AVIATION TECHNICIAN EDUCATION

AND

THE UNIVERSITY CURRICULA

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ABSTRACT

In this paper, the author discusses the responsibility for aviation technician curricula. By examining the legal basis of technician school regulation, he shows the scope and limitations of the FAA involvement in school operations.

He then addresses problems that are often cited involving Part 147 approved programs. Is Part 147 restrictive, and what should be taught, and to what depth. Citing various regulations, surveys, and a series of recently completed Part 147 workshops, he shows that these do not have to be problems.

Suggestions for upgrading technician education programs are then given, including accreditation, industry involvement and support, less dependence on the FAA, and a unified approach to all aviation education.

INTRODUCTION

The technology of aircraft has advanced at a very rapid pace during the forty years since World War II. As a result, the ability of aviation technician education to meet current technological needs has become a subject of controversy. Many contend that the Federal Aviation Administration (FAA) and Federal Aviation Regulation (FAR) part 147 constitute an obstacle in this regards. Others feel that the aviation industry and/or the schools are guilty of failing to keep curricula up to date. There is general agreement that maintaining up-to-date curriculua is a problem. However, there has been little positive action taken toward formulating a solution.

This paper will summarize the legal basis and history of the development of aviation technician school regulation. It will examine the following questions: Does the FAA, with part 147, act as an obstacle to having current curricula? To what level should a person be trained to become a mechanic? And, what role should industry play in the education process? Suggestions will be made of what possible action schools might take to upgrade technician training, especially those schools at the university level.

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The FAA requires that all persons performing, supervising the performance of, or approving aircraft maintenance for return to service be certificated. They also require schools preparing individuals for this certification be certified in accordance with FAR part 147. To properly understand part 147, it's legal basis and that of the school product, the A & P mechanic, should be considered.

The FAA receives its authority from congressional legislation, the

FAA/DOT act. This act charges the FAA with promoting the safety of flight by prescribing and revising reasonable rules, regulations, and minimum standards. These rules, etc., are to govern all aspects of what is commonly called aircraft maintenance(1 - sec. 601(3)). The FAA is also empowered to issue airman certificates for those doing such work. In addition, they have the authority to examine and certify schools giving instruction to those pursuing such certificates(1- sec. 607). It is clearly stated that the purpose of such regulation is to provide for safety and must be in the public interest.

The congressional mandate has been answered by the formation of various rules, regulations, or minimum standards. These are Title 14 of the Code of Federal Regulations and are commonly known as the Federal Aviation Regulations.

FAR part 65 (subpart D) sets the requirements for certification, and the privileges and limitations of an A & P(2 - p 7). Certification is achieved by passing written, oral, and practical examinations covering material in each of 43 subject areas. To be eligibile to take these tests the applicant must be a graduate of a certified school, or have 30 months of appropriate experience in aircraft maintenance. Once certified the mechanic has broad privileges. Unlike some aviation personnel, the mechanic does not have type ratings or the requirement for personal experience records. He has the privilege of performing work on any type of aircraft. Before approving any work for return to service he must have previously demonstrated his ability to do such work (2 - sec.65.81). This demonstration of ability can be to another mechanic and does not require documentation. The question of ability is dependent upon the integrity of the mechanic. Does he know what he is doing? Does he have the pertinent information and tools? Has he done it before? It should be noted that major repairs, major alterations, and annual inspections require inspection authorization before approving for return to service. This

authorization requires three years experience as a mechanic and an additional written examination. It should also be noted that air carriers, repair stations, and certain other operators are required to have their own approved operating procedures for aircraft maintenance. When working in those operations the mechanic will be performing under their rules and not necessarily under the privileges of his certificate.

The newly certificated mechanic finds a broad area of employment available. Bush flying in Alaska, helicopters on the gulf coast, agricultural aviation, air carrier, corporate aviation, general aviation, or aircraft manufacturing offer equal opportunity as far as his certification is concerned. This breadth of opportunity raises the question of how does the FAA ensure that a person is properly qualified to perform as a mechanic. An answer can be found in the interpretation of "qualified" and "perform". By law the FAA can only prescribe regulations necessary for safety. The examinations required by part 65 are therefore limited in each of the 43 subject areas. The applicant is tested to assure that he has an appropriate level of knowledge and skills to perform safely as an entry level mechanic. Controversy exists in that many feel that the entry level mechanic should be an immediately productive employee. Since the regulation speaks to safety and not productivity, the FAA is limited to requiring only minimums necessary to ensure safety.

