THAN FLIGHT CREWMEMBERS. The extensive revisions provide fundamental changes to the content of the rule, including its re-numbering and title change to FAR Part 66- CERTIFICATION: AVIATION MAINTENANCE PERSONNEL, was released to the [FAA](#) from the ARAC process in June of 1996. As of early 1998, there has been no visible implementation action taken by the FAA, nor has a final Notice of Proposed Rule Making (NPRM) been issued. While most working in the industry, and the majority of the industry associations, agree that change is essential and changes to Part 65/66 are generally acceptable, industry continues to wait for the implementation process to begin. Requirement changes in the proposed Part 66 are designed to significantly improve the process of certification, qualification, and training of maintenance personnel. A new NPRM for this rule was signed by the FAA Administrator in late June 1998 and will be released for the public comment period, with implementation to follow. If all goes according to the 1996 schedule, when the initial NPRM was released for public comment, the new PART 66 should be in force by the last quarter of 2000.

There was also an [ARAC](#) group convened to revise [FAR](#) PART 121-CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT; Subpart N--Training Program; 121.375 Maintenance and preventative maintenance program. This group was formed as a result of a February 9, 1995 [FAA](#) report detailing results of the January 1995 Aviation Safety Conference, convened by the Secretary of Transportation. In order to meet the goal of achieving zero accident, the conference participants determined the following: The qualification standards and training for aircraft maintenance personnel should receive the same focus and attention from industry and Government as the standards and training for aircraft crew members. The results of the safety conference also indicated that the FAA should:

1. Revise the current maintenance and preventative maintenance training requirements to set clear minimum standards;
2. Detail the training requirements for required inspection items (RII);
3. Identify initial and recurrent training requirements for aircraft types;
4. Determine training requirements for contract maintenance and maintenance service providers

This work was completed on a fast track schedule by the [ARAC](#) 121.375 group. An extensive revision was developed on which there was general agreement. It was decided that while the ARAC had completed an excellent substantive revision and update of PART 121.375, it would be issued as an Advisory Circular. The final draft of this Advisory Circular (AC) was completed on March 8, 1996. To date, no further action has taken place on the issuance of this AC. It is currently on the [FAA](#)'s "B list" with no release date yet determined. Action on this AC is pending.

Although no [ARAC](#) group was convened for [FAR](#) Part 145 - REPAIR STATIONS, an advance [NPRM](#) for this rule, outlining [FAA](#)'s recommended revisions, was published in 1989. An industry advisory group was established that has been working with the FAA on changes since 1989. The recommended changes to Part 145, as with those that produced the new Part 66, provide significant improvements in the areas of technician certification, training and qualification. Action on this rule is pending.

The October, 1997 United States General Accounting Office (GAO) Report

In the United States General Accounting Office (GAO) Report to Congressional Requesters, published October 1997, entitled: [AVIATION SAFETY - FAA Oversight of Repair Stations Needs Improvement](#) (GOA/RCED-98-21), chapter 4, page 70, Actions Currently Underway to Augment Oversight of Repair Stations, the section, *Upgrading Certification and Training of Aviation Maintenance Personnel*, reads as follows:

Because of significant technological advances in the aviation industry, current [FAA](#) regulations that prescribe the certification requirement for an estimated 145,000 mechanics and repairmen needs to be updated. Aviation maintenance is one of the most complex areas of the industry, and aviation maintenance personnel must possess many technical skills. Changes in aircraft technology have also significantly increased the need for specialized training. FAA has been updating, consolidating, and clarifying all its certification, training, experience and currency requirements for aviation maintenance personnel for a new rule (14 [C.F.R.](#) Part 66) entitled "Certification: Aviation Maintenance Personnel." According to FAA, some of the key features include the

- creation of additional certificate and ratings for aviation maintenance personnel,
- expansion of current certification requirements,
- and establishment of additional training and recurrent training requirements for certificated aviation maintenance personnel.

Initially, on August 17, 1994, the proposed rule was published in the Federal Register for public comment. However, the final issuance of the rule has been delayed because [FAA](#) officials decided they need to combine the proposed rule with other rule revisions. According to FAA headquarters officials, FAA plans to reissue the revised proposed rule in the Federal Register for public comment in December 1997.⁹

Continuing on page 71 under the heading *Recommendation* is the following:

To ensure outdated regulations governing the oversight of repair stations and certification and training requirements for maintenance personnel are updated as soon as possible, we recommend that the Secretary of Transportation instruct the Administrator of [FAA](#) to expedite the efforts to update the regulations and to establish and meet schedules for completing the updates.⁹

Lastly, under the heading *Agency Comments*: "[FAA](#) agreed with the recommendation but did not indicate how or when it would be implemented."⁹

The aviation maintenance community has spent almost 10 years participating in the rule-making process and has spent significant amounts of personnel time and money doing so. Industry continues to anticipate when they may begin to plan for and implement rule changes that will guide them into the future.

Members of the [NTSB](#) have commented and concluded in accident investigations that [FAA](#) needs to expedite the update of regulations governing the oversight of repair stations and certification and training requirements for maintenance personnel.

The [GAO](#) has recommended that “the Secretary of Transportation instruct the Administrator of [FAA](#) to expedite the efforts to update the regulations and to establish and meet schedules for completing the updates.”

The [FAA](#) continues to agree with these recommendations, but does not indicate how or when they will be implemented. Action on the above is pending.

INDUSTRY VIEWS AND COMMENTS

Within this sub chapter are views and comments from people in various elements of the aviation maintenance and repair industry on maintenance training and qualification. The input was obtained during 1997 attending industry meetings, during site visits, and from informal personal telephone interviews. It is interesting to note the wide variance in perspectives relative to maintenance training. Although maintenance managers and the personnel performing the work may share similar views and opinions, they have been placed under separate headings for ease in source identification.

Maintenance Management Comments

The importance of priority training and qualifications in the minds of managers varies. Those managers who directly supervise maintenance technicians are generally strong supporters of training for their people. Higher level managers, while they may agree that training is important, are not strong supporters when it comes down to time off from the job and the associated costs of training. And there are still a few managers who view training only as a necessary evil that one has to deal with. Following are some of their comments and related discussion (see [List 2](#)).

Clearly, in the minds of many managers, there is added value to having highly trained and well qualified technicians in their work force. There were a number of comments as to the value of “good training” when considering safety, productivity and operating performance. It was clear that those who understood the basics of effective training and qualifications programs view them as essential elements within their operations (see [List 2](#)).

List 2. Comments by Managers
• “We can’t do enough training for our technicians -- it improves productivity and provides a competitive edge.”
• “Technicians consider that you [your company] have an interest in them when training is provided.”
• “It’s simple, pay for training up front, or pay more later.”
• “Human factors and MRM [Maintenance Resource Management] is a must if we truly want to reduce aviation accidents.”
• “There is too much “no fault” found in our business. Better training would reduce it.”
• “Be sure that the supervisors and leads also receive the training they need.”

- “A good deal of training needs to be done on the so called new technology aircraft. We are all behind the power curve here.”

Training and qualification is a cost issue. In most situations, training doesn't provide immediate and tangible results, thus it is often given low priority or only token support. Since the status quo is usually acceptable to the regulator with a limited focus on training and qualification issues, many upper level maintenance managers simply don't give training very high priority. While many training managers in the industry try to develop better systems for measuring training results, none have made significant progress (see [List 3](#)).

List 3. Comments by Managers

- “While we know that training is very necessary, it is very difficult to place a dollar value on the results.”
- “Training is a high cost issue. Considering the hourly rate of a mechanic in training, plus the cost of the training itself, adding in lost production and other indirect costs, training is expensive.”
- “What is the true [ROI](#) of training?”
- “Some airlines, who have maintenance data collection systems and measurement tools, are able to show specific positive results of training.”
- “It's a necessary evil, starved for funding because many managers view it this way. It is difficult to show the [ROI](#) of maintenance training when the big problems are worked by every other department in the maintenance organization.”
- “Most of the big bosses are on an incentive program and only care about the bottom line. They will spend as little on training as they can. Look where they cut first when times are tough.”
- “We think that our need to spend more money on training is real, but we can't get through the “bean counters' justification system.”
- “The pending changes to PART 66 and PART 145 have gotten the attention of some of the more alert maintenance organizations. Some have started to take action relative to improved training. There are also a number of managers who are doing nothing. These feel that, given the current operations of the [FAA](#), if changes ever come they will have more than enough time to comply.”

As the third-party business grows, and airlines lower costs, competition increases, and the cost of labor becomes increasingly critical. While the comments above may sound almost as if they came from the early 1900s, there are still some in the aviation industry that hold such views today. Those same comments may show a certain lack of professionalism and commitment to improvement within the industry; fortunately those managers who hold such opinions are in the minority (see [List 4](#)).

List 4. Comments by Managers

- “Only provide workers with enough training to do specific things [tasks], don't give them more just to use somewhere else.”

- “Don’t pass out any certificates of completion or diplomas, they will use them to show the next guy they want to work for.”
- “The more training you provide for some of these guys, the faster they go somewhere else where they can make more money.”
- “There is quite a bit of apprehension over the new ARS [Aviation Repair Specialist] classifications under the new PART 66. The fear is that when technicians become individually certified as ARS-1, they will go elsewhere for more money. The Unions may also ask for extra certification pay.”

Apparently there are a few managers who can only help improve the industry by seeking a career elsewhere! While it is easy to discount such uninformed comments, the fact that there are some individuals in the industry who hold such views cannot be overlooked (see [List 5](#)).

List 5. Comments by Managers

- “Yeah, we conduct some training to keep the Feds happy, but it doesn’t show me much.”

What the Work Force Has to Say

The mechanics, aviation maintenance technicians, aircraft maintenance engineers, specialists (by category), leads, inspectors, or whatever label under which they are currently identified, continue to show high interest in the professional standards of their industry. There is a general view that the worker is not heard by leadership and if they were heard more clearly, more improvements could be made faster than at present. When asked, they will provide candid, well thought out comments and views on maintenance training and qualification. In many cases the comments made by the workers on the hangar/shop floor and on the ramp, although sometimes stated differently, mirror what managers have to say.

List 6. Comments by Workers

- "We need more recurrent training; use it or lose it."
- "More [OJT](#) is needed -- the right way, with check lists and task sign off."
- “There should be less time in the classroom, more practical/hands on.”
- “There’s not enough training -- period. Management needs to realize that it pays off.”
- “Training needs to be based on what we do on the job.”
- “Learning how to troubleshoot better would save a lot of money for the company.”
- “There are too many push-back, tire and brake, mechanics on the line.”
- “We must have special training on the new technology in all the new aircraft.”
- “The culture that allows us to change the same good part over and over again needs to change.”

