COLLEGIATE AVIATION MAINTENANCE TRAINING
PROGRAMS CERTIFIED UNDER 14CFR PART 147
THAT ARE MEMBERS OF THE AVIATION
TECHNICIAN EDUCATION COUNCIL

By

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PREFACE

This study was conducted to provide a comprehensive analysis of collegiate aviation technical education. It will provide information and recommendations that will be valuable to educators, administrators, decision makers and other associated stakeholders. The study establishes a history of the aircraft mechanic and a basis for post-secondary aviation maintenance education at the collegiate level. The study describes the current configuration of collegiate aviation maintenance education programs and surveyed the administrators of aviation technical education programs that confer the bachelor of science degree. A descriptive analysis of the data gathered is provided in the study. Conclusions are drawn from the data and recommendations are made based upon the findings. Although there has been a substantial amount of educational research in the area of pilot training, there has been relatively little research effort in the area of aviation technical education. In that vein, this study is the first of its kind and is intended to form a date baseline to help define the current state of the art within aviation technical education. Aviation is a safety critical industry and to maintain the highest levels of safety highly qualified individuals are required at all levels including the technicians that
maintain the aircraft and related support systems. That level of quality begins at the
educational level and ultimately at the administrative level within that educational
system.

I must offer my sincerest thanks and appreciation to God for the life He has
provided through His Son and for the strength and guidance He has imparted in my life.

I must express my thankfulness for and my thanks to my family; my lovely wife
Leanne in particular, for her willingness to support and follow me through the 24 year
journey that has taken us to this moment in time. Without her support and that of my
sons, Andrew and Jonathan, I could not have undertaken this challenge with any hope of
success. I must thank my parents for their love and sacrifice that provided the stable and
supportive home life that encouraged me to follow the call of the sky.

I also offer my thanks to the members of my doctoral committee—Dr. Steve
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CHAPTER I

INTRODUCTION

Background

Within the United States there are 115 educational entities that conduct 14CFR part 147 aviation maintenance training that are member institutions of the Aviation Technician Education Council (ATEC members, 2008). They vary in configuration, and range from proprietary "certificate" programs and two-year vocational-technical schools to comprehensive collegiate institutions of higher learning that imbed aviation maintenance education within an overarching Bachelor of Science degree curriculum. At the time of this writing, there are 11 collegiate aviation maintenance education programs that confer the bachelor of science degree (ATEC members, 2008).

As advances in aviation technology increase at a rapid rate, the need for high quality aviation maintenance technicians who possess a bachelor of science level of education are in increasing demand (U.S. Department of Labor, 2008). Because of this industry demand for aviation maintenance technicians who are college/university educated, collegiate aviation maintenance education programs are at the forefront of aviation technical education. Because of the importance placed on the existence of these collegiate aviation maintenance educational programs, they form the basis of this study.
As a technology, aviation maintenance has developed hand-in-hand with the milestone advances in the aviation operational realm. The Wrights and Glen Curtiss were both pilot and mechanic for the aircraft they designed and built, but as aircraft were soon produced for sale, the need for mechanics to keep the fragile craft airworthy increased. Such notable aircraft “mechanicians” as Charles Taylor, associated with Wright Aircraft and Lou Krantz associated with Curtiss Aircraft were highly valued for their skills (Prendergast, 1981). The value of highly trained aircraft mechanics was soon realized as the United States began the development of air power during World War I. This critical time saw the development of structured aviation maintenance training programs within the military (Unites States Museum, 2009). With the passage of the Air Mail Act of 1925 by the United States Congress, (also known as the Kelly Act) followed by the Air Commerce Act of 1926 that mandated the federal certification of pilots and mechanics, aviation in the U.S. transitioned from the unpredictable and fragmented era of the barnstormers to a viable commercial entity spawning the rapid increase in air mail and airline operations with the commensurate demand for large numbers of highly trained aviation mechanics (Bilstein, 1994). With Charles Lindbergh's successful Trans-Atlantic crossing in 1927, the growth of aviation education began in earnest with a proliferation of training schools coming into being riding on the wave of interest and excitement.

The coming of the Second World War with its critical demand for highly skilled aviation personnel produced large numbers of aircraft mechanics. After the war, a groundswell of interest in aviation led to rapid growth in general aviation. In addition, the airlines enjoyed leaps forward in technology with the advent of the turbine engine in the 1950’s. Both of these events increased the demand for high quality certified Airframe and
Engine (A&E) mechanics. Many of these individuals had received their initial training in the military training programs of World War II while others were being trained and certified in the growing number of aviation technical training programs. These programs came into being either during the war as part of the War Training Act or later as a result of the education funding available through the G.I. Bill legislation (Bennett, 1996).

The past 25 years have been marked with significant advances in aviation technology including sophisticated avionics systems, automated flight capability, composite construction, and new generation propulsion systems. This progress places new demands on aviation maintenance technicians and upon the educational systems that train them.

As a result, the aviation industry has placed increasing emphasis on the value of the bachelor of science degree as a necessary educational requirement for aviation maintenance technicians. In the modern aviation maintenance environment, advanced mathematics, chemistry, communication skills and computer science are just a few of the educational areas that are necessary to maintain highly sophisticated aircraft to the level required to maximize safety and efficiency (U.S. Department of Labor, 2008).

Since aviation maintenance is a complex and multifaceted discipline with many stakeholders involved, one primary organizational entity came into being for the purpose of interfacing with the FAA on regulatory issues and exchanging ideas, best practices, and information with regard to the implementation of aviation maintenance training. This organization is the Aviation Technician Education Council (ATEC). ATEC was founded in 1961 to further the standing of FAA approved schools with education and industry, and to promote mutually beneficial reactions with all industry and government agencies.
The primary mission of the council is to be an advocate for aviation maintenance education programs with regard to curriculum, technology and financial support (ATEC mission, 2008). Because aviation maintenance education programs who are members of ATEC are dedicated to being at the cusp of developments and advances with regard to aviation maintenance education, the focus group of this study is collegiate aviation maintenance training programs that are ATEC member institutions.

Statement of Problem

Aviation maintenance education programs are unique compared to other, more traditional educational programs within the collegiate environment. The FAA has established the certification standards that must be met before an individual may be certified as an aviation mechanic with airframe and powerplant ratings (A&P). As the congressionally mandated governing body, the FAA is only concerned with the technical aspects of the aviation maintenance education program and the standards to which a student must achieve in each technical subject area and, therefore, it provides no guidance or mandates with regard to specific degree requirements (14CFR part 147).

There are practices within the industry that over time become standards that reflect the current characteristics that an employer wants to find in the successful employee and as such, there is a general requirement for a bachelor's degree for employment as an aircraft mechanic. This is especially true within airline operations, corporate aviation departments, and certified repair stations where a high level of capability and the expectation of upward mobility into areas of greater responsibility are the norm.
The lack of an overarching degree protocol allows the collegiate aviation maintenance education program to structure itself and operate as it desires with regard to the actual technical education being conducted predicated upon compliance with the applicable sections of the code of federal regulations as a general baseline.

As a result of this practice within aviation maintenance education programs, there is wide disparity across the spectrum and little if any standardization with regard to administrative organization, management structure, program infrastructure and curriculum/operations. Even though this issue has been the subject of studies within the realm of flight education and pilot training programs with “University Related Flight Training Programs in Region VI of the National Intercollegiate Flying Association” (Mangrum, 2003) as a typical example, there has been very little research conducted in the aviation technical education arena. In addition, there is little data available that defines the leading characteristics of collegiate aviation maintenance education programs that would shed light on current practices and defining characteristics of these important educational programs. Critical questions needed to be answered with regard to how these programs are structured, funded, embedded within the college/university system, how their curriculum is derived, and compliance with the FAA protocols.
Purpose of the Study

The purpose of this study was to assimilate data from the 11 institutions within the United States that are members of the Aviation Technician Education Council (ATEC). These institutions provide aviation maintenance education leading to FAA certification and confer bachelor’s degrees. Therefore a key objective was to gain insight into how these programs are configured and how they conduct their operations as a means of providing a data baseline outlining leading characteristics of and the differences among these institutions. The results constitute a resource that aids in decision making, policy development and in programmatic implementation. In addition, recommendations were made with regard to the findings that are useful to educators, administrators and the FAA to inform overall improvement in aviation technical education.

Four areas of investigation were identified with regard to collegiate aviation technical education programs. These areas are: 1) administrative organization, 2) management structure, 3) program infrastructure, and 4) curriculum/operations. These areas were selected because they created a structural framework that leads the study in such a way that all organic facets of collegiate aviation technical education are systematically investigated by the completion of the study. As the data were assimilated they comprised a comprehensive descriptive whole. The administrative organization area investigated how the programs are connected to upper administration, and how those administrative linkages are configured and defined. This is important as there is presently a movement within education to redefine the role of the applied sciences and the design of these programs is at the forefront of the issue (de Vries, 2006). In addition, with the industry standard trending toward the bachelor of science degree for aviation mechanics,
many aviation education programs at the certificate and the two-year levels are moving to
develop bachelors degree oriented programs. It is important that this area be investigated
in that administrative organization is a critical component of a bachelor’s level program.
Also, investigation of this important area may provide useful insight for other disciplines
with similar challenges related to program placement, administrative organization and
curricular content that could assist in facilitating programmatic standardization and
quality. The emerging field of geographic information system technology (GIS) is an
example of an educational area that is dealing with similar issues (Wikle, & Finchum,
2003).

