

**KEEPING UP WITH TECHNOLOGY THROUGH CURRICULUM CHANGES
IN CONJUNCTION WITH REQUIREMENTS IMPOSED ON FAA PART 147
AVIATION TECHNOLOGIES SCHOOLS**

Dennis R. Hannon
Department of Aviation Technologies
Southern Illinois University Carbondale

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Abstract

Technological evolution is a naturally occurring phenomenon in fields such as aviation technology which deal with a multitude and variation of control systems and the complex devices they operate. Prior to the 1980, the concept of aviation electronics or *avionics* dealt primarily with communication and navigation systems, most of which were based on radio principles of one form or another. Nowadays, avionics has found its way into virtually every system aboard modern complex aircraft. As traditional steam gauge type instruments are replaced by cathode ray tube and liquid crystal displays, an understanding of these devices has become a necessary addition to many courses in the airframe and powerplant curriculum. While the Federal Aviation Administration (2004) regulates course content in their Part 147 section of the *Code of Federal Regulations* to a large degree, a substantial portion of this responsibility also rests with the individual aviation technology school. In order to provide students with sufficient knowledge of these advanced systems in addition to the basics, adjustments have to be made to the curriculum from time to time. In the university setting, this responsibility often lays with a curriculum committee working in concert with involved faculty. This combined effort is not always without problems and is especially complicated by the need to satisfy the requirements of both the university and the FAA. The Aviation Technologies Department at Southern Illinois University recently undertook such an effort. In addition to dealing with policies of the university and the FAA, a short timeframe was also placed in the committee necessitating a highly proactive approach to implementing the curricular changes to effect the necessary additions. This article discusses our approach to the process and some conclusions drawn from the experience.

Introduction

Keeping up with technology in the field of aviation maintenance has become a challenge for Part 147 schools (Hawkins, 2006). While the basics of the aviation powerplant and airframe have not changed much over the last few decades, the means of controlling and monitoring these aspects of the technology has progressed greatly. What can be especially difficult is the successful melding new material into Accreditation Manuals, master syllabi and courses that satisfy both Federal Aviation Administration (FAA) and institutional requirements for curriculum contents and to promote program completion in a reasonable timeframe (Blakely, 2002). Among other strides in technology, the advent of the digital revolution's emergence in aviation systems beyond those traditionally classified as "avionics" has produced a variety and complexity of system controls, actuators and monitors unprecedented prior to digital signal processing technology entering the electronics mainstream in the early 1980s. Glass cockpit systems are phasing out the older analog systems and ubiquitous steam gauge type instruments for engine control and monitoring, automatic piloting, navigation and communications (Hughes, 2007). In a typical Part 147 curriculum where the FAA addresses what aviation maintenance technologies schools are required to teach to maintain certification, aircraft systems monitoring and control are discussed in a plethora of courses. These include power plant testing, jet transport technology, environmental control systems, aircraft electrical systems, propeller systems, hydraulics, communication/navigation, and electronics flight information systems courses just to name a few. In order to keep up with the changes, a dynamic, versatile and proactive departmental curriculum review committee must be established and maintained.

At Southern Illinois University in Carbondale, the Part 147 Aviation Technologies discipline is a department in the School of Transportation which is part of the College of Applied Sciences and Arts. Other disciplines in the school include Aviation Management and Flight and Automotive Technology. Each of these disciplines encompasses a rapidly evolving field and enjoys a more or less constant demand for individuals trained in its intricacies and workings. The first two departments are intimately related, not so much in curricula but interdependency upon one another for the reliable, efficient and safe transport of people by air. Automotive technology, in many instances, has served as a reliable proving ground for new technologies ultimately integrated into aviation systems. A prime example is the introduction of imbedded microprocessor based systems to aviation after initially appearing in automobiles in the 1980s. The reality of change implementation, although perhaps not so obvious to the casual observer, is that the field of aviation has traditionally been very conservative and hesitant to introduce new technologies until proven safe and reliable in other venues. However, once accepted and adapted it can lead and has rapidly led to a multitude of significant and diverse improvements and advances. The automotive industry has done an excellent job for aviation in this regard.

None of these fields are static. In order to provide high quality entry level individuals to the work force, the technologies taught must reflect to the best extent possible what will be encountered in real world applications of what has been learned. This statement is not meant to discount the need for teaching the basics, but those must be augmented by thorough examination of future trends and cutting edge technologies in

the classroom. This task normally is the mission of the departmental curriculum committee whose members ensure these new aspects are integrated into a finite spectrum of curriculum while preserving conveyance of the foundations on which they are built.