- “Our training should be on what really happens on the line. It should not be too deep and spend lots of time on internals. Tell us, show us, and let us practice what we need for our jobs.”
- “In the old days, we had [OJT](#) instructors who could teach two or three others and fix an airplane at the same time. There is very little hands-on training nowadays.”
- “Don’t bore us with stuff that is too basic, we’ve seen too much of the same stuff.”
- “Too much training happens by accident, where ‘x’ hours of training is given to solve a situation. There is little thought given to the content of such training, or what the mechanic can actually do when the training is over. Some us call this feel-good training, it makes management feel good.”
- “Training at the aircraft factories is too long, too boring, too engineering oriented, and doesn’t give a mechanic what is needed. They could give us what we need in less than half the time.”
- “Education is everything in our business.”
- “Don’t get the wrong idea. A lot of our training is what we need and right on.”

The folks who do the work seem to know and understand what they need in order to be sufficiently trained and properly qualified to perform any and all maintenance tasks. The major focus of their comments seems to point toward a need not only for more training, but more of the type of training they can best apply. This does not necessarily mean more time in training. It is also recognized that effective recurrent training is necessary. What most are asking for, in simple terms, is the right stuff at the right time. While not overly critical of the [FAA](#), many feel that the regulator needs to do more toward providing rules and guidance for the industry -- rules and guidance that ensure both the appropriate quantity and quality of training, with competence-based qualification requirements (see [List 6](#)).

List 7. Comments by Workers
• “ A&P schools are the weakest link. They have no current methods or techniques.”
• “A new A&P only has a learner’s permit.”
• “There are some great new A&Ps, others who can hardly read and barely write.”
• “The A&P schools don’t teach enough about transport aircraft.”
• “Anyone seems to be able to buy an A&P license.”
• “Is the FAA going to bring schools up to date? They are way behind the power curve.”

There is a good deal of concern in the work force over both the quality of current [A&P](#) (PART 147) schools and their graduates. The speculation that anyone can “buy a ticket” (purchase an A&P) is brought up in discussions frequently. A sub-issue in these discussions is the ability of anyone to purchase all the questions and answers on the A&P examination. The comments can be synthesized as follows: A person can purchase all the questions and answers to the A&P exam. With instructions on how to study all of the questions, focusing only on the content of the correct answer, while attending a weekend “crash course,” just about anyone can pass at 70%. The [FAA](#) throws up their hands and states that there is nothing that can be done to keep questions and answers out of the public domain, due to the Freedom of Information Act. Many simply don’t accept that answer and wonder if this is also true for other Federal examinations, such as the FBI, CIA, Secret Service and other agencies. One comment that stands out was from a mechanic who said: “We often can’t, ‘cause we won’t try.” (See [List 7](#).)

List 8. Comments by Workers

- “There needs to be more focus on avionics and electrical. Everyone today needs to know electrical and electronics.”
- “We need training on the new tech airplanes.”
- “Go to where the future is. You just can’t continue to change parts on these new aircraft. More people need to be able to listen to what these new aircraft can tell them with BITE (Built In Test Equipment). The BITE in the new aircraft is very good... many just don’t know how to use it.”
- “Software loading is a big issue. We really don’t have it under control, lots of training is needed (especially on navigational data bases).”
- “It would be a lot better if we had some sort of simulators for maintenance training.”
- “Some [A&Ps](#) can’t splice a wire, change a pin in a connector, or change a simple two wire cannon plug, let alone read a wiring diagram.”
- “More mechanics need to know how to work new technology, read wiring diagrams and schematics, and to perform electrical and electronic trouble shooting.”
- “Passenger and cabin management systems are becoming a big problem. It is no longer just in-flight movies, television, and stereo. More training would help.”
- “Airlines could save a lot of money if there was less ‘no trouble [fault] found’ parts replacements.”
- “The use of computers is great for some of our training, not all of it though.”

There is obviously some need in the area of new technology aircraft training. While some of the airlines are well down the road with training on the newer fleets, others are just starting, or are planning to get started soon. Since few of the newer “high technology” airplanes have been worked on by third-party repair stations, few of those organizations have provided such training. As pointed out previously, the folks who do the work are able to clearly state what they need in order to accomplish it safely and efficiently. The thrust of the comments leads toward a primary need for training on the new “electronic, computerized, digitally integrated systems, fly by wire” technology itself. The need for this type training on specific aircraft by type seems to be secondary (see [List 8](#)).

List 9. Comments by Workers

- “Listen to what the aircraft tell us, develop a most frequent fix for an item -- there are hundreds of repeaters that we don’t capture.”
- “We have no idea what is going on in the rest of our industry relative to safety, incidents, close calls, accidents and what is going on in the industry. The [FAA](#) never tells us anything, or tells our company to pass on anything to us.”
- “I’ve attended MRM (Maintenance Resource Management Training) and it was one of the best courses ever. I learned a lot about safety, myself, how teams work, and when people need to be extra cautious. It also made me feel like the company was interested in me.”
- “Listen to the people, get out and talk to them and pay attention to what they have to say.”
- “We need to get together, brainstorm and get the ears of our management.”
- “There should be a course in pilot language; what they call stuff and how they state problems.”
- “Mechanics should ride the cockpit jump seat every so often to see how the systems operate in flight and how the crews operate them.”
- “It would be a lot better if we worked more as a team. Too many just do their own thing.”

Since Human Factors in maintenance has been introduced, more of the work force is becoming aware of the benefits. Sensitivity to human performance issues is on the increase. The majority of those who have attended [MRM](#) training are quite positive about its value. Most who have not attended such training have heard about it and are interested in attending. Again, the maintenance workers point out the need for current information about what is going on in the industry. The vast majority want to ensure the job is done safely, they want to improve the overall safety record and at the same time increase the level of professionalism (see [List 9](#)).

AMT Training Survey and Results

The Professional Aviation Maintenance Training Association conducted a survey of their members’ views and opinions on maintenance training in late 1997. While the majority of respondents (54.9%) categorized themselves as working in “corporate aviation,” “repair stations” represented 31.4%, with “other, general aviation, and contract” totaling 13.8%. Within corporate aviation, due to the nature of the [AMT](#)’s duties and job scope, one can expect to find more training per employee than within other segments of the industry. Questions and responses are shown in [Table 1](#).

Table 1: AMT Training Survey		
Question	Yes Response	No Response
Does your employer provide you with qualification and/or recurrent technical training on a regular basis?	74.5%	25.5%
Do you feel your employer provides you with a sufficient amount of maintenance technical training?	68.6%	31.4%

Does your employer provide sufficient recurrent training for you to remain up to date with the equipment and tasks you regularly work?	72%	28%
When you attend training, is it paid time?	91.7%	8.3%
Is training scheduled during your regular work hours?	91.1%	8.9%
Do you attend training during special work hours (before or after your regular shift or on days off?)	41.3%	58.7%
Do you attend unpaid training on your own time?	19.1%	80.9%
Have you attended a Maintenance Resource Management (MRM) class?	44.9%	55.1%

It is interesting to note that Maintenance Resource Management courses have been attended by a respectable percentage of the corporate aviation work force. The responses to other questions posed to this group are very much in keeping with what [AMTs](#) working in airlines and repair stations had to say when asked the same, or similar, questions. Classroom training with practical, hands on application included is the most effective type of training. The next effective types of training were rated almost equally. These were formal classroom and formal on the job (OJT). Shorter, task(s)-specific training administered often was deemed superior to infrequently attending lengthy aircraft and systems courses.

Views on Temporary/Contract Personnel

Managers and technicians alike have comments concerning temporary/contract workers. It has become an accepted fact of life that these individuals are necessary in the third party repair station world of dramatic workload fluctuations. Yet there appears to be general concern about this element of the work force (see [List 10](#)).

List 10. Comments Concerning Temporary/Contract Workers
• “We will only permanently hire about one out of ten contract workers who apply.”
• “Some of these contract guys are vagabonds, not very good and don’t stay long.”
• “You have no choice, there are so few technicians available.”
• “It is almost impossible to find decent structures people.”
• “Though generally hidden from management, many full time, permanent employees resent their employer’s use of contractors. The full time folks often feel that they have to carry them.”
• “You just know that when you get rid of one of these folks, they will be working for a competitor next week.”

- “Less than half of the contractors have licenses and you don’t really know much about their backgrounds. Only a few of the structures folks have tickets and are often not very good.”

- “Let’s just say that our best and brightest are not temporary contractors. Do they meet minimum standards? I guess so.”

More information on this subject will be found in the following section, [Contract Maintenance Employee Providers](#).

CONTRACT MAINTENANCE EMPLOYEE PROVIDERS

The entrance of temporary mechanics/technicians primarily into the large transport aircraft third party repair station environment has steadily increased over the last ten to twelve years. The providers of these employees now estimate that there are from 3,500 to 4,500 available in the marketplace. This so-called “fourth” party level of maintenance is an area of concern since surveillance, from all indications, is minimal.

Although the number varies, there are currently about a dozen independent major airframe repair stations which specialize in large transport aircraft maintenance. There are six contract personnel providers who play a major role in this area of the industry; the top three supply well over half of the employees (600 to 900 each, depending upon current demand). The six major personnel providers supply six to eight major repair stations. Thus, the repair stations constantly draw from basically the same manpower pool that shifts from place to place, filling the needs generated by fluctuations in their workloads. The pool continues to grow, constantly adding new people. At the same time, the pool slowly changes as “the best of the contract mechanics” are hired as permanent repair station employees.

The providers state that between 50% to 60% of their employees are [A&P](#) certificated. A high number of the A&P certificated technicians are recent Part 147 school graduates. The majority of the structures technicians are not certificated but have military and/or other aircraft related experience. None of these contract providers are currently training their employee pool. They rely on the organizations where the employees are placed to accomplish such training as needed.

Contract employees generally work on Internal Revenue Service (IRS) form 1099 income reporting status. They are classified as individual contractors, responsible for their own benefits and Social Security (SSI) payments. Working at a \$9 to \$12 per hour minimum salary, they also receive per diem payments on which there is neither income tax nor SSI assessment. As demand for their services increases, due to the growing shortage of qualified technicians, they are demanding higher per-diem (\$250-\$500 or more per week) in lieu of higher salary or salary increases. This can mean an additional \$12,000 to \$25,000 per year for a contract employee. It may also mean that most of the contract employees are making more money, in net salary dollars, than the permanent full time employees they are working with. In some cases there are married couples working at the same repair station, one working as a contract employee, the other for the repair station with salary plus employee benefits. In these situations, a couple has the advantages of both low cost benefits and lower income taxes. It is no wonder that there is a growing core of contract employees who do not wish to become permanent and/or full-time workers. They prefer to “comply” with the “fifty mile from domicile” rule, (this IRS rule does not allow collection of per diem as non-taxable if the employee resides less than 50 miles from the work place) working without benefits on the salary plus per diem basis.

When jobs were in short supply, entry into aviation maintenance jobs was through the temporary provider agencies. This has now become a significant aspect of the upward mobility hierarchy within aviation maintenance. Starting with a temporary job as a contractor, one may next move into a repair station, then on to an airline as the final step. This has become much the same as pilots: start with a low-paid “fly anything” job, then on to a commuter carrier, next to a large regional carrier, and finally into the “major” airlines. In the course of this change in how many maintenance workers enter the industry, a large population of contract employees developed, many of whom prefer to remain in such status for the various reasons cited in this chapter.