The management structure area is related to the previous area in that the
administrative organization area investigated the human factors element related to
external programmatic relationships; the management structure area investigated the
human factors element related to internal systemic relationships. These two areas form a
personnel related analysis of collegiate aviation technical education and in that sense are
vitally important to the study in that they shed light on the organizational structure of
collegiate programs which is an area with certain levels of variation and lack of
standardization (Pusser, & Loss, 2009).

Program infrastructure is related to the actual facilities, equipment, aircraft and
technology utilized in collegiate aviation technical education. This area was important to
the study in that its analysis provided a thorough understanding of where the programs
are physically located, what is being used to transfer information, and what level of
technology is available to the student. The area is important as the literature indicates a
definite gap in what is being addressed in the educational environment and what is needed within industry (Hawkins, 2006).

Finally, the area of curriculum and operational practices rounded out the research effort. Curricular content and design is vitally important to technical education (Thom, & Thom, 2006) and is a unique challenge for collegiate aviation technical education in that it must comply with FAA regulatory requirements and satisfy departmental and institutional protocol. This makes aviation technical education somewhat unique with regard to other types of technical educational programs (Goldsby, & Soulis, 2002).

These four areas form the basis of the four research questions investigated in this study. Each of the questions is further underpinned by a series of related questions designed to inform each initial research question. A data collection instrument was constructed to probe these areas. Information gathered from this research study determined:

Research Question #1

What is the administrative organization of collegiate aviation maintenance education? See Table 1.
### TABLE 1. QUESTIONS THAT INFORM RESEARCH QUESTION #1

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### Research Question #2

*What is the management structure of collegiate aviation maintenance education?*

See Table 2.

### TABLE 2. QUESTIONS THAT INFORM RESEARCH QUESTION #2

<table>
<thead>
<tr>
<th>Research Question: “What is the management structure of collegiate aviation maintenance education?”</th>
<th>Is there a doctoral requirement/research agenda for faculty?</th>
<th>Are there industry training/recurrent training opportunities for faculty?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the personnel classification terminology?</td>
<td>What are the educational requirements for non tenure-track faculty?</td>
<td></td>
</tr>
<tr>
<td>What are the educational requirements for tenure-track faculty?</td>
<td>What is the makeup of the aviation maintenance education faculty?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Are there graduate assistants in aviation maintenance education programs?</td>
<td></td>
</tr>
</tbody>
</table>

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Research Question #3

*What is the program infrastructure in collegiate aviation maintenance education programs?* See Table 3.

### TABLE 3. QUESTIONS THAT INFORM RESEARCH QUESTION #3

<table>
<thead>
<tr>
<th>Research Question: “What is the program infrastructure in collegiate aviation maintenance education programs?”</th>
<th>What facilities are used for aviation maintenance education?</th>
<th>What is the personnel salary budget source?</th>
<th>What is the procedure for procurement and support of training equipment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the status of facilities possession?</td>
<td>How are budgetary short-fails addressed?</td>
<td>Are there both day and night programs?</td>
<td></td>
</tr>
<tr>
<td>What is the nature of student tuition billing?</td>
<td></td>
<td>What are the weekly contact hours for faculty?</td>
<td></td>
</tr>
</tbody>
</table>

Research Question #4

*What are the curriculum/operational practices of collegiate aviation maintenance education?* See Table 4.
TABLE 4. QUESTIONS THAT INFORM RESEARCH QUESTION #4

<table>
<thead>
<tr>
<th>Research Question: “What are the curriculum/operational practices of collegiate aviation maintenance education programs?”</th>
<th>What is the source of FAA approved curriculum?</th>
<th>How are the math/physics requirements complied with?</th>
<th>What are the sources of training aircraft/equipment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the age of aviation maintenance training program?</td>
<td>What is the place of airworthy aircraft?</td>
<td>What is the level of integration of new technology?</td>
<td></td>
</tr>
<tr>
<td>How many training hours are in the approved curriculum?</td>
<td>What are the enrollment trends?</td>
<td>What is the FAA certification process?</td>
<td></td>
</tr>
<tr>
<td>How are the required records maintained?</td>
<td>What types of training aircraft are used?</td>
<td>What are the employment/salary trends for graduates?</td>
<td></td>
</tr>
</tbody>
</table>

Objectives of Study

The objective of this study was to produce a data baseline that provides salient information that can be used by administrators and policy makers as a resource to increase understanding of the discipline on the part of administrators and decision makers and enhance the quality of aviation technical education overall. It allows those entities to determine current conditions within the discipline and identify the procedures that are being implemented across the collegiate aviation maintenance training spectrum. This data baseline also serves to illustrate how various challenges are being addressed by individual institutions. In addition, the data were analyzed and recommendations were made with regard to the practices and conditions indicated.
To accomplish the purposes of this study, the data were gathered from the collegiate aviation maintenance education programs that offer bachelor of science degrees and who are member institutions of the Aviation Technician Education Council. The data were transferred from the questionnaires, assimilated, and presented in a graphic presentation that aids in reference and analysis. Based upon the indications, conclusions were derived and recommendations were made.

Definition of Terms

Aviation Technician Education Council (ATEC) - An organization that is made up of FAA certified aviation maintenance training programs that exists to develop and enhance aviation maintenance training and to build the bridge between education, FAA and the aviation industry.

Certificate - The document of authority issued by the Federal Aviation Administration that confers the privileges and limitations of an aircraft mechanic. The requirements for certification as an aircraft mechanic are outlined in 14CFR part 65 of the Code of Federal Regulations.

Code of Federal Regulations Section 14 (14CFR) - That part of the United States Federal codified law that applies to U.S. aviation and is administered and applied by the Federal Aviation Administration.

Collegiate Aviation Maintenance Education Program - An FAA certified aviation maintenance education program that is imbedded within the organizational structure of an institution of higher learning that engages in the training required for FAA certification as
an Aviation Mechanic and one that confers the bachelor of science degree to its graduates.

**Federal Aviation Administration (FAA)** - The regulatory body charged by the United States Congress to oversee, regulate and administer aviation in the U.S.

**General Aviation (GA)** - That aspect of the aviation industry that is comprised of all aviation operations except air transport and military.

**Live Work** - The use of an actively used airworthy aircraft in the training environment as a training platform. Aviation maintenance students gain experience by performing maintenance related procedures under the direction and supervision of the faculty member who then returns the aircraft to service by making the appropriate logbook entries.

**Proprietary Training Facility** - An FAA certified aviation maintenance training program that is not affiliated with an institution of higher learning, is a for-profit endeavor, and does not confer a bachelor of science degree to its graduates.

**Rating** - An additional document of authority that confers additional privileges and limitations to an existing FAA Aviation Mechanic certificate. The two ratings that may be added to an FAA Mechanic Certificate are 1) Airframe and 2) Powerplant.


**14CFR Part 147** - That section of the Code of Federal Regulations that establishes the certification and operation of an aviation maintenance training program.
Scope and Limitations of Study

This study is focused on collegiate aviation technical programs that offer FAA certified aviation maintenance education leading to FAA certification and a bachelor of science degree that are members of the Aviation Technician Education Council (ATEC). There are currently 11 collegiate aviation maintenance training programs that meet these criteria.

The data gathering instrument was a questionnaire that requested program specific information about each institution that met the aforementioned criteria. The questionnaire was designed to provide information in four categories that inform each of the four research questions. The questionnaire was delivered electronically to the administrator of the aviation technical education program associated with the identified institutions. The results of the questionnaire were compiled and presented in a graphic form in such a way as to comprise a baseline data source that is a resource tool that can be referred to by administrators, stakeholders and policy implementers to assist in gaining insight, making decisions and developing policy that will enhance standardization and efficiency within the collegiate aviation environment. The data also formed the basis for recommendations that were made.

There are certain limitations that exist with regard to this research effort. The study is limited to collegiate aviation maintenance education programs and, therefore, does not gather data from proprietary schools or from training programs that exist at the vocational-technical school or the associate of science degree level. In addition, the data gathered were limited to that which can be gathered with a questionnaire. The structure
of the questionnaire only addressed the four areas of administrative organization, management structure, program infrastructure and curriculum/operations.

**Significance of Study**

This study represents a research effort into an area that has not been extensively investigated. While pilot training programs have been researched at length, research related to aviation technical education has heretofore remained limited. Because the FAA is the only over-arching regulatory body for aviation maintenance training programs, these programs have developed their own policies and procedures with regard to administrative organization, management structure, programmatic infrastructure and curriculum/operations. Since aviation is a dynamic technology that is resource intensive, efficiency and best practices are paramount. This study is designed to provide administrators, stake-holders and policy makers with a tool that will enable them to evaluate their programs, seek plausible solutions to operational challenges, and make effective use of the experience base and solutions derived by other institutions that have solved similar problems or addressed similar issues. Therefore, this study creates a baseline data source that can be used as an informational tool and a management resource that will be useful in decision making that can lead to the best possible practices being implemented. The results of this study also allowed for the formation of recommendations applicable to each of the four areas of inquiry that are potentially valuable to aviation technical education, government and industry stakeholders.
Organization of Study

This study was constructed to address four research questions related to collegiate aviation technical education programs for the purpose of establishing a data baseline that will identify current characteristics and points of commonality with regard to administrative organization, management structure, program infrastructure and curriculum/operations as related to collegiate aviation maintenance training programs. Data were gathered through a questionnaire delivered electronically to the program administrators of collegiate aviation maintenance programs that confer the bachelor of science degree and who are members of the Aviation Technician Education Council.

Following the preliminary components of Chapter I, Chapter II is comprised of a literature review, the purpose of which is to build a background basis of information that informs the research questions.