Discussion

At the beginning of the academic year, as is the policy of the SIU Aviation Technologies Department, a curriculum committee was formed to address the issues delineated above and effect changes where deemed necessary to the broad airframe and powerplant technician certification portion of the curriculum. As a major revision to the airframe and powerplant curriculum had not occurred for several years, the committee was tasked with doing a thorough review of the existing material and was under a short deadline to effect changes where required. As is typical in any federally certificated school of aviation technologies, the prime movers for course quality and content are the Code of Federal Regulations, specifically Federal Aviation Regulations 14 CFR, Part 147; FAA Order 8300.10; and the FAA School Accreditation Manual.

The Part 147 and 8300.10 documents relate specifically to aviation maintenance educational facilities, curriculum content, quality of faculty, review, evaluation and virtually all aspects of a technical training institution for Airframe and Powerplant Technicians. The Accreditation Manual is produced by the department under guidance from the above and approved by the FAA. From these three documents, a Master Syllabus containing an outline of material to be presented is developed which is then used to draft the actual course syllabus that is distributed to the students on the first day of class. The Master Syllabus also delineates the course level (i.e. 100, 200, 300, 400), credit hours of each course and topical outline as well as the required and reference textbooks used. Each criterion must coincide with that required by Part 147, the 8300.10 and follow the guidelines set forth in the FAA approved Accreditation Manual (FAA, 2004).

With the tasking of the committee established, a plan for accomplishing its charges needed to be considered. A one and one half month deadline was imposed on the committee to ensure appearance of any course summary, level or credit hour changes to the Undergraduate Course Catalog in a timely manner. The short fuse left little time for the extensive discussion, compromise and approval sessions that often accompany such endeavors. To minimize the potential for delay, the committee was informed up front of the deadline and advised to schedule its discussion meetings and develop its recommendations accordingly. As membership in the committee is initially voluntary, solicitation for a temporary or interim chair was sought by the department chair. This individual would consider the make up of the committee, recruit members and set the time and place for the initial meeting. At the first official meeting, a permanent chair would be chosen by election and the committee make up would be validated. It was felt in this instance, all things considered, that a broad range of faculty, both in number and specialty, be encouraged to sit on the committee. As the SIU Aviation Technologies Department offers three specializations under its bachelor's program, one representative from each consisting of advanced maintenance, helicopter technology and avionics was desired. In addition, since the faculty consisted of both continuing and term faculty, at least one term faculty member for the committee was sought (Department of Aviation Technologies SIUC, 2004).

The initial voting membership of the committee consisted of 7 out of the total of 12 full-time departmental tenured, tenure-track and term faculty or about 60% of our complement. Normally, the committee consists of four members. The interim department chair and field representative/academic advisor as well as the department administrative assistant also served on the committee as ex officio, non-voting advisory members in the first two cases and as the recording secretary in the third. One voting committee member was a tenured senior assistant professor, five were tenure track assistant professors and the remaining member was a term assistant instructor. Three of the seven voting members had previously served on the curriculum committee. Two of the members were newly appointed tenure-track professors including one who had been with the department for a number of years in a term assistant instructor capacity. A part-time, emeritus faculty member with an avionics background was also asked and agreed to advise the committee in an *Ad Hoc* non-voting capacity.

Many aspects relating to the decision making process were offered to the committee as background for its deliberations. The interim department chair and field representative/academic advisor's presence at the early meetings effectively catalyzed this process. The FAA requires a total of 1,900 hours of instruction as a certification criterion for a Part 147 aviation technologies school designed to prepare students for their airframe and powerplant technician license. Further, a reasonable timeframe must be allocated for students to complete their FAA requirements in addition to core courses required by the University for a bachelor's degree. Both these requirements had to be integrated into a curriculum allowing for a four year degree completion time. Any curricular adjustments also needed to consider maximum permissible faculty workload under the SIU Faculty Association Collective Bargaining Agreement and extant department staffing levels. In several cases, established six credit hour courses exceeded this limit as enrollment numbers and FAA imposed class size limits required more than one course section. Although the use of multiple instructors in multi-sectional courses was not unheard of, it was felt such an arrangement was undesirable in a setting where twenty different airframe and powerplant courses, many of which require multiple sections and comprise five or more credit hours, are offered. Consideration was given therefore to faculty workload versus credit hours versus enrollment as guidelines for credit hour adjustments. The Aviation Technologies Department also tends to be somewhat unique in the university setting in that both lecture and associated laboratory courses are taught exclusively by instructors or professors and not graduate students. Further, the course instructors themselves are directly responsible for the general upkeep of their laboratories including ordering consumables and equipment as well as performing equipment maintenance and calibration. Such responsibilities must be considered as essential indirect teaching and occupy a substantial amount of available staff time. In the venue of a research orientated university such as Southern Illinois, a careful balance must be preserved to ensure faculty are afforded the opportunity to pursue scholarly activities such as research and publication in conjunction with their direct and indirect teaching responsibilities.