As this report was in the final editing stages, it was learned that at least one of the largest contract labor providers is the process of recruiting labor from outside the United States. This organization is currently in the process of gaining Department of Labor and Immigration and Naturalization approval in order to offer jobs and obtain appropriate visas. One of the potential sources being investigated is the UK, where they are also experiencing a shortage of qualified aircraft maintenance technicians. Not only is the contract aircraft technician labor pool growing and due to the shortage of qualified candidates, is now on the brink of becoming an international issue.

Candidate Quality and Verification of Experience and Qualifications

The demand for these employees is high and continuing to grow. One major provider stated: “I can place every qualified [AMT](#) that I can find. Further indicating: “I usually have about 300 open orders at any given time.” Another said: “It is almost impossible to find decent structures people....All too often those who state that they are ‘good’ structures people, in fact come up short when placed on the job.”

Most providers rely on interviews, background statements, previous training records, military documentation, and resumes as indicators of training, experience and qualifications. While a majority of the employees have legitimate experience, certification, training, and qualifications, others do not. Few of the contract employee provider organizations contacted use the services of professional applicant background check/review organizations to verify previous employment, education, training, experience, certification, and/or convictions for breaking the law.

One of the placement agencies, due to problems with quality of structures employees being placed, began to conduct some basic skills testing. When given a “simple structures practical test,” there was a 50% failure rate. There was also a 50% failure rate on a basic blue print reading test that had been developed initially by a major airframe manufacturer’s technical support organization. Given this, it required up to 100 candidates to recruit 25 to 30 structures technicians. A major airline has experienced similar results testing certificated [A&P](#) mechanics. What concerns the people who provided this information is that the individuals who have failed such testing not only remain in the candidate pool, but also are hired by other organizations in the industry who may not have similar candidate screening practices.

The [FAA](#) has no oversight responsibility for contract maintenance employee providers. Only when their personnel become employees, contracted to work in aviation maintenance organizations, do these people come under surveillance and become subject to review. As “contract employment agencies,” they are simply brokers who supply labor for a placement and collect a fee for the service.

The Future of Contract Maintenance Employees and Possible Shortages of Qualified Technicians

There is open discussion within the industry over the growing shortage of qualified certificated and non-certificated workers in the aviation maintenance industry. The airlines, due to better salaries, benefits, and job security, are hiring those certificated [A&Ps](#) that are best trained, qualified, and experienced. Those with less training, qualifications, and experience, who are often newly certificated A&Ps or non-certificated specialists, are being employed in certificated repair stations. Those that remain, or elect to do so, work through temporary contractor placement organizations.

The future of contract maintenance employment seems to be strong. It provides aircraft maintenance organizations and repair stations with a supply of employees to meet the variability of workloads within their individual businesses. At the same time, it is a part of the industry that can most easily expand and reduce in size with the changing demands of what has been a very cyclical industry over the past 30 years.

The predictions of the August 1993 Pilot and Aviation Maintenance Technician Blue Ribbon Panel report⁴ are proving to be valid. The supply of qualified Aviation Maintenance Technicians is not meeting the current demand and the demand is increasing. The primary reasons for this were predicted in the report:

1. The shortage will not be manifested in numbers of employees, but in the numbers of qualified employees available.
2. A significant source of [AMTs](#), the US Military services, has been dramatically reduced.
3. New aircraft orders are now at an all time high, revenue passenger miles are increasing at a rapid rate.
4. The last down cycle in the industry caused closure of numerous [AMT](#) schools, along with a related student population reduction of over 50% from the 1991 peak of 26,850 reported in the [FAA](#)'s 1996 Training and Certification in the Aircraft Maintenance Industry report.
5. Aviation industry parents, who in the past motivated significant numbers of their children to enter the industry as [AMTs](#), no longer view it as a "good, stable, life-long" career.
6. Primarily due to the significant industry down-turn, resulting from the recession during the early to mid 1990s, neither the industry's leadership nor the [FAA](#) heeded the conclusions or adopted any recommendations posed by the Blue Ribbon Panel.

The headquarters staff of the Professional Aviation Maintenance Association (PAMA) submits that there are other factors creating an environment that exacerbates the deepening shortage:

1. The majority of [AMTs](#) who were furloughed and entered other career fields during the last down cycle have not returned to the industry.
2. A significant number of Part 147 school [A&P](#) certificated graduates went into other industries when there was no one hiring in aviation. These folks will not return; they are gone forever.
3. One third to one half of Part 147 school's current graduates with [A&P](#) certification enter careers other than aviation.
4. [AMT](#) salaries have not kept pace with technical salaries of related jobs in other industries, especially in the case of repair stations and contract maintenance providers.
5. There are 5 jobs for every graduate with an [A&P](#), 3 of these are non-aviation!

An airline training manager provided information from the Clearwater, Florida's National Aviation Academy's recent newsletter: "Adequately staffing the aircraft maintenance industry will require nearly 8,000 newly hired [AMTs](#) in 1998, 10,000 in 1999, with the number estimated to climb to 14,000 to 16,000 per year 4 to 5 years hence. The AMT education industry is producing newly licensed [certificated] AMTs at the rate of less than 2,000 per year. The difference speaks for itself." The article also pointed out that individuals applying to take their first [A&P](#) (the General Section) [FAA](#) Examinations were:

- 10/01/1990 to 09/30/1992 16,337

- 10/01/1995 to 09/30/1997 3,559

This represents a 77% reduction from the levels of 5 years ago!

On the cover page of the fax transmission containing the information provided above, was a candid comment from the training manager who sent it: “Perhaps someone one day will get to what I perceive as the root cause among young people driving them to select a non-aviation career path: low pay and little respect for the profession. A circus chimpanzee can be taught to ride a bicycle, but can he fix it when it breaks?”

A young Mercedes Benz technician, who graduated from a Part 147 school with [A&P](#) certification, made a comment which serves as an excellent summary: “Why should I go back into aviation as a career? I’m happy where I am -- weekends off, no shift work, a clean heated/air conditioned shop to work in, with better pay and benefits.” One could conclude that the days of young people entering careers in aviation maintenance, just to be involved in aviation, may be over. [PAMA](#) leaders feel that our industry must compete effectively with other industries in order to build and retain a qualified, professional workforce in aviation maintenance.

Regulation and Oversight of Contract Maintenance Employee Providers

Beyond the certification requirements for mechanics and repairmen in [FAR](#) PART 65, the personnel requirements in FAR PART 145, and the requirements for mechanic training in FAR PART 147, there are no specific regulations for contract maintenance employee providers. Other than some industry standards (primarily welding and non-destructive testing) there are no [FAA](#) nor national standards for non-certificated aviation maintenance technicians that work as specialists. Specialist standards exist in other countries, including an excellent system that was recently developed by our Canadian neighbors.

A report published by the [FAA](#) in March of 1996⁵ provided a complete study on the current dearth of standards for aviation repair specialists, the need for standards, how other organizations develop and use national standards, and recommendations on how to formulate such a process for use by the FAA. Although over 500 copies of this report have been published and distributed, there has been no action taken, nor does it appear there may be any planned until after the new [FAR](#) PART 66 is released. In the meantime, the contractor employee pool continues to grow.

MAINTENANCE TRAINING PROVIDER COMPARISONS

Maintenance training is developed and delivered by several levels of providers. All of the technical data used for training originates with the original equipment manufacturers’ (OEM) engineering and maintenance organizations, distributed through their technical publications departments. The technical data is initially converted into training and learning materials by the OEM training organization, or a third party training provider partner. This so called “factory” training, and the associated training materials, provide the base line from which all subsequent training is developed.

The industry has improved training development and delivery standards through the cooperative development of [ATA Specification 104, Guidelines for Aircraft Maintenance Training](#), by the ATA Maintenance Training Sub-Committee. This document provides common language, standards and guidelines that have been approved and are recognized throughout the United States and most of the International air transport maintenance industry.

Technology for maintenance training has improved significantly over the past 10 to 15 years. Many providers of maintenance training have employed the new technologies which include: electronic delivery of training materials by instructors in the classroom; high resolution color graphics, active schematic diagrams, three dimensional “see through” animation of systems and components; desk top simulation of system operations (including basic and aircraft based troubleshooting); computer-based materials presented by instructors; stand alone student-paced computer based training; distance learning delivered over land line networks and satellites. With current training technology it is possible to bring a virtual airplane, powerplant, or component into the classroom for what approaches “hands on” training quality.

In the near future all of this technology will be made available over the Internet and World Wide Web. This high quality maintenance training will soon be available to almost everyone in the industry, at most locations throughout the world. In order to receive and use this state-of-the-art training, however, the necessary equipment needs to be on hand. The cost of the required equipment is rapidly coming down, as is the cost of connecting to the service providers that deliver the data. The future cost and quality of new training technology may be such that it will be affordable for any maintenance industry organization that wants to use it.

The majority of maintenance training developed and conducted in the industry is well above the minimum standard. At the top of the scale is state-of-the-art, high technology training that employs all of the latest concepts that constitute good training design. At the bottom of the scale is training that is barely acceptable. In the minds of some industry members, it is not acceptable at all.

A brief description of the training being developed and/or delivered by the various industry training providers can be found in the sub-sections that follow.

Original Equipment Manufacturers

The original equipment manufactures (OEM) who provide their own maintenance training design and build aircraft, engines, and major components. Those OEM who do not provide training directly to the operators and users of their equipment provide training and/or technical data to the airplane engine and major component manufacturers for their use.

Most training delivered by [OEM](#) is not a direct cost (“free of charge”) to the initial buyers of their products. New buyer training is most often included in the initial purchase price, negotiated as part of pro-forma purchase agreements. OEM will sell their training to subsequent buyers of their “used” products and third party maintainers. Due to what is considered by many potential training buyers to be a very high cost, the market for OEM training sales in the air transport large airplane sector is small.

Recently, one of the major aircraft manufacturers concluded a joint venture company agreement with a large third-party training company and no longer directly develops nor delivers its own maintenance and flight training. The third-party training company concerned has been in the business of conducting all training development and delivery for several smaller aircraft manufacturers, in both flight and maintenance training, for a number of years. These (“factory authorized”) training agreements have served to generally improve the overall quality of the training products delivered. There is a developing trend for outsourcing in the air transport industry, which has now manifested in the training arena. This concept has been a common practice for training in the corporate and general aviation elements of the industry since the 1950s. Although this is a new concept within air transport, there is no foreseeable negative impact on maintenance training with this type of business arrangement.

The training provided by the major aircraft, engine, and component [OEM](#) is generally of the highest possible quality, employing state-of-the-art delivery technology. Training provided by intermediate to small size vendors is generally good, but most often employs the standard instructor/classroom delivery methods.

[OEM](#) training is usually very complex, covering the aircraft, engines and major components produced from every operations and maintenance aspect, down to the minor details. Due to the highly detailed nature of this training, especially aircraft OEM, the “factory training” courses are lengthy. Typically, an aircraft type course can require up to 10 - 12 weeks for the complete mechanical, electrical/electronic/ avionics courses. Due to the high detail and overall length of the OEM training programs, US airlines generally use this training only for their instructors, specific engineering, technical support, and line maintenance control personnel. Airline maintenance instructors take the information gained and the extensive training/learning materials packages provided back to their organization. This is used to develop and prepare courses specifically tailored for their individual operations.