To better understand the nature of aviation maintenance and aviation maintenance education in particular, the literature review will begin with a look at the history of the aviation mechanic beginning with the person of Charles Taylor whose mechanical talents were indispensable to the Wright brothers. It will then touch on the milestones in aviation history that defined the transitional points in aviation maintenance training, such as the Air Mail Act of 1925, the Air Commerce Act of 1926 and the rise of collegiate aviation maintenance education programs through the World War II era and into the modern era.

A section of the literature review will address the development of organized post-secondary aviation technical education and the salient legislative actions that informed it followed by a review of the federal regulations applicable to aviation maintenance education and certification. An overview of the overall educational process for the
aviation mechanic is included so a basis for the four research question areas may be established. Challenges facing collegiate aviation technical education will be addressed in that they critically affect the future of the discipline. The last section of the chapter will discuss the Aviation Technician Education Council (ATEC) because of the important role it plays with regard to educational enhancement, interfacing with government, relationship building with industry, and the support it provides by encouraging scholarly endeavor within the area of aviation technical education.

Chapter III examines the procedures and methodology employed to collect and analyze the data. Chapter IV addresses the statistical presentation of the data, describes the results of the data as gathered and makes a final summary with regard to the data. Chapter V presents the conclusions and recommendations based on the research with a summary of the study included as well.
CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

This chapter provides an overview of a broad array of publications that comprise a source of background information with regard to collegiate aviation maintenance training programs in the United States. The review is made up of an in-depth look at: 1) the aviation maintenance technician, 2) the development of aviation technical education programs, 3) FAA and the certification requirements of an aviation maintenance education program, 4) aviation maintenance technician educational experience, 5) challenges facing aviation maintenance education and 6) the Aviation Technician Education Council (ATEC). This literature review is designed to provide insight and useful background with regard to the research questions.

The Early Aircraft Mechanic

To look historically at the aviation mechanic, one must begin with the advent of the airplane and its inventors, Orville and Wilber Wright. Their dedication to detailed research, their systematic approach to problem-solving, and their superb engineering
culminated in the first successful flight of a heavier-than-air flying machine on the dunes of Kitty Hawk, North Carolina on December 17, 1903 (Anderson, 1985). Orville and Wilbur were unique individuals in that their dreams of flying were augmented with a rare engineering acumen and natural mechanical talent that gave them the ability to build and fly the first successful heavier-than-air flying machine. Anderson asserts that “they were the premier aeronautical engineers of history” (Anderson, 1985, p. 24). They possessed a highly developed mechanical ability that facilitated the building of a variety of machines of their own design including a printing press and ultimately an improved bicycle design. It was this area that proved financially profitable for them and provided the resources that allowed them to fund their later work in aeronautics (Anderson, 1985).

The place of the Wright brothers in history is secure, but, in reality, there was a third member of this team that for many years remained largely unknown. That person was Charles Taylor. Taylor, a machinist who started working with the Wright brothers in 1901, is responsible for designing and constructing many aviation “firsts” while working for the Wrights. He built the wind tunnel that was so critical to the Wright’s research that led to the breakthrough 1902 glider (Taylor, 2009). He ultimately is the one who designed and built the first successful aircraft engine. Later, after the airplane began to be a common sight in the skies over Huffman Prairie on the outskirts of Dayton, Ohio, he became the first aircraft mechanic as his primary area of responsibility centered on maintaining Wright aircraft.

In a 1948 interview Taylor stated, “The Wrights refused to teach me to fly and actually discouraged the idea. They said they needed me in the shop and to service their
machines” (Taylor, 2009, p. 19). Later, he was retained by Calbraith Rogers to maintain his Wright aircraft as he attempted the first transcontinental flight in 1911. The flight was eventually successful with Rogers flying from Sheepshead Bay, New York on September, 17 1911 and almost 3 months later landing at Long Beach, California. During the flight, Rogers crashed 16 times and the aircraft was repaired so many times that when it arrived at Long Beach, only the rudder, engine oil pan and a single strut remained of the airplane that actually departed from Sheepshead Bay, a true testament to Taylor’s ability to keep the airplane flying (Taylor, 2009). Although Taylor remained unacknowledged for his contributions to aviation until the mid-1950s, his contributions to aviation are now recognized and honored by the FAA through the Charles Taylor Master Mechanic Award that is presented each year to an individual who has served as a certified aircraft mechanic for 50 years (Federal Aviation Administration, 2004).

A contemporary of the Wrights and Taylor that must be included in any history of the aircraft mechanic is Glen Curtiss. He was born in Hammondsport, New York in 1878, and his interests were in many ways parallel to those of the Wrights. He was drawn to technical/mechanical endeavors, working as a young man as a technician at the Eastman Dry Plate and Film Company a firm that would later become Kodak (Anderson, 1985). Later, he took over a bicycle shop and became a leading bicycle racing champion. Eventually as his passion for speed increased, he attached an engine to a bicycle frame and became the inventor of the first functional motorcycle (Anderson, 1985). Soon Curtiss was operating his own motorcycle factory and was producing engines with the highest power to weight ratios then in existence (Anderson, 1985). Eventually, time and
circumstance would lead Curtiss into the budding world of aviation where he quickly began to make his mark.

His first endeavor in aviation came when he produced engines for the Baldwin powered balloon (a dirigible) and was retained by Baldwin to maintain the engines. Later, at a fair where the Baldwin powered balloon was to perform, he met the Wrights for the first time. This led to a relationship with the Wrights and information and training he gained from them led to a competing and contentious relationship with the Wrights that led them in and out of court for many years. The upshot is that Curtiss formed an airplane production company that produced the June Bug and later amphibious designs and this competition with the Wrights spurred on improved designs as both vied for government as well as private customers (Anderson, 1985).

Orville and Wilbur Wright, Charles Taylor and Glen Curtiss were trail blazers in aviation and essential to their success was their mechanical ability not only to build machines that could fly but to develop the technical skills that were necessary to inspect, repair, overhaul and maintain the machines once they became commonplace (Anderson, 1985).

The Aviation Mechanic 1914-1918

By 1910, the Wrights had established a flying school to train pilots who purchased their aircraft and shortly thereafter Glen Curtiss followed suit with a school of his own. These schools emphasized pilot training but maintenance of the airplanes beyond basic repairs seems to have been overlooked. This would soon change. Events on the continent of Europe would steer the World towards war and the nature of that war
would cause a demand for airplanes, pilots and mechanics on a significant scale. The air services of the world, in general, were unprepared for global war. When the United States declared war on Germany in April of 1917, the entire aviation service of the Army consisted of 96 rated officers and two flying schools. There were no schools for mechanics at that time (Ashcroft, 2005). In May of 1917, the Premier of France Alexandre F. Ribot, cabled President Woodrow Wilson requesting that the United States commit to sending 5,000 pilots and 53,000 mechanics to Europe to support the Allied war effort. Wilson and the U.S. Department of War adopted the Ribot request as its basis for the Air Service Training Program. As a result, Congress appropriated $640,000,000.00 for “aeronautics.” By the end of the war in 1918, there were 28 aircraft mechanic schools established that produced 14,176 mechanics with an additional 22,059 being trained in Great Britain (United States Museum, 2009).

At the end of the war, the airplane had gained acceptance as a tool far beyond the novelty status that had informed the mindset of many before the war when the capability of the machine was limited and the possibilities for it had not been fully explored. If nothing else, World War I had the effect of propelling aeronautical technology forward. At the beginning of the war in 1914, aircraft were fragile, unreliable craft used for scouting and courier duties with speeds of 65-85 miles per hour. By the end of the war in 1918 fighter and bomber aircraft were commonplace and their reliability and capability had radically increased with speeds ranging from 120-145 miles per hour. New developments in powerplant technology such as the carburetor, supercharging and sparkplug ignition coupled with airframe technologies such as braking systems, oxygen systems and the advent of airborne communication radio required the aviation mechanic
to possess increased technical skills and analytical ability that put them on the cutting edge of applied science in that day (Millbrooke, 2000).

The Interwar Period

The early interwar period (1919-1927) was a time of increased aviation awareness across the United States. Although the United States was a late entrant into World War I, over 10,000 trained pilots reentered civilian life. After the war ended in 1918, many of them looked for ways to continue a career that involved airplanes in spite of the military policy of downsizing to pre-war levels. The limited opportunities for military flying careers coupled with the large number of surplus training aircraft available for relatively low prices led to a new era in aviation history: the age of the Barnstormer. (U.S. Centennial of Flight, 2003). This era represented the first civil aviation in the United States and was the basis for what is referred to in current terminology as General Aviation.

During the war, thousands of Curtiss JN-4 training aircraft were produced. At the end of the war, they were available as surplus property, usually for as little as $200.00 each. Many ex-service personnel who had received their primary training in these aircraft purchased them and then grappled with how to make a living with them. Large numbers of trained pilots, large numbers of low priced surplus aircraft, and no regulation of any type allowed the barnstormer to flourish during this period of time (O’Neal, 1981).

Barnstormers wandered across the country in search of a crowd of onlookers willing to pay to see aerial stunts or an airplane ride. For many people, the barnstormers were their first look at an airplane and their first introduction to aviation. An airplane
landing in a farmer’s field was a holiday event. Small towns would close up shop and the local population would gather to watch a pilot perform spins, loops and rolls. Sometimes barnstormers would tour in groups or “flying circuses” with specialty acts involving parachute jumps, wing walking, aerial transfers and “death dives.” The bravest of the locals would pay for a short airplane ride (O’Neal, 1981).