As the level and complexity of technology in the airframe and powerplant areas has increased, so to has the need for packing additional material into the more advanced courses. This coupled with required prerequisites, evaluation of common material in different classes and credit hours available helped to determine where the more advanced

courses should fall on the 100 to 400 undergraduate course level scale and what is contained in each master syllabus. As a rule of thumb, the committee considered the more technically orientated courses with two or more prerequisites to fall into the 300 and 400 levels. Similarly, any courses not requiring college level prerequisites coupled with consideration of complexity of material should fall into the 100 or 200 levels. In spite of this rather complicated admixture, the committee was able to come up with a working and practical recommendation to present to the faculty at large. Due to the extensive representation of stake holding faculty on the committee, this process was greatly simplified and the approval process streamlined. Unanimous faculty approval was attained at the very first faculty meeting following presentation of the committee's recommendations. This unanimous approval, however, was not without reservations.

During the curriculum committee's review of the airframe and powerplant course master syllabi, many were found to be extensive in their outline of material covered with one exceeding fifteen pages in length and several containing six or more pages. The committee took a twofold position in that while there was a strong desire to limit master syllabi to about three pages, the wealth of material contained in the more lengthy versions should be retained as a source document for curriculum maintenance and development as extensive topical outlines. Such resources would be invaluable for both new and more seasoned faculty called upon to teach a particular course for the first time.

The SIU Aviation Technologies Department has seen a rapid turnover of faculty in the last three or four years. This is due to retirements and transfers as members who joined the department shortly after its inception have attained retirement eligibility and have had an aspiration to do so sooner rather than later.

Importantly, the desire was strong, especially among the more senior faculty, to ensure sufficient time remained available to cover material deemed relevant and necessary in spite of course credit hour adjustments. To this end, the committee remained charged with carefully reviewing affected master syllabi in an effort to prevent mitigation or loss of important and necessary curricular elements. Fortunately some duplication of material covered in other courses was found permitting adjustment or certain material could be effectively moved into other courses where the credit hours were increased. In each case, steps were taken or remain ongoing to insure that adequate coverage of material and strict adherence to FAA requirements remains intact.

Conclusion

Serving two masters in curriculum development and implementation is obviously difficult. Coupling this concept with the policy of academic freedom afforded to instructors in course development provides a potential for conflict. While this in itself is not necessarily undesirable, much time and energy is often devoted to argument and compromise prior to arrival at a consensus. Unfortunately in this evolution, the time available to implement curriculum change and implementation was severely limited. In an effort to minimize this aspect of the process, a great deal of informative discussion ensued between the department chair, committee chair and the faculty at large prior to formal committee deliberations. These discussions and the multiple features of the situation served to establish ownership in and high motivation on the part of the committee for effecting necessary changes. The SIU Department of Aviation Technology enjoys a low student to faculty ratio, partly imposed by the FAA but also pursued by the

faculty. It is firmly believed that this in large part assures a high quality of education for our students. However, as more attention is being paid to the fiscal aspects of running a program based on credit hours versus faculty workload versus student enrollment, it is important for a program to accurately present its effectiveness in a manner demonstrating not only its value to industry but also to its parent college and the university as a whole. The ongoing development of an educational process, especially in a highly technical field such as aviation technologies, must remain dynamic. To this end, a high level of productive discourse must ensue at all levels in the department. While university faculty enjoy a level of freedom to develop their programs not generally experienced in industry, care must be taken to establish goals early and to avoid getting bogged down in issues aside from the business at hand. Good communication seems to be the key and appears to have served well in this endeavor.

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