[OEM](#) training may best be described as the base line from which all other training on the specific type, model, and configuration of aircraft, engine, and major components are based. It is the foundation of the pyramid on which all follow-on training is built.

Obviously, [OEM](#) maintenance training materials are spread all over the world, used by operators and maintainers in every corner of the world. Once OEM equipment is “out of production,” the training documentation and learning materials are only updated and maintained until the last class is taught for the final product delivered. These documents are often archived, and become “basic reference only.” Only a few OEM conduct any training on out of production equipment for an extended period of time; it simply has not been cost effective for them to do so. The OEM have no processes in place to control the out of production equipment information that is circulating through the industry, nor have they elected to take to task those who abuse their proprietary information agreements and violate the copyright laws. As a result of these factors, an after market for training courses and training materials has developed. These factors may constitute issues worthy of attention.

Air Carriers (FAR Part 121)

The second tier in the maintenance training hierarchy are the air carriers. The major passenger (including the larger of the “low cost” carriers) and cargo air carriers are, for the most part, keeping pace with the state of the art and are using the majority of the new generation training and learning materials provided by the [OEM](#) for their newer fleets. One of the major air carriers now has more computers (over 150) for delivery of computer-based maintenance training than they have for pilot training. Training on the older, out of production fleets is usually delivered in the standard classroom lecture demonstration method.

The carriers, as discussed in the previous section, generally send their instructors for new aircraft introductory training to the appropriate [OEM](#) for the complete offering of courses. The instructors return to their organizations after this training and develop airline specific courses. These courses are developed using the instructor’s own training experience, using the training materials package provided by the OEM. Course content and length will vary depending upon the student’s work area assignments, tasks to be accomplished, whether training involves a totally new aircraft or a variant of a fleet currently operated, and other similar factors.

Carrier-developed courses, by their nature, are usually much (50% to 75%) shorter than those provided by [OEM](#). This is not meant to imply that it is not as effective. On the contrary, it is often the most effective way to train. Carriers target courses for [AMTs](#) for the level at which they will apply the information and on the specific tasks they will accomplish on the job. Information presented in previous sections includes comments from AMTs indicating that some feel they don’t always need the level of detail provided in some of the training that they attend. Most often the training provided by the OEM is based upon “how the airplane works;” carriers tend to focus more on “how to work the airplane.”

The air carriers have a workload that extends beyond specific aircraft type training. They also conduct the mandatory programs such as: [RII](#), category II/III, aircraft run-up and taxi, winter operations/de-ice, vendor ground handling, and on-call maintenance. They also provide specialist skills training such as metal structures repair, composite repair, special welding processes, soldering, fuel tank entry, confined space entry, basic troubleshooting principles, maintenance manuals, job documentation, new employee indoctrination, maintenance resource management (human factors), hazardous materials, hazardous communications, [OSHA](#) and special safety programs, fire extinguishers, and live fire fighting -- the long list of courses required to support a maintenance operation.

In a survey conducted on maintenance training by the [ATA](#) with their Maintenance Training Sub Committee airline members, most respondents conclude that they would conduct more training if given the option. While they feel that training is generally supported by maintenance management, it is often under-funded due to the difficulty in proving the [ROI](#) of maintenance training. The survey also provides that, excluding the cargo air carriers, the current major air carrier instructor to [AMT](#) ratio is an average of 130 to 140 AMTs per instructor. Including the cargo air carriers distorts the ratios somewhat, as they require more instructors due to their high number of operating stations with very few AMTs assigned. With the cargo air carriers included, the instructor to AMT ratio is in the 105 to 108 range. The current AMT turnover rates remain comparatively low at the major air carriers, ranging from somewhat less than 1% to a high of nearly 3%. The amount of training provided yearly per AMT runs at about 40 hours for line maintenance, near 24 hours for heavy maintenance, and up to 12 hours for shop specialists.

The following table shows the distribution of air carrier [AMTs](#) by assignment areas and their average hours of training per year:

Table 2. Air Carrier Aviation Maintenance Technicians: Average Training Hours Per Year			
Assignment Areas Air Carriers	Percentage of Total Technicians	Average Training Hours Per Year	Comments
Line Maintenance	45%	40	Consistent with most majors
Base Maintenance	30%	24	Varies, majors do most
Eng/Compnt Shops	25%	12	Hrs. vary with specific skills

The [AMTs](#) at the air carriers, although they offer constructive criticism, are generally satisfied with the training they receive. Many would prefer that training become more task specific and that more “hands on” be provided. One area of concern is with informal [OJT](#). A significant number of AMTs would prefer OJT that is more formal, with task objectives, check lists, and specific task sign-offs.

Training and qualifications records are, in most cases, computerized, accurate, and effective. Some of the so called Training Record and Qualifications Systems (T&Q) are very elaborate and also include: course outlines, training scheduling, classroom scheduling, student performance records, recurrent training requalification requirements, and more.

Training facilities are better at some carriers than others. The large, established carriers have modern, climate controlled facilities with state-of-the-art classrooms. Those that do not are working toward converting to improved facilities and training equipment as quickly as they can.

Some of the carriers are becoming more active in sales of maintenance training to other carriers who may have purchased or leased their previously owned airplanes. In some cases, they are also providing initial airplane courses to third party repair stations. This has not yet become a significant factor in the market place since the carriers do not add extra staff to conduct sales training.

The carriers share an issue with the [OEM](#): no means of controlling training courses or training and learning materials. Instructors may leave or retire with a large library of information they have collected, often over a period of several years. Although not often discussed, there is a cash sales market for such materials within the third party training organizations. Some may also use the materials as their own, conducting training on contract as freelance instructors, or under contract to third party training companies.

There is a small element within the air carrier segment, the small, low cost “start ups” that are in a category of their own. While meeting all of the minimum [FAA](#) requirements, the majority of their maintenance and ground handling is contracted to third-party providers. While certificated under [FAR](#) Part 121, for all intents and purposes they favor a minimalist approach toward maintenance training with practices similar to those employed by some of the certificated repair stations who embrace a similar operating philosophy.

Certificated Repair Stations

There is a wide range in training and qualifications processes/practices among the large transport aircraft repair stations. A few are highly professional, run on a par with the major air carriers’ maintenance and training organizations; others are somewhere in the mid range. At the low end of the scale are a very few that could be classified as in need of significant re-organization in the area of training and qualification.

[Table 3](#) represents the data gathered from the [ATA](#) survey discussed in the preceding chapter.

Table 3. Repair Station Aviation Maintenance Technicians: Average Training Hours Per Year			
REPAIR STATIONS BY CATEGORY	Percent of Techs. Assigned	Average Training Hours Per Year	Comments
A&P Certificated	46%	24	Varies from station to station
Non Cert. Specialist	54%	12	Varies with station/specialty

The higher-end repair stations have their own maintenance instructor staff that could be compared with a typical small-to mid-sized domestic carrier. They have a small cadre of well-versed instructors who conduct the internal process and skill courses that supplement operations. The majority of the aircraft courses are obtained through [OEM](#), air carriers or third-party training providers. These repair stations have instructor/[AMT](#) ratios that run between 275 to 350 AMTs per instructor. They have decent training facilities and very acceptable classrooms. Although none are currently using electronic training systems and learning materials, they are in the process of upgrading.

The mid range group is working toward improving their training and qualifications processes. Most have only a training department of one or two persons who oversee all of the record keeping, training, and scheduling. They obtain training from third-party providers, while also conducting required training and indoctrination programs. They also supplement internal training with lead mechanics, supervisors, and persons from other internal departments as applicable. Most have older facilities, classrooms that are minimally equipped, (usually with a TV monitor and VCR, an old vintage view foil projector, a chalk board, and possibly some “cork boards” for large diagrams and schematics), not very well lighted nor ventilated, with “hand-me-down” mixed tables and chairs. All of their aircraft-specific classroom training is purchased from airlines, third-party training providers, or freelance instructors. Possibly due to cost pressures and the competitive nature of the third-party maintenance business, these organizations struggle to improve. The management fully understands that training improves performance, but has difficulty funding the changes they would like to accomplish.

The lowest common denominator requires little discussion. Just about everything that can be minimum is minimum. Anything above the minimum requirement is either required by statute or regulation, enforced, or necessary in order to bid upon a specific contract. Since the minimum acceptable for training and qualifications is not as clearly defined as it could be, it is an area that is handled as a “do what you have to” part of the operation. The philosophy appears to be that as long as the [FAA](#) accepts it, it’s OK; if they write it up, fix it.

During 1994 a Repair Station Survey was conducted by Pima College in Tucson, Arizona, concerning the types of specialty categories that could be used as the initial [ARS](#) I specialties for the new [FAR](#) PART 66. Forty repair stations were contacted, twenty-three responded. Since there has been little change in the Repair Station business, other than an increase in the total numbers of technicians, the data remains valid. The following table shows the approximate distribution of repair station technicians by categories of specialty.

Table 4. Distribution of Repair Station Technicians by Specialty	
Specialty	Percentage Assigned
<u>A&P</u> Certificated - Generalists	47%
Avionics	10.5%
Avionics – FCC Certificated	1.5%
<u>NDI</u>	2%
Structures – Composite	2.5%
Structures – Sheet Metal	36.5%

The survey also requested responses to the questions in the table below:

Table 5. Pima College Survey		
Questions	YES	NO
Would your company support the proposal of specialist ratings issued by the FAA for the following disciplines?		

Avionics	100%	0%
Non-destructive Testing	100%	0%
Composites	99.96%	.04%
Structural Repair	99.96%	.04%
Would your company be better served by technicians trained to industry standards on transport category aircraft?	100%	0%
Does your company offer training in any of the specialties proposed?	60%	40%

It appears from the data shown above that some companies in the repair station industry, at least the 23 respondents to the Pima College Survey, are interested in the [ARS I](#) categories and the training to standards that will be developed. It is also interesting to note that of the specialties in which the repair stations have high interest, only 60% provide training. Another factor pointed out by the data is that 40% do not provide any training in the skills by which they would “be better served by technicians trained to industry standards on transport category aircraft.” One might ask why the other 17 of the 40 companies surveyed elected not to respond?

Third-Party Maintenance Training Providers

There are basically two levels of third-party training companies. The top-level organizations are on a relative par with [OEM](#) training. Included in this group are similar organizations that specialize in special skills training such as metal structures and composite structures repair, non-destructive testing processes and specific equipment operation, welding, electronics technology, etc. The second tier training companies do not demonstrate the same high standards.