It was a difficult, nomadic life with the pilot being mechanic as well, with repairs and maintenance being undertaken with whatever materials happened to be on hand. The nature of aviation maintenance during this period may be best described by author Paul O’Neal: “He contrived to doctor a misfiring engine or to patch a fuselage with spare fabric and pieces of packing crate” (O’Neal, 1981, p. 29). There were no safety regulations in existence with mishaps and accidents being commonplace. By the second half of the 1920’s, the first wave of barnstormers, “the military trained fliers.” had been thinned out. They had been killed or sought out more stable vocations. The most capable fliers had settled down to regular flying jobs or established a fixed base of operations (FBO) to offer aircraft charter and flight instruction (O’Neal, 1981). With aviation related businesses coming into being and the advent of the fixed base operator, the need for qualified aircraft mechanics increased. This was a time of transition for aviation and the aviation mechanic in particular.

The Aircraft Mechanic-Regulation

Two pivotal events that would reshape the face of aviation were the passage of the Kelly Airmail Act of 1925, and the passage of the Air Commerce Act of 1926. These acts provided the stability to the industry that would foster investment and development and
give impetus to the rise of scheduled airline operations and facilitated the growth of private or general aviation (Millbrooke, 2000).

Even though the carriage of the mail was initiated by the government in 1918, there was minimal government involvement during this period. Only the U.S. Post Office had been given any authority to foster or develop aviation as an industry (Jackson, 1982). By the mid-1920’s, the carriage of the mail by aircraft had grown to the place where development and expansion was needed. At that time, the Post Master General lobbied Congress for funding and increased authority in aviation related matters. In 1925, Congress passed the Air Mail Act, commonly referred to as the Kelly Air Mail Act in reference to the bill’s sponsor Sen. Clyde Kelly of Pennsylvania. The passage of the bill is significant to the aviation mechanic in that it gave the Post Master General a wide range of authority to enter into contracts with private persons or companies for the carriage of mail by air (Allen, 1986). News quickly spread across the aviation community that the Act allowed for 80 percent of the revenue for mail carriage to be paid to the individual or company. As a result, the post office was inundated with thousands of bids. As contracts were awarded and companies purchased aircraft and hired pilots, the demand for qualified aircraft mechanics grew as well. This Act was, in effect, the beginning of commercial aviation in the United States and was the impetus behind the growth of the airline and commercial aviation industry that exists in the country today. American Airlines, Northwest Airlines and United Airlines, are examples of legacy carriers today that can trace their roots back to the Kelly Air Mail Act of 1925 (Jackson, 1982).
The new air mail contract carriers began looking for sources of business capital to expand but found investors to be few and banks were skeptical of the odds of return on their investment. The public viewed flying as inherently unsafe and those involved in the industry to be little more than gypsies with a death wish. Barnstorming, a spate of accidents, and the lack of regulation at any level helped inform that mindset. The rapid growth of air commerce created by the Air Mail Act of 1925, coupled with the industry’s call for regulatory structure to placate the fears of potential investors along with the desire to improve the safety of aviation overall, caused the Department of Commerce to request the formation of a congressional joint committee on aviation. On May 20, 1926, President Calvin Coolidge signed the Air Commerce Act into law (U.S. Centennial of Flight, 2003).

For the first time there was a federal requirement for certification within the rapidly growing aviation industry. The need for structured training required by the rapid expansion of the aviation industry in response to the Air Mail Act of 1925 and the new federal licensing requirements of the Air Commerce Act of 1926 provided the impetus for the creation of aviation training schools that developed both pilot training programs, and aviation mechanic training programs. Although several schools came into being at this time, they were proprietary in nature and at this point in history were not degree conferring institutions (Mangrum, 2003).

Several events from the late 1920’s to the outbreak of World War II facilitated a period of vast growth in the aviation industry. The Lindbergh Trans-Atlantic flight of 1927 enthralled the public and created an entire generation of people who embraced a mobility and modernism embodied in aviation (Millbrooke, 2000). The development of
gyroscopic instrumentation and radio communications and navigation gave aircraft the ability to fly in inclement weather and made scheduled airline operations a reality (Heppenheimer, 2001). The advent of the all-metal cabin class aircraft with reliable radial engines, constant speed propellers, retractable landing gear, anti-ice equipment and auto-flight capability was embodied in the Douglas DC-3 aircraft which made its debut in 1934 (Heppenheimer, 2001). In spite of the economic depression of the 1930’s, aviation grew with an increase in manufacturers, airlines and private or general aviation. With this growth came an increasing demand for certified aviation mechanics who were knowledgeable in the complex construction and systems of modern aircraft.

By the outbreak of World War II, airplanes were flying in scheduled airline service around the World. Radio communications and navigation technology was commonplace. The rise of private aviation had spread across the United States and the aircraft mechanic was firmly established as a vital part of the equation and their critical place on the leading edge of aviation safety was clearly recognized (Lederer, 1941).

The Aircraft Mechanic-Post World War II

At the end of World War II, there were two pivotal events that had a great effect on the aviation maintenance technician. The first was the rapid growth of the airline industry in the late 1940’s, and the second was the rapid rise of private or general aviation in the late 1950’s (Bilstein, 1994). Both of these realities created a large demand for qualified and capable aircraft mechanics.

Today the airlines employ thousands of aviation maintenance technicians and rely heavily upon their skills and ability to maintain some of the most sophisticated aircraft in
the world. In the airline industry, aviation maintenance technicians typically specialize in a particular area of aviation maintenance and support, such as composite structures, avionics, powerplant overhaul, non-destructive testing and inspection. The need for qualified aviation maintenance technicians is projected to increase over the next 10 years (U.S. Department of Labor, 2010).

In addition to the airlines, the strong general aviation facet of the aviation industry is an employer of thousands of aviation maintenance technicians. They may be employed by FAA certified repair stations that are specialized in particular technical areas such as powerplant overhaul, component overhaul, retrofit, avionics repair/upgrade and structures. Also, they make up a large portion of the workforce with aircraft manufacturers or are employed within the flight departments of corporate entities that support in-house aviation operations, in many cases employed as pilot-mechanics. In addition, they provide the maintenance, support and inspection operation for hundreds of fixed based operators that offer these safety critical services to thousands of aircraft owners and operators.

In 2008 there were over 140,000 employed aviation maintenance technicians in positions across the aviation industry. The demand for qualified aviation maintenance technicians is expected to increase by 7% over the next 10 years. In addition, with the rapid advances currently experience in aviation technology, there is increasing demand within the industry for these individuals to be college graduates (U.S. Department of Labor, 2010).
Organized Aviation Maintenance Education

The development of modern aviation maintenance training was a result of the Air Commerce Act of 1926. This Act of May 20, 1926 was passed at the urging of the aviation industry and associated stakeholders in an effort to improve and maintain safety standards. At this point in history, the Department of Commerce was charged with aviation regulation and an Aeronautics Branch was created. Under the auspices of this act, pilots, aircraft, mechanics and aircraft were required to be federally certificated. With regard to the aviation mechanic, the Aeronautics Branch was tasked with developing and implementing the certification standards that potential aviation mechanics had to meet as well as codifying the regulations that would control the certification process. In addition, the Aeronautics Branch was required to establish the performance standards that had to be met by the aviation mechanic with regard to procedures, compliance and safety (The FAA-a historical perspective, 2009).

Before the Air Commerce Act of 1926, there was no real structure to aviation maintenance training. Although both the Wrights and Glen Curtiss had established flying schools by 1911, the maintenance aspect was relegated to training the pilots to maintain their own aircraft in the field by whatever means at hand. Men like Charles Taylor and Charles Furnas, both associated with the Wrights had built reputations as being master aircraft mechanics and were highly sought for their expertise (Kelly, 1989).

With the start of World War I, the participants in the war developed large air forces that relied heavily upon the skills of the aviation mechanic. Within the military, training became formalized and structured with many procedural protocols for aviation maintenance being developed at that time. In light of this, the pilots of the era were still
required to be well-versed with regard to engines, structures and maintenance and, in essence, were the maintenance supervisors for their particular aircraft. It is notable that several of the most famous pilots of the era were those with advanced understanding and experience with aviation mechanics. In Great Britain, James McCudden and in the United States, Eddie Rickenbacker both had extensive maintenance backgrounds that they attributed to their operational success (Coonts, 1996).

During the inter-war period, formal aviation maintenance was a rarity. Within commercial aviation that was focused during that era primarily on the carriage of mail, the mechanics were, for the most part, individuals who had received military training during World War I. Among the barnstormers so prevalent during the era, there were no standards for safety and the repair and maintenance of their aircraft was sporadic and haphazard at best (Bilstein, 1994).

By the late 1920’s, commensurate with the advent of certification and the need for structured aviation maintenance training, schools began to offer aircraft mechanic courses. Parks College in St. Louis, MO became the first federally approved program in the United States when it was issued Air Agency Certificate #1 in 1927 (St. Louis University, 2009).

By 1934, the Aeronautical Branch of the Department of Commerce was restructured and renamed the Bureau of Air commerce. Certification standards for pilots and mechanics continued to develop and strengthen. Most aviation maintenance training schools in this era began solidifying their training curricula and moved into line with the federal standards as requirements for certification and testing became more clearly defined (The FAA-a historical perspective, 2009). The schools that began operations
during this time were proprietary in nature and were in business to capitalize on the surge in interest that began in the late 1920’s with the Lindbergh Trans-Atlantic flight and continued through the 1930’s with the developments in aviation technology and the growth of aviation as an industry and it’s integration into the society overall. Many of these schools are still in existence and some continue today as four-year degree granting institutions. Parks College of Engineering, Aviation and Technology located in St. Louis, Missouri is an example of this (St. Louis University, 2009).