The school regulation, part 147, parallels this philosophy. Part 147 requires that a certificated school teach at least the appropriate level of knowledge and skills that will allow the graduate to perform safely as an entry level mechanic. Part 147 also prescribes operating rules within the school to ensure that the quality and quantity of education are achieved. It should be noted that a graduate of a certificated school still must be examined under the provisions of part 65.

The current era of technician training began on May 2, 1970 when a major revision of part 147 became effective. A major part of this revision was based upon a survey conducted in 1965 by a national advisory committee. This was the first of three phases of "A National Survey of Aviation Mechanics Occupation". The survey was under the direction of Dr. David Allen, of UCLA, and is commonly referred to as the "Allen Study".

In phase I the committee conducted a survey of mechanics working in the field. Fifty-two tasks or areas were identified and 401 companies, representing over 18,000 mechanics, were surveyed (3 - p 26-29). The survey was concerned with the number performing each task, the frequency of performance, the knowledge and skill level required, the time factor involved in the task, and the amount of industry training available. This data was analyzed and a suggested core curriculum (subject matter and level) developed for aviation mechanic training. This material was utilized by the FAA in determining the curriculum subject and level requirements of the revised part 147.

The Allen Study in phase II identified, through experimental research, ways to implement the core curriculum utilizing current instructional techniques (4 - p1).

Phase III of the Allen Study consisted of two parts. The first involved teacher training and curriculum development based upon the results of phases I and II. The material from phase III was intended to serve as a model curriculum which would comply with revised part 147. The individual school was expected to make modifications or adaptations which would be necessary to meet their own needs (4 - p1).

The second part of phase III consisted of a resurvey of 30% of the original companies surveyed in phase I. The objectives were to update the core curriculum and to test a method by which the FAA could update it

periodically. In relation to the latter it should be noted that Dr. Allen conducted a resurvey in 1973 (5). Little attention appears to have been given to either of these resurveys.

A major provision of the revised part 147 was that all schools then certificated, were to be recertificated by May 1972. It was during this period that the Allen Study, Phase III - Model Curriculum, was mistakenly interpreted by many as the only way to comply. This misinterpretation, which still exists today in many areas, has cast a negative image on the entire Allen Study. Because of this image the Allen Study's full potential has never been realized.

Part 147 is basically the same today as in 1970 as only minor changes of an operational nature have been made.

The validity and relevancy of part 147 has frequently been questioned. As the decade of the 1970s drew to a close questions became more frequent. The question of when is the FAA going to update part 147 was often asked. After having indications that revision and updating were imminent, the Aviation Technician Education Council (ATEC) was surprised to learn that nothing was planned. At the 1982 ATEC Conference, Leo Weston of the FAA Airworthiness Office stated that the FAA is satisfied with part 147. They feel it is adequate and does not need to be changed. He also stated that if the organization (ATEC) felt there was a problem, they should petition for change under FAR part 11.

In an attempt to make sense out of a confused situation ATEC commissioned a survey. The survey was conducted by Johnson and Ziegler through the facilities of the Aviation Research Laboratory at the University of Illinois (6). A questionaire was sent to aviation technician school administrators and instructors, of which 163 responded. The results indicated displeasure with part 147 but did not provide any specifics on what should be done. For

virtually every recommendation a counter remark could be found. A task force was created to work with the part 147 problem. After further analysis the task force concluded that many of respondents did not understand part 147. To test this conclusion another survey form was sent out only to school administrators. In the results of this survey twenty-nine of ninety-one (32%) respondents answered that they thought serious problems existed with part 147. Forty-four of ninety-two (48%) responded that they thought serious problems existed with the interpretation, utilization, or enforcement of part 147. Those responding that there were problems were asked if they felt that these could be rectified by minor changes and better interpretation. Forty-four answered yes with only five saying no (7).

With these results and further study of 147, the ATEC task force was able to conclude that part 147, as written, is adequate and effective. It was recognized that problems did exist in the form of misunderstanding and variation of interpretation among the geographical regions. These problems did appear to have an influence upon the ability of many schools to update their curricula.

ATEC then submitted a proposal for funding from the FAA to conduct ten workshops on FAR 147 standardization. These workshops were funded and took place during the period of March 1 to May 31, 1985. The major purpose of the workshops was to evaluate part 147 as written. A major question was does flexibility exist to allow individual schools to meet their unique needs.