The high quality maintenance training providers and selected specialty organizations have distinct characteristics that are easily recognized:

- Modern training facilities with up-to-date, modern classrooms and/or shop areas, often in multiple locations
- Course and learning materials developed using current training design processes
- Clearly stated course objectives and measurable student learning objectives
- Electronic learning materials, high quality projection equipment and computers where effective
- When advertised as “Factory Approved Training,” it actually is
- Professional instructors fully qualified and current on the courses they deliver
- Students tested to ensure achievement and mastery of the learning objectives
- Cost is higher than some of the competitors in the marketplace

Second level third-party training providers also have distinct characteristics that are easy to recognize:

- Few, if any, have their own facilities, but will use the purchaser’s classrooms, or rent space in a nearby hotel or conference facility

- They advertise that no expensive electronic equipment or computers are needed
- Usually the buyer has to furnish a Vu slide projector and perhaps a VCR and monitor
- There is a tacit don't ask, don't tell policy concerning the source of training materials
- The term "[FAA](#) Approved Training" is used, when in fact the FAA doesn't approve maintenance training -- it is acceptable unless stated otherwise by FAA
- They use only fully qualified airline or manufacturer instructors
- The instructor teaching a class may let slip that he/she works for "XYZ" airlines, but takes vacation to teach classes for "TUV" maintenance training services
- Aircraft type training is usually not more than 40 hours, with avionics a little more
- Student testing is offered at the buyer's request and is not necessarily competence- or objectives-based
- The training manual may have slight smudges, or random lines, at the top or bottom of its pages
- They cost less than "those other guys," a huge amount less than the [OEM](#) and can also beat the prices charged by the airlines

The issue of "pirated" training materials may need further examination by the industry and the [FAA](#). One airline maintenance training manager recently commented that he was given a "training manual" provided to a furloughed employee, who was a student at a third-party repair station where he is now working. The name of the airline from which the materials had been taken had obviously been removed and the pages re-copied. The organization that did this work failed to note that several of the pages were in landscape, rather than portrait format. On all of the landscape formatted pages, clearly visible, was the name of the airline and internal reference information. The manager passed the document along to the airline's legal department, but doubts that there will be any action taken. Probably unknown to the FAA, they have purchased aircraft type introductory training from organizations that use these "pirated" materials. These materials have also been provided and used in the FAA's own contracted classes.

Non-Affiliated Individuals -- Freelance Instructors at Large

There is a cadre, number unknown, of instructors who work "at large" as independents. While some of these individuals may have excellent credentials and good learning materials, the common denominator is at a lower level. Comments from both users of these services and individuals at contract maintenance personnel provider organizations show concern about this element of the maintenance training delivery system. [List 11](#) is a summary of their comments.

List 11. Comments on Independent Instructors
<ul style="list-style-type: none"> • Many "at large" instructors are teaching with materials that are up to 25 years old, without benefit of follow-on updates.
<ul style="list-style-type: none"> • These often outdated training materials have come into the market place through instructors who have left or retired from airlines and original equipment manufacturers.
<ul style="list-style-type: none"> • Anyone can simply make copies of diagrams taken from the maintenance manuals, use the information in the Description and Operations (D&O) section, make some black and white vu-foil transparencies, and teach a class.
<ul style="list-style-type: none"> • Some of these instructors "work out of the trunk," teach a few classes per year, then sit in the shade the rest of the time.

- The Original Equipment Manufacturers (OEMs) have known this is going on for years. They have never taken action to control these materials, even though they are proprietary and protected under copyright laws.
- The airlines have no control over their instructors making copies of their course materials while working there, then using the materials after they leave or retire. Some individuals have also sold these materials to other third party training providers.
- The [FAA](#) only looks at training records and the fact that a technician has attended training. Do the Airworthiness Inspectors ever look at the training materials, where they came from, and whether or not they are up-to-date? No comments suggested that the FAA reviews any of the training materials in detail or checks its sources.
- It is not difficult to obtain any manufacturer's or airline's training courses and materials. With the application of some "white out" to cover the original owner's name and a copy machine, you're in business.
- No legitimate training organization can compete with the prices these individuals charge. So they continue to charge less than the competition, most of which is pure profit. No one seems to care that they continue to exist conducting business in this way.

The consensus of opinion in the industry is that this element, even in a recently more training-sensitive environment, will continue to exist unchecked without the regulator's intervention.

SUMMARY

This research has produced significant amounts of data gathered during on-site visits, at industry conferences, meetings and seminars, from industry association conducted surveys, telephone interviews, group and individual interviews. The participants, to whom anonymity was promised, were forthright, candid, and professional with their comments, favorable and otherwise. The findings indicate that the personnel qualifications and training at aviation maintenance facilities range from excellent to poor. These findings also suggest that those areas where substantial improvements may be in order represent only a small segment of the overall maintenance training and qualifications system. The vast majority of the industry's maintenance training and qualifications community is doing what is intended, i.e., following the rules, meeting appropriate training and qualifications requirements, and working toward continuous improvement.

There is a wide range of activity in the area of training and qualifications in today's growing and ever-changing air transport maintenance industry. The majority of the training being developed is very high quality, using the latest training technology, being taught objectively, being measured and tested, and is available to an ever expanding number of [AMTs](#) in all facets of the work force.

The full spectrum of training is available to [AMTs](#) and skilled specialists in the industry. It ranges from the highest leading edge technology learning materials and delivery systems, presented in up to date classrooms that are specifically designed to enhance the learning environment, down to the quality of training that was less than desirable during World War II. The best that the maintenance training community has to offer is only available at the [OEM](#) and the larger, successful, air carriers. There are only a few other elements within air transport where this "top of the line" training is provided on a consistent basis.

The ValuJet accident has motivated increased surveillance and sharper focus on maintenance program requirements and airworthiness responsibilities between operators and the repairs stations to whom they outsource maintenance. There is heightened awareness within airlines relative to their responsibilities for airworthiness when their aircraft are being maintained by a third party. Certainly the repair station environment has become more conscious and aware of issues that can create safety breaches in the system. Given all of this, not much concern has been generated nor has a great deal been done by the [FAA](#) to change the status quo in the areas of training and qualification. The consensus of industry opinion, gleaned from the information gathered for this research, strongly points out the need for the FAA to take serious and rapid action toward raising the standards for maintenance training and qualifications, especially the “minimum” standards.

[FAA](#) accepts “minimum standard,” with no definitions of course completion competency requirements for trainees, nor much guidance for Maintenance Operations Inspectors on standards. There are no specific FAA requirements for course completion, written, oral/practical testing, or competency demonstration requirements other than the few required or mandatory courses such as: Cat II/III Certification, Run-up and Taxi, Aircraft Winter Operations, [NDI](#), and a few others.

Operators and maintainers alike will conduct any training that is “government mandatory,” because it is a “legal” requirement. They will conduct low [ROI](#) value mandatory government regulated training, i.e., Hazcom, Right to Know, Hazardous Materials, [OSHA](#), etc. One airline conducts no maintenance and ramp operations training during the month of October and part of November so that “all hands” can complete annual winter operations certification and recurrent training. When specific training is not mandatory, it may be “optional” depending upon the position taken by maintenance management regarding the value of technician training as it relates to safety and productivity.

There are no specific requirements for recurrent, refresher, or “refreshment” training for other than specifically mandated, or specific regulation(s) required, training. Dental technicians require 24 hours of recurrent training annually to maintain certification. [AMTs](#) have no annual recurrent training requirements beyond what is required for a specific few with special task responsibilities. There is no system where the [FAA](#) can communicate with its [A&P](#) certificated mechanics to pass on pertinent regulatory information, recent safety issues, accident reviews, breakdowns in the system, or human factors issues that could adversely affect aviation safety if not remedied.

Fundamental maintenance regulations have been completely re-written, or have undergone substantive and essential revision, yet they are “on hold,” or “somewhere in the system.” When asked where aircraft maintenance rule changes stand, the [FAA](#) most often replies that action on the above is pending.

Some Air Carrier and Repair Station VPs, Directors, Managers and Supervisors have limited background in, or no realistic concept of, training needs nor training value; some still view training as “a necessary evil.”

The competition for qualified maintenance technicians is growing while the supply is dwindling, as more potential entrants into the industry go elsewhere for higher pay and better working conditions.

There is growing concern in the maintenance industry over the lack of attention to known issues with potentially serious effects and consequences that do not appear to be of high interest nor as being vigorously pursued by the regulator.

Industry leadership’s views have, and are continuing to change. The “old school” did not put high value and significant emphasis on training and qualifications. Times have changed, the industry has changed, the equipment being operated has dramatically changed. However, the background and qualifications of technical personnel entering the industry have not kept pace and in some cases have diminished.

Enlightened maintenance leadership has adopted the philosophy of “cost effective training” as the best possible way to operate. While looking for reasonable return on investment from training, they recognize that measurement of [ROI](#) for training is difficult to accomplish. They also recognize that providing the highest possible levels of training and qualifications that can be achieved is simply good business. Safety is the key responsibility of the industry. Safety is highly dependent upon the training and qualifications of aircraft maintenance industry personnel for two basic reasons: 1) to maintain the excellent record that currently exists and 2) to accomplish necessary improvements as the aviation industry moves into the 21st century.

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There are many professionals in the aviation maintenance industry who care about the standards under which they are trained and qualified to perform their jobs. These professionals were willing to share their thoughts, provide constructive comments, and trusted they would not be referenced as individuals. The readers of this document should understand that it is these professionals who meet the requirements, follow the rules, work toward meeting and exceeding the minimum standards, and are dedicated to improving aviation safety. There is no question that the vast majority of people in the aviation maintenance industry are skilled professionals who take their responsibilities very seriously.

Special thanks to all who participated in this research, giving freely of their time, providing candid professional opinions, demonstrating that they care about safety today and continual improvements in the future.

APPENDIX 1

1.1 Pertinent Federal Aviation Regulations

The purpose here is to show the extent of regulatory content on the subject of maintenance training and qualifications, discuss individual PARTS and show their interrelationships. The following excerpts from the Code of Federal Regulations (CFR), Aeronautics and Space, 14 [FAR](#) PARTS 43 through 47, contain information and requirements pertinent to maintenance training and qualifications and are titled:

- [PART 43](#)--MAINTENANCE, PREVENTIVE MAINTENANCE, REBUILDING, AND ALTERATION
- [PART 65](#)--CERTIFICATION: AIRMEN OTHER THAN FLIGHT CREWMEMBERS
- [PART 121](#)--CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT
- [PART 135](#)--AIR TAXI OPERATORS AND COMMERCIAL OPERATORS
- [PART 147](#)--AVIATION MAINTENANCE TECHNICIAN SCHOOLS

Guidance information for Airworthiness Inspectors to conduct compliance surveillance of the above rules is found in the Airworthiness Inspector's Handbook 8300-10. Pertinent excerpts from this handbook have been inserted for reference in the following subsection, [1.2](#).

1.1.1 PART 43

PART 43-Maintenance, Preventative Maintenance, Rebuilding and Alteration defines the basic performance standards for aviation maintenance. The quotations that follow show that the rule provides a very clear and complete definition of who may perform maintenance, the certification and/or qualifications required, and under what conditions privileges may be exercised. Part 43 could be described, as it is often for new A&P students, as the "Bible of Maintenance Practices." It is listed as part of the prerequisite information needed by an Airworthiness Inspector for surveillance of a PART 145 Certificated Repair Station in the Airworthiness Inspector's Handbook 8300-10; Volume 2; Section 2, Procedures; 3A References, Forms, and Job Aids.