Parks College was founded by Oliver Parks in 1927 in the wake of the Lindbergh flight. It was the first federally certified school of aviation. It began as a flight school and quickly expanded to offer aviation maintenance training. With the passage of time, it transitioned from a proprietary school into a College of Engineering, Aviation and Technology that is now part of the St. Louis University system (St. Louis University, 2010).

Embry-Riddle Aeronautical University in Daytona, FL which began operations in 1925 and Spartan College of Aeronautics in Tulsa, OK which began operations in 1928 have similar histories in that they began in the aviation surge of the late 1920’s as proprietary schools offering flight training, quickly expanded to aviation maintenance training and today have transitioned to accredited four-year degree conferring institutions (The Embry-Riddle story, 2010); (Spartan history, 2010).

In 1938 the Civil Aeronautics Act transferred federal civil aviation responsibilities from the Department of Commerce to a new independent agency called the Civil Aeronautics Authority (the forerunner of the current FAA). This Act made the CAA a stand-alone agency with increased levels of authority and the training/educational
requirements for the aviation mechanic were firmly established at that time. The certificate and rating system was established during this period with the maintenance certificate being called the “Aviation Mechanic Certificate” with the associated ratings being labeled “Airframe” and “Engine.” For the first time, the aviation mechanic was termed the “A&E” mechanic. Later, with the advent of the turbine engine the term “powerplant” would replace “engine” and the mechanic title would become the now familiar “A&P” (14CFR Part 65).

The War Training Act

In 1939, with the world political situation deteriorating rapidly, the United States government began exploring ways to prepare for potential war. As a result of this initiative, the Civilian Pilot Training Program (CPTP) came into being and it had a marked influence on collegiate aviation maintenance training for years thereafter (U.S. Centennial of Flight, 2003).

The Civilian Pilot Training Program came into being as a result of the Civilian Pilot Training Act of 1938. This Act developed a relationship between participating colleges and the government whereby aviation training would be delivered through the collegiate system and the cost associated with the training would be borne by the government. The rationale behind the program was based upon the idea that the participating college or university would provide the foundational educational concepts and the particular branch of the military the candidate went into would then have a student who possessed solid foundational skills that could then be effectively built upon.
with advanced training. This would take the burden off of the military training establishment and produce a base of highly qualified personnel from which to draw from.

Although the most visible aspect of the CPTP was the training of pilots, the training of aircraft mechanics was an important part of the Act as well. With the beginning of U.S. involvement in the war after December 1941, the program was renamed the War Training Service and it produced thousands of high quality pilots and mechanics that went directly from the college/university environment into military service. Hundreds of colleges and universities developed flight and maintenance training programs that filled a critical need in the war effort of the country. The program was curtailed in 1944 after victory was in sight and the military had built up its training capacity to meet demand. Even though the War Training Service ceased to exist at the end of World War II, the relationship between aviation educational programs and conventional higher educational institutions was firmly forged at that time (U.S. Centennial of Flight, 2003). Many of the collegiate aviation maintenance training programs in existence today can trace their beginnings back to this period.

The G.I. Bill

The relationship between aviation technical education and the collegiate environment was further strengthened at the close of World War II with the implementation of the Servicemen’s Readjustment Act of 1944, commonly known as the G.I. Bill of Rights. This Bill provided an array of assistive measures designed to help returning service personnel transition smoothly back into civilian life after years of war. Low interest home loans and job placement programs were designed to prevent the bonus
army revolt of the 1930’s or the economic downturn that is commonplace as a country moves from a war economic footing to a peacetime economy (Bennett, 1996).

In addition to economic incentives for returning service personnel, funding for education was provided. A serviceman who had served more than 180 days and was honorably discharged could have a degree program paid for including certain types of technical education that included flight and maintenance training. This was a watershed event for education as thousands of veterans flooded into the nation’s colleges and universities. In response to demand, these institutions expanded existing aviation programs and, in some cases, developed aviation programs where none had existed previously (Bennett, 1996).

With federal funding for technical education, flight and aviation maintenance in particular, educational institutions embraced aviation and developed extensive program capability to handle the onrush of students. The Korean War, just five years after the end of World War II and a generation later, the Viet Nam War, gave ongoing impetus to aviation maintenance education with the flow of federally funded students into the associated colleges and universities. The G.I. Bill exists to this day and is currently administered through the Veterans’ Administration. It has evolved through the years to better serve today’s veterans and continues to be an important source of funding for collegiate aviation maintenance training programs (Bennett, 1996).

The Federal Aviation Act of 1958

In the late 1950’s the transition of air transport category aircraft from large piston engines to gas turbine powerplants radically changed the industry. With that change came
new challenges with regard to maintenance, certification standards and safety. As the result of a spate of accidents, Congress urged passage of the Federal Aviation Act of 1958. The legislation transferred the function of the Civil Aeronautics Authority to the newly formed Federal Aviation Agency (FAA). This agency was given much broader authority to address aviation hazards and emphasized regulatory expansion. Under the new directives of the Federal Aviation Agency, the regulations addressing aviation maintenance and the certification standards for the training and certification of aviation mechanics were expanded and solidified. The old regulations referred to as CAR’s (Civil Aviation Regulations) were restructured and renamed FAR’s (Federal Aviation Regulations); (U.S. Centennial of Flight, 2003).

In 1965, the current administrator of the Federal Aviation Agency, Najeeb Halaby, proposed to the Lyndon Johnson Administration that a Department of Transportation be created as a cabinet position and that the Federal Aviation Agency be folded into that Department. This proposal was enacted and the Department of Transportation came into being on April 11, 1967. At that time, the Federal Aviation Agency became the Federal Aviation Administration and the associated regulations related to the certification standards and the function of the aviation mechanic took the form that they are in to this day (U.S. Centennial of Flight, 2003). At this time, the federal aviation regulations were added into the larger body of federal code and technically became the Code of Federal Regulations Section 14 and are accurately referred to today as “14 CFR” (Federal Aviation Administration, 2009).

The regulations specifying the certification of aviation maintenance training programs became 14CFR part 147 Aviation Maintenance Training Schools and the
certification standards for aviation mechanics became 14CFR part 65 Subpart B Certification: Airmen Other Than Flight Crewmembers-Mechanics (14CFR part 147); (14CFR part 65).

Certification-Aviation Mechanic Schools

An aviation maintenance technician school is required to be certified by the FAA regardless of their overarching configuration-proprietary school, two-year vocational program or four year college/university institution. The FAA certifies an aviation maintenance technician school with regard to five areas. These areas are: 1) facilities/space, 2) instructional equipment, 3) materials/special tooling/equipment, 4) instructional curriculum, and 5) instructor requirements (14CFR part 147).

Special emphasis is placed upon the curriculum and a minimum standard must be met with regard to content and instructional hours. The curriculum is certified separately and is broken down into three areas: 1) general section, 2) airframe section, and 3) powerplant section. The general section is the foundation upon which the airframe and the powerplant sections are built. It must be a minimum of 400 hours of instruction in length with a requirement that the hour requirement be divided between classroom and shop time. The airframe section is focused on structures and systems not related to propulsion and it must be comprised of a minimum of 750 hours divided between classroom and shop time. The powerplant section is related to propulsion and related systems and it must be comprised of a minimum of 750 hours divided between classroom and shop time. The minimum instruction time requirement for an approved curriculum is 1,900 hours (14CFR part 147).
For the collegiate aviation maintenance training program, meeting the FAA requirements and those academic requirements established by the institution and keeping the entire program within the four year format poses a challenge. The traditional Monday, Wednesday, Friday or Tuesday, Thursday format common to colleges or universities further exacerbates the problem. In most cases collegiate aviation maintenance programs have had to develop creative solutions to these programmatic issues.

The logistics involved in melding the FAA requirements with the collegiate environment the situation is further complicated in that the FAA requires each student to meet the instructional time requirements of 14CFR part 147. Accurate records of student attendance are required to reflect student participation down to the tenth of the minute. This must be further broken down into classroom time and laboratory time. All time missed by the student must be made up and documented in accordance with 14CFR part 147.33.

In addition to the basic requirements of the federal regulations, collegiate programs mandate mathematics and physics requirements that exceed the FAA established minimum. Also these programs have general education requirements and program specific requirements that must be met for graduation. A final factor that affects collegiate aviation maintenance training programs relates to the faculty. Faculty members in these programs must meet both the minimum certification requirements specified by the FAA and must also possess the degree/s and credentials required to hold faculty rank within the institution.
Certification-The Student Experience

The FAA mandates that all maintenance, preventive maintenance, rebuilding and alteration and inspection of certificated engines, airframes, propellers or components must be undertaken by an appropriately rated mechanic with few exceptions, such as the preventive maintenance allowed to be performed by a certificated pilot under 14CFR part 43 app. D and the annual inspection that requires the certificated mechanic to also possess the Inspection Authorization (IA) addressed in 14CFR part 65.91. It is this regulatory structure that makes the aviation mechanic with airframe and powerplant ratings (A&P) such a critical component within the aviation industrial infrastructure.

Certificated aircraft are required by federal law to be maintained by certificated and appropriately rated mechanics just as they are required to be operated by certificated and appropriately rated pilots.