The workshops showed quite conclusively that interpretation varied among regions and schools (8). There was general agreement that part 147 as it is written, if properly interpreted, does have flexibility. Although there was informal agreement on many issues of interpretation during these workshops, formal policy has yet to be established. Both the FAA and ATEC are currently analyzing the workshop data in order to formuate formal policy and/or change.

The only change contemplated is that necessary to allow all schools to benefit from the flexibility that has been shown to exist. The workshops would appear to have lessened the role of the FAA as a scapegoat for lack of curriculum updating.

A second question often asked is what should be taught and to what depth? The first priority must be to teach the appropriate levels as required by part 147. As long as part 65, mechanic certification, is unchanged, the schools will continue to need to teach all subjects. Many question the need of teaching wood working or dope and fabric. It is pointed out that many of these items require a low level of achievment. A major concern of many is that teaching to a lower level is dangerous. They fear that the student will over estimate his abilities. Opponents of this viewpoint cite part 65.81. The mechanic must have demonstrated his ability before approving for return to service. They also stress that teaching the student his limitations as a mechanic are an essential part of the course.

Once the FAA requirements are met a school can spend the remainder of its program time in going into more depth in areas of its choice. This will often be dictated by geographical location or unique school needs. To illustrate this point we will refer to an ATEC survey (7). When schools were asked how many hours were spent in teaching wood, the responses ranged from a low of 3 to a high of 65 with a mean of 22.7. The school with 65 was a high school program with a total program length of 2500 hours. One reason for the high number of hours in woods is that it is a good medium to teach hand skills.

A second area asked about was aircraft covering (fabric). The range of hours in this area was from a low of 10 to a high of 120 with a mean of 34.6. The school with 120 hours is a community college with the minimum number of total hours (1900) located in the state of Alaska. Alaska has a large number of fabric covered aircraft.

These two examples illustrate how a school can provide more in depth instruction. In the first case the school has more than minimum total hours in its curriculum. It is teaching more than required depth in wood to meet needs unique to it and it's students. In the second case the school is teaching the minimum number of total hours. However, it is still able to teach in more depth a subject that it's graduates will possibly be utilizing once employed.

Approved part 147 curricula are found in high schools, trade and technical schools, two year colleges, and four year universities. It should be evident that such a range of institutional types would have a similar variation of student abilities and maturity. Regardless of instituional type, part 147 requires that the school offer at least 1900 hours. For some schools with high school programs or "open-door" admission policies the 1900 hours is not enough. Additional hours are required to meet the FAA standards. Other schools may be able to comfortably teach the required material in the 1900 hours and have time left over for more in depth instruction. Thus what to teach, above part 147 requirements, is a matter for the individual school to decide.

The role of industry in training technicians must also be considered in determining what to teach. The national survey that was used to determine curriculua requirements used the amount of industry training available as a criteria. The logic was that if industry provided training the schools could place less emphasis on it. Conversely if industry was not providing training then the schools should ensure that the student received it. This logic is as valid today as it was in 1965. While many will point to the fact that technology has advanced tremendously since 1970, a similar point could also be made for industry training. Many advisory committees suggest that the schools concentrate on the basics and let industry teach specialized knowledge and

skills as needed.

There are those that contend that the schools should turn out job ready mechanics, so that industry would not have to provide training. John Griffin Jr., President of East Coast Aero Tech, comments that "an MBA fresh out of school, gets a job making fifty to sixty thousand a year and the first thing he does is go into a training program". To state it another way, industry training is not unique to aviation. There will always be a need for industry training. The real question is where will the schools stop and industry take over.

If part 147 is not a major obstacle to curriculum development, the schools find themselves in a position of responsibility for the future of technician education. It is suggested that the four year universities, with approved part 147 curricula, should be leaders in this area. The reasons for this suggestion are university tradition and mission, staff qualifications and loads, admission policies providing students of higher academic ability, and an increasing demand for graduates with bachelor degrees and A & P certificates.

Suggested areas for action include the following: (1) changing the image of a school with an approved part 147 curricula as being only a "mechanic or A & P" school, (2) changing the concept that all 147 approved schools have similar programs, (3) development of accreditation for aviation technician schools, (4) involvement of the aviation industry as a full partner with the schools in curriculum development, (5) development of industry support for aviation education similar to that in other disciplines, (6) development of innovative and more efficient teaching methods, (7) reduction of schools dependence upon the FAA, and (8) development of better coordination and mutual goals for all facets of aviation education.