§ 43.3 Persons authorized to perform maintenance, preventive maintenance, rebuilding, and alterations.

(a) Except as provided in this section and § 43.17, no person may maintain, rebuild, alter, or perform preventive maintenance on an aircraft, airframe, aircraft engine, propeller, appliance, or component part to which this part applies. Those items, the performance of which is a major alteration, a major repair, or preventive maintenance, are listed in Appendix A.

(b) The holder of a mechanic certificate may perform maintenance, preventive maintenance, and alterations as provided in Part 65 of this chapter.

(c) The holder of a repairman certificate may perform maintenance and preventive maintenance as provided in Part 65 of this chapter.

(d) A person working under the supervision of a holder of a mechanic or repairman certificate may perform the maintenance, preventive maintenance, and alterations that his supervisor is authorized to perform, if the supervisor personally observes the work being done to the extent necessary to ensure that it is being done properly and if the supervisor is readily available, in person, for consultation. However, this paragraph does not authorize the performance of any inspection required by Part 91 or Part 125 of this chapter or any inspection performed after a major repair or alteration.

(e) The holder of a repair station certificate may perform maintenance, preventive maintenance, and alterations as provided in Part 145 of this chapter.

(f) The holder of an air carrier operating certificate or an operating certificate issued under Part 121, 127, or 135, may perform maintenance, preventive maintenance, and alterations as provided in part 121, 127, or 135.

(g) The holder of a pilot certificate issued under Part 61 may perform preventive maintenance on any aircraft owned or operated by that pilot which is not used under Part 121, 127, 129, or 135.

(h) Notwithstanding the provisions of paragraph (g) of this section, the Administrator may approve a certificate holder under Part 135 of this chapter, operating rotorcraft in a remote area, to allow a pilot to perform specific preventive maintenance items provided--

(1) The items of preventive maintenance are a result of a known or suspected mechanical difficulty or malfunction that occurred en route to or in a remote area;

(2) The pilot has satisfactorily completed an approved training program and is authorized in writing by the certificate holder for each item of preventive maintenance that the pilot is authorized to perform;

(3) There is no certificated mechanic available to perform preventive maintenance;

(4) The certificate holder has procedures to evaluate the accomplishment of a preventive maintenance item that requires a decision concerning the airworthiness of the rotorcraft; and

(5) The items of preventive maintenance authorized by this section are those listed in paragraph (c) of Appendix A of this part.

(i) A manufacturer may--

- (1) Rebuild or alter any aircraft, aircraft engine, propeller, or appliance manufactured by him under a type or production certificate;
- (2) Rebuild or alter any appliance or part of aircraft, aircraft engines, propellers, or appliances manufactured by him under a Technical Standard Order Authorization, an FAA-Parts Manufacturer Approval, or Product and Process Specification issued by the Administrator; and
- (3) Perform any inspection required by Part 91 or Part 125 of this chapter on aircraft it manufacturers, while currently operating under a production certificate or under a currently approved production inspection system for such aircraft.

1.1.2 PART 65

PART 65-Certification: Airmen Other Than Flight Crew Members is the rule under which certification requirements are stated and defined. Although currently under major revision, including a number and title change to PART 66-Certification: Aviation Maintenance Personnel, the rule clearly states and defines the current maintenance certification requirements. There are also guidance materials in the form of Advisory Circulars and Flight Standards Information Bulletins issued by the [FAA](#) to further define and clarify the rule. It is referenced in PART 145 under Personnel Requirements and in the Airworthiness Inspector's Handbook 8300-10 in Volume I; 1. Purpose, A; in Volume 2, Chapter 70-Evaluation FAR PART 121/135 411(a) (2) Maintenance Training Program/Record; and in Chapter 95-Inspect FAR PART 145 Domestic Repair Station.

Subpart D - Mechanics

§ 65.75 Knowledge requirements.

(a) Each applicant for a mechanic certificate or rating must, after meeting the applicable experience requirements of § 65.77, pass a written test covering the construction and maintenance of aircraft appropriate to the rating he seeks, the regulations in this subpart, and the applicable provisions of parts 43 and 91 of this chapter. The basic principles covering the installation and maintenance of propellers are included in the powerplant test.

(b) The applicant must pass each section of the test before applying for the oral and practical tests prescribed by § 65.79. A report of the written test is sent to the applicant.

[Doc. No. 1179, 27 FR 7973, Aug. 10, 1962, as amended by Amdt. 65-1, 27 FR 10410, Oct. 25, 1962; Amdt. 65-6, 31 FR 5950, Apr. 19, 1966]

§ 65.77 Experience requirements.

Each applicant for a mechanic certificate or rating must present either an appropriate graduation certificate or certificate of completion from a certificated aviation maintenance technician school or documentary evidence, satisfactory to the Administrator, of--

(a) At least 18 months of practical experience with the procedures, practices, materials, tools, machine tools, and equipment generally used in constructing, maintaining, or altering airframes, or powerplants appropriate to the rating sought; or

(b) At least 30 months of practical experience concurrently performing the duties appropriate to both the airframe and powerplant ratings.

[Doc. No. 1179, 27 FR, 7973, Aug. 10, 1962, as amended by Amdt. 65-14, 35 FR, 5533, Apr. 3, 1970]

§ 65.79 Skill requirements.

Each applicant for a mechanic certificate or rating must pass an oral and a practical test on the rating he seeks. The tests cover the applicant's basic skill in performing practical projects on the subjects covered by the written test for that rating. An applicant for a powerplant rating must show his ability to make satisfactory minor repairs to, and minor alterations of, propellers.

§ 65.80 Certificated aviation maintenance technician school students.

Whenever an aviation maintenance technician school certificated under part 147 of this chapter shows to an FAA inspector that any of its students has made satisfactory progress at the school and is prepared to take the oral and practical tests prescribed by § 65.79, that student may take those tests during the final subjects of his training in the approved curriculum, before he meets the applicable experience requirements of § 65.77 and before he passes each section of the written test prescribed by § 65.75.

[Doc. No. 9444, 35 FR 5533, Apr. 3, 1970]

1.1.3 PART 121

PART 121-Certification and Operations: Domestic, Flag, and Supplemental Air Carriers, and Commercial Operators of Large Aircraft is the complex rule to which all air carriers must conform. The Subpart on Maintenance and preventative maintenance training programs, although short in length, is very specific as to what each specific certificate holder must have in place. It is also augmented with guidance materials in the form of Advisory Circulars and Flight Standards Information Bulletins issued by the [FAA](#), that further define and clarify the rule. It is referenced in the Airworthiness Inspector's Handbook 8300-10 in Volume I, 1. Purpose, with a very detailed set of requirements and guidelines in Volume II, Chapter 70.

Subpart N--Training Program

§ 121.375 Maintenance and preventive maintenance training program.

Each certificate holder or person performing maintenance or preventive maintenance functions for it shall have a training program to ensure that each person (including inspection personnel) who determines the adequacy of work done is fully informed about procedures and techniques and new equipment in use and is competent to perform his duties.

1.1.4 PART 135

PART 135-Air Taxi Operators and Commercial Operators is, for all intent and purposes, a mirror image of PART 121 for smaller, less complex aircraft. References to information located in the Airworthiness Inspector's Handbook 8300-10 are the same as Part 121, shown under the previous heading.

Subpart J--Maintenance, Preventive Maintenance, and Alterations

§ 135.433 Maintenance and preventive maintenance training program.

Each certificate holder or a person performing maintenance or preventive maintenance functions for it shall have a training program to ensure that each person (including inspection personnel) who determines the adequacy of work done is fully informed about procedures and techniques and new equipment in use and is competent to perform that person's duties.

1.1.5 PART 145

PART 145-Repair Stations: The personnel requirements for both domestic and foreign repair stations are set forth and defined in this rule. It clearly states that personnel who perform maintenance, repairs, and alterations must be properly trained, qualified, and/or supervised by an appropriately certificated airman. While there is no specific training and qualification section per se, there are requirements in 145.39 and 145.43. It is also augmented with guidance materials, in the form of Advisory Circulars and Flight Standards Information Bulletins, issued by the [FAA](#) that further define and clarify the rule. It is referenced in the Airworthiness Inspector's Handbook 8300-10 in Volume I, 1. Purpose, with a detailed set of requirements and guidelines in Volume II, Chapters 97 and 162.

Subpart B--Domestic Repair Stations

§ 145.39 Personnel requirements.

- (a) An applicant for a domestic repair station certificate and rating, or for an additional rating, must provide adequate personnel who can perform, supervise, and inspect the work for which the station is to be rated. The officials of the station must carefully consider the justifications and abilities of their employees and shall determine the abilities of its uncertificated employees performing maintenance operations on the basis of practical tests or employment records. The repair station is primarily responsible for the satisfactory work of its employees.
- (b) The number of repair station employees may vary according to the type and volume of its work. However, the applicant must have enough properly qualified employees to keep up with the volume of work in process, and may not reduce the number of its employees below that necessary to efficiently produce airworthy work.
- (c) Each repair station shall determine the abilities of its supervisors and shall provide enough of them for all phases of its activities. However, the Administrator may determine the ability of any supervisor by inspecting his employment and experience records or by a personal test. Each supervisor must have direct supervision over working groups but need not have over-all supervision at management level. Whenever apprentices or students are used in working groups on assemblies or other operations that might be critical to the aircraft, the repair station shall provide at least one supervisor for each 10 apprentices or students, unless the apprentices or students are integrated into groups of experienced workers.
- (d) Each person who is directly in charge of the maintenance functions of a repair station must be appropriately certificated as a mechanic or repairman under Part 65 of this chapter and must have had at least 18 months of practical experience in the procedures, practices, inspection methods, materials, tools, machine tools, and equipment generally used in the work for which the station is rated. Experience as an apprentice or student mechanic may not be counted in computing the 18 months of experience. In addition, at least one of the persons so in charge of maintenance functions for a station with an airframe rating must have had experience in the methods and procedures prescribed by the Administrator for returning aircraft to service after 100-hour, annual, and progressive inspections.
- (e) Each limited repair station shall have employees with detailed knowledge of the particular maintenance function or technique for which it is rated, based on attending a factory school or long experience with the product or technique involved.

§ 145.43 Records of supervisory and inspection personnel.

- (a) Each applicant for a domestic repair station certificate and rating, or for an additional rating, must have, and each certificated domestic repair station shall maintain, a roster of--
 - (1) Its supervisory personnel, including the names of the officials of the station that are responsible for its management and the names of its technical supervisors, such as foreman and crew chiefs; and
 - (2) Its inspection personnel, including the names of the chief inspector and those inspectors who make final airworthiness determinations before releasing an article to service.
- (b) The station shall also provide a summary of the employment of each person whose name is on the roster. The summary must contain enough information as to each person on the roster to show compliance with the experience requirements of this subpart, including--
 - (1) His present title (e.g., chief inspector, metal shop foreman, etc.);
 - (2) His total years of experience in the type of work he is doing;

- (3) His past employment record, with names of places and term of employment by month, and year;
- (4) The scope of his present employment (e.g., airframe overhaul, airframe final assembly, engine inspection, department, etc.); and
- (5) The type and number of the mechanic or repairman certificate that he holds, and the ratings on that certificate.