The goal of collegiate aviation maintenance technical training is to achieve FAA certification as an airframe and powerplant (A&P) mechanic and earn a bachelor of science degree. To do this, all requirements stipulated under 14CFR part 65 Subpart D must be met. In addition, within the collegiate environment, the student must complete the general education requirements stipulated by the institution and the major requirements established by the department that are usually made up of core courses and the additional major specific courses required by the aviation maintenance major. These courses are usually advanced mathematics and physics and in some instances communications, business and/or management courses (Middle Tennessee State, 2010).

Aviation maintenance training is a building block process made up of classroom instruction and an associated shop or laboratory exercise. The student must meet the FAA
established standard on tests and exercises in the classroom portion and must successfully accomplish the required shop or lab projects to the standard specified by the FAA that is commensurate with the level of complexity placed upon that particular project. These levels of importance range from a “knowledge of general principles” of a process or concept to “performance of a high degree of practical application” (14CFR part 147).

The initial area of instruction is referred to as the general section in that it is common to both the airframe and the powerplant curriculum. Although it is rarely done in modern training, since the FAA views the airframe ratings and the powerplant ratings to be separate and free standing it would be possible for a mechanic to hold just the airframe rating or just the powerplant rating separately, therefore, the general section is so named because it provides basic concepts and operations that are common to both ratings (14CFR part 147). The general section is made up of several topical areas of study. See Table 5.

<table>
<thead>
<tr>
<th>Mechanic Privileges and Limitations</th>
<th>Ground Operations and Servicing</th>
<th>Cleaning and Corrosion Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance Publications</td>
<td>Maintenance Forms and Records</td>
<td>Materials and Processes</td>
</tr>
<tr>
<td>Weight and Balance</td>
<td>Physics</td>
<td>Mathematics</td>
</tr>
<tr>
<td>Basic Electricity</td>
<td></td>
<td>Aircraft Drawings</td>
</tr>
</tbody>
</table>

TABLE 5. TOPICAL AREAS OF INSTRUCTION IN THE GENERAL SECTION
The FAA requires 400 hours of instruction to be successfully completed and properly documented for the student before they are allowed to proceed. After successful completion of the general section, the students usually proceed to the powerplant section. This area is designed to provide the theoretical instruction and the practical application related to aircraft propulsion systems. The curriculum is divided into Powerplant Theory and Maintenance where piston engine and gas turbine (jet) related concepts are addressed, including the inspection requirements that are unique to each powerplant type and Powerplant Systems and Components, where related systemic concepts are addressed. See Table 6.

**TABLE 6. TOPICAL AREAS OF INSTRUCTION IN THE POWERPLANT SECTION**

<table>
<thead>
<tr>
<th>Powerplant Theory and Maintenance</th>
<th>Engine Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Turbine Engines</td>
<td>Aircraft Reciprocating Engines</td>
</tr>
<tr>
<td>Powerplant Systems and Components</td>
<td>Engine Fire Protection Systems</td>
</tr>
<tr>
<td>Engine Electrical Systems</td>
<td>Ignition and Starting Systems</td>
</tr>
<tr>
<td>Induction and Engine Airflow Systems</td>
<td>Engine Fuel Systems</td>
</tr>
<tr>
<td>Engine Fuel Systems</td>
<td>Engine Exhaust and Thrust Reverser Systems</td>
</tr>
<tr>
<td>Propellers</td>
<td>Auxiliary Power Units</td>
</tr>
<tr>
<td></td>
<td>Engine Exhaust and Thrust Reverser Systems</td>
</tr>
</tbody>
</table>
The FAA requires 750 hours of instruction to be completed and properly documented before the student is allowed to proceed. After successful completion of the powerplant section, the student will have met the federal requirements for testing and certification as an aviation mechanic with powerplant rating. Most collegiate programs facilitate the testing process at this stage and the students progress from this point holding the FAA mechanic certificate with powerplant rating. The student then proceeds to the airframe section. This section addresses the structural and systems related aspects of aviation maintenance. As such, it is divided into two sections; Airframe Structures and Airframe Systems and Components. See Table 7.

### TABLE 7. TOPICAL AREAS OF INSTRUCTION IN THE AIRFRAME SECTION

<table>
<thead>
<tr>
<th>Airframe Structures</th>
<th>Wood Structures</th>
<th>Sheet Metal and Non-Metallic Structures</th>
<th>Aircraft Covering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding</td>
<td></td>
<td>Assembly and Rigging</td>
<td>Airframe Inspection</td>
</tr>
<tr>
<td>Airframe System and Components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aircraft Landing Gear Systems</td>
<td>Aircraft Fuel Systems</td>
<td>Cabin Atmosphere Control Systems</td>
<td></td>
</tr>
<tr>
<td>Aircraft Instrument Systems</td>
<td>Communication and Navigation Systems</td>
<td>Fire Protection Systems</td>
<td></td>
</tr>
<tr>
<td>Aircraft Electrical Systems</td>
<td>Position and Warning Systems</td>
<td>Ice and Rain Control Systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydraulic and Pneumatic Power Systems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This section is the last component of the curriculum and is made up of the FAA required 750 hours of instruction to be properly completed and documented. Throughout the maintenance training process, the FAA approved curriculum must be complied with completely. In every subject area, each classroom exercise and all unit and final tests are components of the approved curriculum and they must be completed by the student and the grades must be entered into that student's training record before that student is allowed to proceed. In like manner, all shop/lab projects are a part of the approved curriculum for that subject area and they must be completed, graded and entered into the student record before the student is allowed to progress to the next subject area (14CFR part 147).

Certification Testing

When the aviation maintenance student has met the regulatory requirements for a certificate and rating/s, they are eligible for the certification testing process. Depending upon the particular nature of the operating certificate of the school, the student may be eligible for testing upon completion of the general section and either the airframe section or the powerplant section or they may be required to complete the entire program before a graduation certificate may be issued and then be tested for both the airframe and the powerplant ratings. Within the collegiate environment both approaches are commonly encountered with the testing for the remaining rating corresponding with the completion of the bachelor of science degree requirements of the institution shortly before graduation.

The mandate of the FAA stipulates that the administrator of the FAA determines that the applicant meets all certification standards and is responsible for issuing the
appropriate certification and rating/s. The FAA administrator accomplishes this responsibility by delegating individuals to represent the FAA in the testing and certification process. The person representing the administrator in the certification process for aviation mechanics is referred to as a technical personnel examiner (TPE) but is commonly referred to in the industry as a designated mechanic examiner. “DME” is the most common title for this individual. This person is designated through the Flight Standards District Office (FSDO) of a particular geographical region and the number of designated mechanic examiners within a region is based upon projected need in that area. In most collegiate aviation maintenance training programs, the individual/s who hold the examiners designation are associated to some extent with the program and are referred to as “affiliated DME’s” (14CFR part 183).

The testing process is made up of a computer based knowledge test and upon successful completion of that test, is followed by an oral and a practical examination administered by the DME. This test is administered by an FAA approved testing center and upon successful completion, a test report certificate is issued to the applicant that is valid for 24 calendar months and must be presented to the examiner when the oral and practical tests are taken.

The oral portion of the certification consists of questions and responses from the applicant that demonstrate that they possess a solid understanding of the concepts and processes related to the various subject areas involved. Each subject area must be passed before proceeding to the next and a failure in any area constitutes a failure of the entire test. Once the oral portion of the test is successfully passed, the applicant will be assigned a series of practical exercises that correspond to the various subject areas. Again, each
area must be successfully completed to the appropriate standard. A failure in any subject area is a failure of the test.

Since the practical portion of the test may consist of such activities as data research, inspection, repair procedures, maintenance process and fabrication, the testing process may take from two to four working days to complete. The test is not subjective in nature. It is the responsibility of the examiner to determine whether the applicant has performed the particular task to the standard specified in the practical test standard established by the FAA or not.

Upon successful completion of the testing process, the examiner is authorized by the FAA to issue the aviation mechanic certificate with the appropriate rating or ratings. This document is commonly referred to as the “temporary certificate” and is issued so the applicant may exercise the privileges of the certificate while the FAA processes the application file and issues the permanent certificate.

Challenges in Aviation Maintenance Education

There are two issues that currently present unique challenges within the field of collegiate aviation technical education. One is the debate within higher education regarding the inclusion of technical training within the academic environment. The second relates to a growing gap between the subject elements of the 14CFR part 147 that control approved curriculum design and the advancing levels of sophistication currently existing in the aviation industry.
Technical Education in the Post-Secondary Environment

The debate within academic circles regarding the inclusion of technical training programs within the academic environment is not a new development. This disparity of views can be traced as far back as ancient Greece. Both Plato and Aristotle wrote about learning as a concept and addressed “learning as a purely mental activity verses learning through physical, spiritual and mental activity” (Hansen, 2007, p. 86). Plato held that the mental aspect of life was more important than the physical. In contrast, Aristotle held that both were equally important (Hansen, 2007). These views were debated through the time of the enlightenment period and are addressed in the writings of Descartes, Pascal and Rousseau. By the mid-1700’s the argument related to the theoretical verses the application approach was firmly entrenched within the academic environment with emphasis being placed upon the theoretical approach. The view was that the purpose for higher education was the furtherance of scholarly pursuit; which in that day was embodied in education, law and religion (Thom, & Thom, 2006).