The implication of image is not intended to be degrading to "mechanic"

schools. The reference is to the concept held by some that a school with a part 147 curriculum is only teaching mechanics. This concept is probably valid for approved programs found in specialized aviation trade schools, vocational high schools, and area vo-tech institutes. The latest directory of approved schools (9) shows that 53% of the approved programs are offered by community colleges or four year universities. Many of these programs include more than the required subject matter of part 147. There are 21 programs associated with four year universities. In these one would find many students preparing for a career in management or engineering that utilizes their technical training.

All approved programs contain a core of part 147 material. The point to be made is that some schools go well beyond this level. Therefore all programs are not similar. Typical thinking of some is illustrated by the following incident. A state higher education commission requested information from a four year school and a two year school in regards to the similarity of their programs. The two schools pointed out that they had different admission requirements, different lengths of program (2 yr vs. 4 yr.), and different career goals among the students. They also stated that upon initial counseling, it was not uncommon to advise students to attend the other school to better meet their needs. The commission's report listed the two schools as having similar programs!

Perhaps the major need of part 147 programs in institutions of higher education is accreditation. At the present there is no suitable program for aviation technician curricula. Although many use the criteria of part 147 for this purpose, it contains only minimum standards and in no way compares with ABET, or similar agencies. The issue of accreditation has been addressed by ATEC which has 70% of all certified schools among its members. The need for accreditation is of major concern to those schools associated with higher

education. It is suggested that ATEC and UAA make a joint effort in development of an valid and meaningful accreditation program for aviation curriculua. Such a program could be developed under the auspices of an existing agency or a new agency.

Curriculum development should be a joint effort with industry saying what and the school determining how. Another important consideration of such action would be the determination of where the schools stop and industry starts training. The need for and development of "add-on" advanced programs in some schools should be investigated. The potential use of school personnel and facilities for industry training also deserve consideration. The key to this situation is improved communication between the schools and industry.

Industry support is a sensitive subject. Many in industry acknowledge their support for education. However, while other schools are receiving donations of complete laboratories, aviation schools are getting discounts on manuals and surplus parts. Lack of support similar to other disciplines is regarded by many school administrators as lack of need for the program. Avenues other than direct economic support also need to be investigated. As an example, many companies are very generous with allowing school personnel to attend their training sessions at no charge. The problem is that many schools do not have resources for travel that would allow their staff to attend. As a suggestion, perhaps industry could provide occasional "teacher" training programs on a regional basis, allowing more to benefit.

Innovative and new teaching methods in aviation technology have been discouraged by perceptions of limitations in part 147. As a result riveting is still being taught the same as it was when "Rosie the Riveter" was building B-17s. With an ever increasing technology, and the need to continue to teach some degree of the old, the development of more efficient teaching methods needs little explanation. The university programs would be more likely to

have the flexibility that would allow time for experimentation and development. These methods could then be made available to all schools.

A major obstacle to the advancement of aviation education has been the tendency to wait for the FAA to tell the schools what to do. The FAA has set minimums and by law is restricted to that position. It is time for the schools to accept the responsibility of aviation education. This includes compliance with the FAA minimum requirements.

The last suggestion is difficult to quantify and is largely based on observation. An outside observer of "aviation education" would probably observe many different entities, operating in diverse manners, and calling themselves aviation education. He would find little coordination among these groups. In some cases he would find activities that are in opposition with other groups, most probably due to lack of knowledge as to what others are doing. Aviation education faces adequate competition from other educational disciplines without having to resort to internal problems. The phrase "there is strength in numbers" may be overused but is none the less valid. All facets of aviation education would benefit from a coordinated effort.

Conclusion

The aviation technician schools need to take control of their destiny. FAA requirements only set, and are restricted to, minimums and in no way prohibit going beyond. There is no standard curriculum other than the subject material required by part 147. Each school has the ability to determine a curriculum consistent with its needs as long as the provisions of part 147 are met.

It is the duty and responsibility of the schools to create and maintain excellence in aviation technician education. The university schools should be leaders in this effort.

Future success is dependent upon the establishiment of good relationships with industry and the FAA. Equally important is the need for all facets of aviation education to work together.

APPENDIX A

References

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