(c) The station shall change the roster, as necessary, to reflect--

- (1) Terminating the employment of any person whose name is on the roster;
- (2) Assigning any person to duties that require his name to be carried on the roster; or
- (3) Any appreciable change in the duties and scope of assignment of any person whose name is on the roster.

(d) The station shall keep the roster and employment summaries required by this section, subject to inspection by the Administrator upon his request.

(e) A domestic repair station may not use the services of a person directly in charge of maintenance or alteration unless it keeps current records on him as required by this section.

[Doc. No. 1157, 27 FR 6662, June 13, 1962, as amended by Amdt. 145-5, 31 FR 8585, June 21, 1966; Amdt. 145-15, 41 FR 47230, Oct. 28, 1976]

Subpart C--Foreign Repair Stations

§ 145.75 Personnel.

(a) Each applicant for a foreign repair station certificate and rating, or for an additional rating, must provide enough personnel who are able to perform, supervise, and inspect the work for which he seeks a rating, with regard being given to its volume of work.

(b) The supervisors and inspectors of each certificated foreign repair station must understand the regulations in this chapter, FAA airworthiness directives, and the maintenance and service instructions of the manufacturers of the articles to be worked on. However, they do not need airman certificates issued under this chapter and, along with the persons performing the work of the station, are not considered to be airmen within the meaning of section 101(7) of the Federal Aviation Act of 1958 (49 U.S.C. 1301) with respect to work performed in connection with their employment by the foreign repair station.

(c) In cases where the persons engaged in supervision or final inspection are not certificated under this chapter or by the country in which the station is located, their qualifications are determined by the Administrator, based on their ability to meet the requirements of paragraph (a) of this section as shown by oral or practical test or any other method the Administrator elects.

(d) No person may be responsible for the supervision or final inspection of work on an aircraft of United States registry at a foreign repair station unless he can read, write, and understand English.

1.1.6 PART 147

PART 147-Aviation Maintenance Technician Schools is the rule that sets forth and defines the initial education and training required to become certificated and an A, P, and/or A&P mechanic. It is inserted here to ensure that all the FAA requirements for training, qualification, and certification of aviation maintenance personnel have been shown.

This rule will be modified, under current thinking, as part of the introductory process of the new PART 66. A research project, in which a complete Job Task Analysis was conducted, is in the final stages of completion. The final phase is scheduled for release in March of 1998. The information gained through this effort will be used, along with another study that defines the integration of the new PART 66 into PART 147, to update the current rule.

As with the other rules in this chapter, PART 147 is also augmented with guidance materials in the form of Advisory Circulars and Flight Standards Information Bulletins issued by the [FAA](#), that further define and clarify the rule. There is also material in the Airworthiness Inspector's Handbook 8300-107 which is not quoted here, as Subpart B, below, provides sufficient data for the purposes of this chapter.

Subpart B--Certification Requirements

§ 147.21 General curriculum requirements.

- (a) An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must have an approved curriculum that is designed to qualify his students to perform the duties of a mechanic for a particular rating or ratings.
- (b) The curriculum must offer at least the following number of hours of instruction for the rating shown, and the instruction unit hour shall not be less than 50 minutes in length--
- (1) Airframe--1,150 hours (400 general plus 750 airframe).
 - (2) Powerplant--1,150 hours (400 general plus 750 powerplant).
 - (3) Combined airframe and powerplant--1,900 hours (400 general plus 750 airframe and 750 powerplant).
- (c) The curriculum must cover the subjects and items prescribed in appendixes B, C, or D, as applicable. Each item must be taught to at least the indicated level of proficiency, as defined in appendix A.
- (d) The curriculum must show--
- (1) The required practical projects to be completed;
 - (2) For each subject, the proportions of theory and other instruction to be given; and
 - (3) A list of the minimum required school tests to be given.
- (e) Notwithstanding the provisions of paragraphs (a) through (d) of this section and § 147.11, the holder of a certificate issued under subpart B of this part may apply for and receive approval of special courses in the performance of special inspection and preventive maintenance programs for a primary category aircraft type certificated under § 21.24(b) of this chapter. The school may also issue certificates of competency to persons successfully completing such courses provided that all other requirements of this part are met and the certificate of competency specifies the aircraft make and model to which the certificate applies.

[Doc. No. 1157, 27 FR 6669, July 13, 1962 as amended by Amdt. 147-1, 32 FR 5770 Apr. 11, 1967; Amdt. 147-5, 57 FR 28959, June 29, 1992; Amdt. 147-6, 57 FR 41370, Sept. 9, 1992]

§ 147.23 Instructor requirements.

An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must provide the number of instructors holding appropriate mechanic certificates and ratings that the Administrator determines necessary to provide adequate instruction and supervision of the students, including at least one such instructor for each 25 students in each shop class. However, the applicant may provide specialized instructors, who are not certificated mechanics, to teach mathematics, physics, basic electricity, basic hydraulics, drawing, and similar subjects. The applicant is required to maintain a list of the names and qualifications of specialized instructors, and upon request, provide a copy of the list to the FAA.

[Amdt. 147-5, 57FR 28959, June 29, 1992]

1.2 Airworthiness Inspector's Handbook: 8300-10

This document is also augmented through Advisory Circulars, Handbooks, and Flight Standards Information Bulletins. The Airworthiness Inspectors appear to be provided with a significant amount of regulatory information, rules, and guidance materials. It appears to be objective and in sufficient detail for them to understand the requirements of acceptable maintenance training and qualification processes within the various elements of the aviation maintenance industry. There are, however some areas that do not appear to be as detailed and complete as others.

A comparison between the level of detail in Volume 2, Chapter 70-Evaluate FAR PART 121/135.411 (a)(2) Maintenance Training Program/Record Vs Chapters 97- Inspect [FAR](#) 145 Domestic Repair Station and Chapter 162- Certificate FAR PART 145 Domestic Repair Station/Satellite Station is significant.

Chapter 70 provides the inspector with a detailed description of an acceptable training PART 121/135 program, records and record keeping, qualification processes, required courses, instructor qualifications, surveillance of acceptable training presentations and other related topics.

Chapters 97 and 162 focus on certification of PART 145 repair stations, with the training and qualification of employees in the personnel evaluation and record keeping sections. There is no description of specific training processes, courses, etc. as in Chapter 70. On the other hand, while there is no detail about training program requirements, processes or content in PART 121.375, there is a good deal of personnel requirements and related information in PART 145.39 and 145.43.

When comparing the regulatory requirements between PART 121/135 and PART 145 guidelines in the Airworthiness Inspector's Handbook 8300-10, one could conclude that PART 121/135 is more stringent, with more objective, clearly and effectively defined content. An inspector conducting an inspection, audit, or certification of a PART 121/135 air carrier has a good deal more information as to the requirements for an acceptable training and qualifications program. It could also be interpreted that 121/135 operators have more objective, refined, stringent, requirements and guidance materials on which to base their training and qualification programs.

VOLUME 1

1. **PURPOSE.** This order is referred to as a handbook and, as such, directs the activities and provides guidance for Airworthiness Aviation Safety Inspectors (ASIs), involved in the following:

- A. The certification, technical administration, and surveillance of individuals, facilities, and organizations in accordance with FAR Parts 65, 91, 121, 125, 129, 133, 135, 137, 141, 145, 147, 149, and 183.
- B. Investigating, conducting, and/or responding to aircraft accidents and incidents, accident prevention activities, enforcement activities, and miscellaneous tasks not related to specific Federal Aviation Regulations.

VOLUME 2

CHAPTER 70 EVALUATE FAR PART 121/135.411(a)(2) MAINTENANCE TRAINING PROGRAM/RECORD

Section 1 Background

1. [PTRS](#) ACTIVITY CODES

- A. *Maintenance*: 3305 (New)/3306 (Revision)
- B. *Avionics*: 5305 (New)/5306 (Revision)

3. **OBJECTIVE.** This chapter provides guidance for evaluating and accepting an operator /applicant's maintenance/ inspection training program.

5. **GENERAL.** Effective training is the basis for a successful maintenance/inspection program. Although many procedures for maintaining and inspecting aircraft may be similar, the equipment, procedures, and task documentation used may all be unique to the operator/applicant's specific programs.

A. **FAR** Parts 121, 135, and 145 require that maintenance/inspections be performed in accordance with the operator/applicant's manual.

B. Maintenance/inspection training programs are the most efficient manner to inform personnel of the requirements of the operator/applicant's program.

7. **COORDINATION REQUIREMENTS AND SCHEDULING.** Aviation Safety Inspectors (ASIs) should encourage applicants to discuss pending maintenance/inspection training program development with the certification team before the program is submitted for final acceptance. It is especially important that programs be reviewed for conformity with appropriate regulatory requirements. This review can reduce the number of major changes an operator will have to make after a program has been printed and distributed.

9. **SCHEDULING MAINTENANCE TRAINING PROGRAMS.** Delays in program acceptance results in delays in the certification process. To facilitate the evaluation of the training programs, the applicant should be encouraged to schedule a classroom training session in a timely manner.

11. **CONTENT OF MAINTENANCE/INSPECTION TRAINING PROGRAMS.** The operator/applicant's training program should include company indoctrination and technical training (formal and on-the-job training). The program should contain a list of tasks to be taught and a method for recording the training. Completion of the training must be entered in the individual's training record.

A. *Company Indoctrination.* Each maintenance/inspection employee should receive instruction in the use of the operator/applicant's manuals, policies, procedures, and forms.

B. *Maintenance/Inspection Technical Training*

(1) Training may consist of a combination of formal (classroom) instruction and on-the-job training. The operator/applicant may give training credit to individuals for experience gained while employed by other operators.

(2) Procedures unique to the operator/applicant should be taught. Training records should indicate the amount of formal training, on-the-job training, and experience each individual receives.

(3) Technical training may be contracted to another operator, manufacturer, or in the case of a specialized process, to a person knowledgeable in that specialized process. The operator/applicant is responsible for the content and quality of such training.

(4) The FAA does not establish a fixed amount of time for indoctrination or technical training courses, but should use a minimum time proportional to the operator/applicant's complexity.

C. *Responsibilities for persons other than an Operator's employees.* **FAR** Part 121 requires each certificate holder to be primarily responsible for having a training program and ensuring that the training received throughout the operator's system is of equal quality and effectiveness. This covers all persons such as the certificate holder's employees, contract personnel for emergency maintenance and servicing, etc.

(a) **FAR** § 121.375 and 135.433 relate in part that each certificate holder or person who performs maintenance shall have a training program to ensure that each person, including inspection personnel, is fully informed about procedures, techniques, and new equipment in use and is competent to perform the applicable duties.