With the advent of the industrial revolution, the theoretical view was challenged and began to move in a more applications based direction. Rapid technological advances such as steam power, water/sewer systems, bridge and waterway advances and the rise of mass production created a need for individuals who could design and build (Kelly, & Kellam, 2009). This created the climate that elevated engineering to the level of “profession” and higher education responded with the creation of engineering degree programs. By 1918, the engineering degree had grown from civil and mechanical options to an overall technology related field with over 15 degree areas with technical specialties (Thom, & Thom, 2006).
Even though the effects of the industrial revolution moved technical education into the realm of higher education, resistance to its presence was still being brought to bear. Several educational reports during the early 20th century document the enduring controversy. The Mann report of 1918 which surveyed engineering/technical education held that the technical must be balanced with the theoretical but stressed the importance of the technical application in higher education. In contrast, the Wickendon report of 1929 stressed that the “role of education should be to open the mind, not train it” (Thom, & Thom, 2006, p. 26). This mindset informed the theoretical framework of engineering and technology related curriculum design in the interwar period (Kelly, & Kellam, 2009).

Renewed importance was placed on technical education with the approach of World War II. At that time, there was support at the federal level to increase emphasis on technical education in the move toward a war footing. As a result, the applications approach flourished in the academic environment during this period. Engineering education moved toward problem solving and practical application. Under the auspices of the Civilian Pilot Training Act of 1939, and later the G.I. Bill, technical education programs like aviation were integrated into the higher education environment (Bennett, 1996).

By the latter half of the 20th Century, the theory verses application debate heated up once more. During the late 1950’s there was a shift in educational thought with regard to engineering and the technologies. There was a decided shift in curricular content that emphasized pure science and the associated research approach. This shift brought with it the inclusion of humanities-related studies and emphasized the role of education as a socialistic construct (Kelly, & Kellam, 2009). This paradigm shift was most clearly
advocated in the Gritner Report of 1956 as it asserted that the primary function of the engineer was to expand theory (Thom, & Thom, 2006). At this point a perception shift resulted in researchers and scientists becoming highly esteemed in the public eye over those individuals who apply the knowledge. From this point in time, engineering education and technical education parted philosophical company and proceeded down divergent paths. For the remainder of the 20th Century, the Gritner report remained a significant resource with regard to program and curriculum development in higher education and it had a profound effect on the way technically focused collegiate programs have evolved (Thom, & Thom, 2006).

Over the past 15 years, there has been increasing pressure brought to bear on collegiate programs that are technology focused to move in a more theoretical direction. The source of the pressure is two-fold. It comes from the old debate surrounding the placement of applications-based education in the higher educational environment and from the changing economic framework that higher education operates within (Gearhart, 2003). As funding for higher education from state legislatures decreases in today’s economic climate, colleges and universities are under pressure to identify additional sources of revenue and to reduce costs. Funded research has taken on increased importance. In addition, the laboratory environment that is a critical component of technical education represents an expensive investment on the part of the institution. As a result, institutional leadership has put increasing emphasis on the attainment of the doctoral degree and the establishment of a research agenda for faculty while at the same time deemphasizing teaching (Thom, & Thom, 2006).
Technical education overall has responded to this influence in a variety of ways. Some programs have restructured their curricular philosophies and have worked within their disciplines to redefine the role of theory. Nursing as an educational program has done this successfully in that research and the importance of graduate-level study within the profession is now a recognized necessity with master’s and doctoral degree programs becoming common (Lenz, Andreoli, Gilliss, Edwardson, & Honig, 2004).

In other instances, programs that have historically been associated with a technology are being grouped together under an application-related branch of a preexisting engineering department or college. Oklahoma State University offers an example of this with its mechanical engineering technology degree option. In this case, programs within this area fall into three categories: 1) those that were associated with a vocational focus in the past, such as construction and electronics 2) those that were associated with a manufacturing application such as hydraulic/pneumatics and controls, computer aided design/manufacturing (CAD/CAM), and 3) those that are being implemented at the college/university level based upon industry related trends, such as fire protection and safety technology (Oklahoma state university-mechanical, 2010).

The re-association of technical education and engineering is a developing trend and one that is proving to be a beneficial for both entities. In recent years, a criticism of engineering programs has been that the engineering curriculum has focused so heavily on the theory side of the process that new engineers lack the application skills demanded in the modern workforce (Thom, & Thom, 2006). This deficiency has driven changes in the engineering accreditation standard through the Accreditation Board for Engineering and Technology (ABET). The result is a new accreditation standard known as ABET 2000. In
the past, ABET established strict standards that accredited engineering programs had to meet with regard to program organization, personnel, curriculum, etc. This assured a high degree of standardization but restricted innovation (ABET 2000, 2010). Under ABET 2000, the individual engineering and technology program is given freedom to respond to industry (constituent) demands, which in turn is driving changes in the engineering curricula that emphasizes the value of the technical or applied science approach. This paradigm shift may prove to be an opportunity for technical programs such as aviation maintenance training as they can now be accredited as engineering programs. This reunion of engineering education and technical education will have the potential effect of integrating application skills into the engineering curriculum and at the same time allowing for a balanced theoretical influence on technical education; which could be a positive trend for both educational areas. (Thom, & Thom, 2006).

The Technology Gap

There is deepening concern within the aviation industry and the aviation technical educational community that a serious gap has developed between the 14CFR part 147 aviation maintenance training curriculum and the current state of the art in the aviation industry. The current training curriculum was established in 1970 with only a minor revision of its content in 1993 (ARAC, 2008). In the early 1970’s a growing technological disparity between curriculum content and current industry demands was identified in two studies; Survey of the Aviation Mechanics Occupation (U.S. Office of Education 1970) and A National Study of the Aviation Mechanics Occupation (University of California, 1974).
Although no action on curricular content was taken at that time on the part of the FAA, there were significant advances in aviation over the next 20 years such as the advent of microcomputer technology, composite construction, turbofan engine technology and advances in avionics. In 1993, the FAA made a small revision to 14CFR part 147 by addressing the use of computers in training, composite construction, unducted fan engine technology and auxiliary power units (ARAC, 2008). In spite of the small changes made to the required curriculum, the General Accountability Office (GAO) expressed growing concerns on the topic to the U.S. House of Representatives Aviation Subcommittee in the report: *New FAA Approach Needed to Meet Challenges of Advanced Technology* (USGAO, 2003). As a result, an Aviation Rulemaking Advisory Committee (ARAC) was formed and research into a proposal to revise the certification standards (14CFR part 65) was undertaken. Although a revision to the regulation was constructed, it received resistance on several points during the Notice of Proposed Rule Making (NPRM) period and was withdrawn in 1998 (Goldsby, & Soulis, 2002).

Although curricular revisions continued to be pressed for by industry stakeholders and the aviation maintenance educational community, after the events of September 11, 2001 a new set of priorities were identified as security related issues dominated federal efforts and the FAA stated that the proposal was to be placed in moratorium with no efforts to readdress the issue (USGAO, 2003).

In spite of a lack of action with regard to curricular revision by the FAA, the industry and the educational community were still feeling the gap widening with the passage of time. The industry was operating a new generation of aircraft that required maintenance technicians to have mastery of new concepts and approaches. In addition,
since the affected subject areas in need of revision were a part of the code of federal regulations, changes to reflect these new technologies were almost impossible to make (ARAC, 2008).

In 2002, a new report addressed the curriculum/technology gap once more. The report: *Optimization of Aviation Maintenance Personnel Training and Certification* (Goldsby, and Soulis, 2002) provided an historical background to the problem and readdressed the need for changes in the way aviation maintenance personnel were educated and certified under the code of federal regulations. Shortly after the release of this report, the General Accountability Office (GAO) released a report initially to confirm projected employment projections for aviation mechanics as expressed in a report from the U.S. Bureau of Labor Statistics. In the process of researching industry need for aviation maintenance technicians, the GAO identified a disparity between educational curricular content and the current technology trends in the industry overall and chastised the FAA for their lack of action (USGAO, 2003).

During this period, aviation operators, industry analysts, and the educational community began putting increased pressure on the FAA to take action on a problem that had become critical. The publication of papers such as, *A Call for Contemporary FAR 147 Training* (Hawkins, 2006) and *Back to the Future: A Survey of Engineering and Technology Education over the Last Century* (Thom, & Thom, 2006) were indicative of the growing concerns.

In response to pressure place upon them by the GAO report and pressure from industry and educational groups, the FAA began to revisit the issue in 2007 (ARAC, 2008). At that time the “Aviation Maintenance Technician Schools Curriculum and
Operating Requirements Working Group” was established. It was made up of representatives of aviation maintenance education, industry, professional organizations and the FAA (Thompson, 2010). The purpose of the group was to reinvestigate the issue and create guidance information for the FAA to facilitate the revision of the curricular requirements of 14CFR part 147 and the certification requirements of 14CFR part 65 (ARAC, 2008).

With the representation of the FAA within the working group, it took on the function of an Aviation Rulemaking Advisory Committee (ARAC) and spent two years creating the revisions and guidelines for a regulatory overhaul of aviation maintenance education. The working document was completed and submitted in December 2008. Although everything logistically is currently in place for a modernization of the aviation training curriculum and the certification standards for aviation maintenance technicians including growing support by key individuals within the FAA, there have been new obstacles that have caused the process to be put on hold. The first delay was the change of Presidential Administration in November 2008 that required the confirmation of an entirely new cabinet and FAA head. The second delay was caused by several high profile events/accidents that have received considerable attention by congress with their mandate to the FAA that address these events. As a result, the ARAC request for a Proposal For Required Rule Making (NPRM) addressing 14CFR part 147 and 14CFR part 65 have been placed on “hold-status” by the FAA (Thomson, 2010).

It is hoped that FAA action will come within the next year. Aircraft are increasing in capability and complexity daily. Aircraft like the Boeing 787 and the advent of the
Unmanned Aerial Vehicle (UAV) embody technology that requires new concepts and new approaches with regard to maintenance and support. It is vital that the FAA move expeditiously to close the curriculum/technology gap in order to maintain the levels of efficiency and safety currently existing within the aviation system plan (Hawkins, 2006).