(b) FAR § 121.371(a) and 135.429(a) relate in part that no person may use any person to perform required inspections unless the person performing the inspections is appropriately certificated, properly trained, qualified, and authorized to do so.

NOTE: FAR Part 1 defines a person as an individual, firm, partnership, corporation, company, association, joint-stock association, or governmental unit.

D. *Category II/III Maintenance Personnel Training.* Each applicant for Category II/III must establish an initial and recurrent training program. This program must be acceptable to the Administrator and cover all personnel performing quality control inspection and maintenance work on Category II/III airborne systems and equipment. Training records for such personnel are to be kept current and made available to the [FAA](#) for inspection.

E. *Recurrent Training.* The operator/applicant's training program should ensure that deficiencies discovered through continuous analysis and surveillance and/or reliability programs are corrected during recurrent training. Additionally, recurrent training should include at least the following:

Review, reinforcement, and upgrading of all training given in both indoctrination and technical subjects

Input from maintenance bulletins and/or maintenance newsletters

Critical tasks, such as run-up/taxi, Required Inspection Items (RII), and Non-destructive Inspection (NDI)

F. *Training Records.* Training records must be retained by the operator/applicant to document that personnel are adequately trained. Training records should be maintained at a central location, but may be maintained at other locations provided these locations are listed in the operator/applicant's manual.

G. *Special Emphasis Training.* Special maintenance/inspection training programs are required when new or different types of aircraft and/or equipment are introduced.

13. ACCEPTING THE MAINTENANCE/INSPECTION TRAINING PROGRAM. The task of acceptance differs from approval in that no specific procedure or vehicle is used to accept a training program. The program is approved by the general manager upon acceptance by [FAA](#). A list of effective pages will show acceptance date of the maintenance/inspection training program.

Section 2 Procedures

1. PREREQUISITES AND COORDINATION REQUIREMENTS

A. *Prerequisites:*

Knowledge of the regulatory requirements of [FAR](#) Parts 121 and/or 135

Successful completion of the Airworthiness Inspectors Indoctrination Course or equivalent

Familiarity with the type of operation being evaluated

B. *Coordination.* This task requires coordination with maintenance, avionics, and regional specialists.

3. REFERENCES, FORMS, AND JOB AIDS

A. *References*

Section 604 of the FA Act of 1958, as amended

[FAR](#) Parts 65 and 145

49 [CFR](#) Part 173

B. *Forms.* None.

C. *Job Aids.* None.

5. PROCEDURES

A. *Review Operator File*

B. *Review Schedule of Events.* If this task is performed as a part of an original certification, review the Schedule of Events to ensure that this task can be accomplished in accordance with the schedule.

C. *Review Maintenance/Required Inspection Item (RII) Training Programs.* The program should include the following elements in both the Maintenance Training Program and the RII Training Program:

- (1) The name of the person responsible for the overall administration of the maintenance/RII training program
- (2) The name(s) of the person(s) responsible for other processes within the maintenance/RII training program (e. g., recordkeeping, revisions to training programs, and security of the program)
- (3) Designated maintenance/[RII](#) training instructors
- (4) A description of how instructors are determined to be qualified
- (5) Procedures used to authorize instructors
- (6) A file on the instructors consisting of qualifications, authorizations, and other documents pertaining to instructor assignments
- (7) A list describing what type of training is required for new employees or [RII](#) candidates (Indoctrination, on-the-job training, etc.)
- (8) Procedures for evaluating, crediting, and documenting a new employee's previous training
- (9) Procedures for determining what additional training is required for a new employee
- (10) A schedule for recurrent training, a description of recurrent training, and procedures for determining requirements for other training
- (11) Recordkeeping procedures, including records of the following:
 - Training dates
 - Who performed the training (instructor should indicate by signing)
 - The number of hours of training performed
 - The content of the training performed
- (12) Criteria for determining the quality of the training program (training standards)
- (13) Evaluation of the need to revise training programs
- (14) A training syllabus that describes the following:
 - Content of each training course
 - Format of training (classroom, on-the-job training)
 - Duration of training courses
 - Standards for grading students
 - Training aids
- (15) Criteria to determine acceptability of contract training, to include:
 - Qualifications of instructors
 - Criteria to establish appropriateness of reference material being taught
 - Reporting procedures to inform operator of student progress
 - Criteria to determine adequacy of facilities
 - Criteria to evaluate contractor's training syllabus

D. *Review [RII](#) Training.* The operator/applicant must provide RII original and recurrent training, including:

- (1) A statement that RII students are appropriately certificated, qualified, trained, authorized, and current as airframe and/or powerplant mechanics or appropriately certificated repairmen
- (2) A method for notifying the RII candidate of the successful completion of the course
- (3) A method for receiving confirmation by the candidate of acceptance of RII authorizations and responsibilities

Observe Operator/Applicant Performing Training. This observation is performed regardless of whether the operator performs the training or contracts with another company.

- (1) Ensure that facilities are adequate, including classrooms, training aids, and reference materials.
- (2) Evaluate the instructor's presentation and knowledge.
- (3) Ensure that course content and instruction is in accordance with the training syllabus.
- (4) Ensure that training recordkeeping is performed in accordance with maintenance/[RII](#) inspection program.

F. *Analyze Findings.* Evaluate all deficiencies to determine what changes will be required.

G. *Debrief the Operator/Applicant*

- (1) If deficiencies are discovered during the review, return the program to the operator/applicant with a letter describing the problem areas, if necessary. If this review is being performed as a part of a certification, inform the operator/applicant that issuance of the certificate will be withheld until deficiencies are corrected.

Schedule a meeting with the operator/applicant to discuss the problem areas if it may be helpful in resolving deficiencies. Discuss how to resolve deficiencies.

7. TASK OUTCOMES

A. File [PTRS](#) Transmittal Form

B. *Successful Completion of this task will result in the following:*

A letter to the operator/applicant indicating acceptance of the program

The original accepted program sent to the operator/applicant along with instructions to provide a copy of the program to the Certificate Holding District Office (CHDO).

Document Task. File all supporting paperwork in the operator/applicant's file.

9. FUTURE ACTIVITIES. Normal surveillance.

CHAPTER 97 INSPECT [FAR](#) PART 145 DOMESTIC REPAIR STATION

Section 1 Background

1. WPMS ACTIVITY CODES

A. Maintenance: 3650

B. Avionics: 5650

3. OBJECTIVE. This chapter describes the process required to inspect a [FAR](#) Part 145 domestic repair station.

5. GENERAL

A. This inspection will be conducted as a result of a work program requirement, a previous surveillance effort, allegations of improper maintenance, or component failure trends. The inspection, based on these reasons, may be a comprehensive in-depth inspection or may just cover specific areas related to a specific job function.

B. The inspector should carefully review the regulations, identify the applicable sections, and proceed to conduct the inspection for compliance. While conducting the inspection, the inspector should verify that the facility and personnel are qualified to perform the maintenance functions as listed in the operations specifications.

7. CONDUCTING THE INSPECTION. Repair stations can vary from a one-man operation to a large overhaul facility. Based on the size and complexity of the repair station, the Certificate Holding District Office may need to form an inspection team capable of effectively evaluating all aspects of the operation.

A. Repair Stations Doing Work Away From a Fixed Location. Inspections of these stations will be conducted by the district office where the work is being performed. The inspector from the geographical office performing the inspection should maintain good communications with the parent facility's Certificate Holding District Office in matters regarding procedures, manuals, equipment, personnel, etc.

B. Airmen Certification. Technical supervisory personnel in propeller or instrument repair stations require repairman certification. Technical supervisory personnel in all other stations may be certificated as either airframe or powerplant mechanics, or repairmen.

C. Parts Inspection Procedures. All incoming parts must be inspected by the procedures in the certificate holder's manual. In addition, the procedures must ensure traceability of foreign and domestic parts.

Section 2 Procedures

1. PREREQUISITES AND COORDINATION REQUIREMENTS

A. Prerequisites

- Knowledge of the regulatory requirements of [FAR](#) Part 145
- Successful completion of the Airworthiness Inspectors Indoctrination course
- Previous experience with FAR Part 145 operations

B. Coordination. This task may require coordination with other specialties or district offices and the certificate holder

3. REFERENCES, FORMS, AND JOB AIDS

A. References

[FAR](#) Parts 43, 65, 121, and 125

SFAR 36

Order 8300.10, Airworthiness Inspector's Handbook, Vol. II, Ch. 2

B. Forms. None.

C. Job Aids. None.

5. PROCEDURES

A. Evaluate Certificate Holder's Documentation. Inspect the following:

(1) Repair station certificates to ensure that:

- Certificate is displayed in the repair station and is visible to the public

Certificates in the repair station are identical to those in Certificate Holding District Office file

- Ratings are appropriate for the work being done

(2) Personnel roster to ensure that:

Staffing consists of enough qualified, knowledgeable personnel to perform the work for which the certificate holder is rated

Personnel directly in charge of maintenance functions for the repair station are certificated in accordance with [FAR](#) Part 65, as required by FAR § 145.39(d)

Certificate holder's roster of supervisory and inspection personnel is current and reflects all personnel assigned these duties

Certificate holder's roster includes all authorized signatures for "Return to Service" and indicates the area of responsibility of each person as shown in Advisory Circular 145- 3, Figure 12

(3) Technical and regulatory data used by station to ensure that:

- Technical data is appropriate for the maintenance or alterations to be performed
- Data is current, accurate, and complete
- Data is in the certificate holder's possession and easily accessible to all personnel

(4) Forms and records to ensure that:

(a) Station records are completed and retained as required

(b) Required reports have been submitted, e.g., Malfunction or Defect reports

CHAPTER 162 CERTIFICATE FAR PART 145 DOMESTICREPAIR STATION/SATELLITE STATION

5. PREAPPLICATION PHASE

A. Respond to an Initial Inquiry

- (1) Discuss with the applicant the following subjects, to include:
 - (a) The necessary technical expertise required by the applicant's proposed organization, to include the following:
 - Aviation-related experience
 - Proposed organizational structure
 - Knowledge of the specific maintenance functions to be performed
 - (b) The rating required for the type of work to be accomplished
 - (c) The requirements for sufficient personnel to meet the demands of the proposed repair station. This includes at least one certificated person with appropriate ratings that coincide with the ratings sought.

• [FAR § 145.63](#)

C. Evaluate Maintenance Organization. Ensure the following:

- (1) The number of personnel is sufficient to satisfy the volume and type of work to be performed, as required by FAR § 145.39
- (2) Individuals directly in charge of a maintenance functions are appropriately certificated
- (3) A personnel roster is available and includes all supervisory and inspection personnel
- (4) Supervisory and inspection personnel employment summaries are available

D. Analyze Deficiencies

- (1) If deficiencies are noted, notify the applicant in writing. If appropriate, meet with the applicant to review deficiencies in detail.
- (2) Corrective action must be taken and the Certification Project Manager notified in writing by the applicant, in order for the certification process to continue. Each deficiency and corrective action must be fully documented and recorded in the certification file.