The Aviation Technician Education Council

The Aviation Technician Education Council was founded in 1961 and is located in Harrisburg PA. It is an organization made up of FAA certified aviation maintenance technician schools, individuals associated with aviation maintenance training and supporting industry organizations (ATEC members, 2008). The mission of ATEC is to facilitate the growth of positive and constructive relationships with educational entities, the FAA and industry groups. The council’s primary focus is advocacy for FAA certified aviation technical educational programs with regard to curricular development and improvement, technical and financial support and the promotion of relationships between educational programs, government and industry groups (ATEC members, 2008).

Within the guidelines of their mission statement, ATEC maintains several outreach functions in support of their objectives with committees made up of affiliated aviation technical education professionals who serve as members and expert advisors. See Table 8.
TABLE 8. ATEC STANDING COMMITTEES

<table>
<thead>
<tr>
<th>Communications</th>
<th>Government Relations</th>
<th>Industry Relations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance</td>
<td>Instructional Support</td>
<td>Presentations and Publications</td>
</tr>
<tr>
<td>Scholarships and Awards</td>
<td></td>
<td>Member Services</td>
</tr>
</tbody>
</table>

Three important facets of the ATEC mission to support aviation technical education are: 1) curricular/instructional support, 2) scholarly research/publication and 3) scholarship opportunities for students studying in the field of aviation maintenance technology. The Council supports aviation technical education by acting as a clearinghouse for instructional resources that can be accessed by member institutions to enhance the quality of instruction at their particular institution. This support can be in the form of technical information, manufacturer specific data and process specific information in both pictorial and video formats. They also recognize an apparent disconnect between industry and education in that there is little direct support of aviation technical education by manufacturers and operators in the form of information or technology exchange (Hawkins, 2008). They continue to build relationships with industry entities and encourage technology and information exchanges that benefit not only the educational side but the application side as well.

In addition, the Council continues to represent aviation technical education by interfacing with government entities and maintaining positive pressure on the FAA to motivate agency action upon recommendations that would modernize and enhance
educational quality and the certification standards and processes for Aviation Maintenance Technicians (ATEC mission, 2008). It is well recognized that the curriculum content of 14CFR part 147 has not changed in any significant way in over 50 years (USGAO, 2003). ATEC has been at the forefront of the effort to revise and update the training methods and curricular content of 14CFR part 147 and the certification standards and process of 14CFR part 65 (Goldsby & Soulis, 2002). ATEC also encourages the advancement of the aviation technical educational body of knowledge by facilitating and encouraging inquiry and publication in the areas of aviation maintenance education emphasizing technical educational pedagogies and methods. The ATEC Journal acts as both the organization’s communications organ and the vehicle where scholarly inquiry is published and disseminated (ATEC members, 2008).

Lastly, an important function of the Aviation Technician Education Council is to assist quality aviation technical students in their educational endeavors. This is accomplished through a variety of scholarships available to qualifying candidates that provide financial assistance for tuition, tool grants, type specific training programs and, in some cases, direct monetary awards. In addition, education/industry relationships are forged and maintained that allow for the donation of training materials ranging from books and data, specific tooling and hardware to aircraft specific items or components to aviation technical education programs. Funds are also available for faculty continuing education/enhancement opportunities ranging from funding for travel and seminars, to manufacturers training schools to process specific training opportunities (ATEC mission, 2008).
The airplane and the aerospace industry have made a lasting and indelible impression upon our world. The United States aviation system is the safest in the world and the modern aircraft is a technological marvel. Highly qualified personnel with competencies certified to the highest standard are of paramount importance in this equation. The aircraft maintenance technician is no exception and in reality, the importance of their contribution to safety cannot be overemphasized. The science associated with aviation maintenance and support with its related concepts, approaches and methodologies has developed hand-in-hand with the overall science of aviation. Just as pilot training has advanced through the effective pursuit of information and the transfer of the resultant skills and knowledge, aviation maintenance has grown into the applied science it is today through the effective accumulation of knowledge and the transfer of that knowledge through education. From the earliest master mechanics who passed along their expertise to the early pilots in the Wright and Curtiss schools, to the advanced collegiate aviation maintenance training program of today, the transfer of skills and knowledge, the challenge of the pursuit of excellence, the attainment of the high standards is, in a word, education. In that light, education has remained at the core of the applied science of aviation maintenance technology.

The vital importance of education on aviation overall and on aviation maintenance in particular is the energizing force behind this study. The importance of the aviation maintenance instructor interacting with the student, supported by an effective educational and administrative organization, cannot be minimized. Education is an
This study identified current practices within collegiate aviation maintenance training education and compiled the resultant information into a data baseline that forms a reference that can inform decisions related to the administrative organization, management, program infrastructure and curriculum/operations within collegiate aviation maintenance training programs. This chapter of the study is intended to give historical insight into the aviation maintenance technician, the development of aviation technical education programs, the FAA and the certification requirements of an aviation maintenance education program, the aviation maintenance technician educational experience, challenges facing aviation maintenance education, and the Aviation Technician Education Council for the purpose of informing the research questions.
CHAPTER III

METHODOLOGY

Introduction

This study collected data needed to address research questions framed in Chapter III with regard to the administrative organization, management structure, program infrastructure and curriculum/operations of collegiate aviation maintenance education programs certified under 14CFR part 147 and who are members of the Aviation Technician Education Council. The purpose of the information is to provide a data baseline that can be used by aviation educational administrators, policy makers and stakeholders an informational reference and to assist institutions in decision making and policy development and implementation. In addition, recommendations were generated based upon the data for the purpose of increasing the effectiveness and quality of collegiate aviation maintenance education.

Data for this study was collected through a questionnaire that was made available to administrators of the institutions electronically. The completed questionnaires were returned via e-mail and the responses were collected and assimilated. This chapter explains the research methodology utilized in the study, describes the sample population and addresses the selection of the sample. Construction of the questionnaire and the questions that comprise the questionnaire instrument are addressed.
Sample Selection

The population for this study is the 115 aviation maintenance education programs that are members of the Aviation Technician Education Council as of June 2008. These aviation technical education programs are dispersed across the FAA administrative regions. Within the larger population are the 11 aviation maintenance education programs that are Bachelor of Science degree conferring members of the Aviation Technician Education Council. This group was isolated for study because they possess similarities with regard to how post-secondary technical education is conducted in general. This facilitates the observation of similarities in the organization, management, infrastructure, and operations of aviation maintenance training programs. In addition, current trends within the aviation industry have placed increased emphasis on the possession of the Bachelor of Science degree as a credential required for hiring and advancement. In that light, collegiate aviation maintenance training programs are at the forefront of the overall aviation technical educational process. The collegiate aviation maintenance training programs that make up the sample are: Embry-Riddle Aeronautical University, Lewis University, Southern Illinois University at Carbondale, Purdue University, Kansas State University at Salina, Pennsylvania College of Technology, Western Michigan University, Vaughn College, Middle Tennessee State University, Letourneau University and Utah State University.

On March 24, 2009, a request for determination of non-human subject or non-research was made to the Oklahoma State University Institutional Review Board (IRB). At that time it was determined by the IRB that this study complied with the applicable
requirements of research and that the study did not involve the use of human subjects and as such is not subject to oversight by that body (Appendix B).

Research Instrument

The data collection instrument was a questionnaire-type survey consisting of 50 questions that were broken down into four investigation areas that corresponded with the four research questions (Appendix A). The research question areas were: 1) administrative organization, 2) management structure, 3) program infrastructure, and 4) curriculum/operations. Supporting questions under each investigation area were framed so as to allow each respondent to address how each factor or situation was addressed at that particular institution. If there was something that was not applicable or did not apply to a particular institutions situation an "other" response was made available. Where a response might warrant additional or clarifying information from a respondent a "comment" area was made available for the respondent to use. The survey was constructed to be administered electronically with the completed questionnaire returned in like manner.

The survey instrument was validated through a construct validation process that involved modeling the survey instrument for this study after one that had been used in a study that was similar in nature. To that extent the survey instrument was constructed with reference to an instrument used to gather information regarding 14CFR part 141 collegiate flight training programs (Mangrum, 2003). In addition, after the survey was constructed, it was sent to an individual regarded as an expert in the field of aviation technical education for the purpose of testing the survey delivery/recovery system and the
content of the survey itself. The individual was asked to comment as necessary as to the content of the survey and if any changes needed to be made. No changes or modifications were suggested by the individual.

The survey process was based on an e-mail to the program head or administrator of each aviation maintenance technical education program as listed in the member institution directory of the Aviation Technician Education Council (ATEC). The e-mail contained an explanation of the research endeavor and asked for research participation in the study. An attachment to the e-mail contained the survey instrument. Verbiage on the survey itself provided additional information including participation instructions and communicated to the individual that responding to the survey and returning it would constitute informed consent on their part.

Research Design

This research study was designed to provide answers to the questions addressed in the problem statement framed in Chapter I and provide a representative depiction of the nature of collegiate 14CFR part 147 aviation technical education. The data collected provided answers to the four research questions. Also the responses to the questions that made up the questionnaire constituted an overview of the current nature of collegiate aviation maintenance education programs and represent possible resource for program administrators, policy implementers and other associated stake-holders with regard to planning and decision making not only within collegiate aviation maintenance programs but to all 14CFR part 147 aviation maintenance education programs within the Aviation Technician Education Council.
Data Analysis

When completed questionnaires were returned, the data were entered into a spreadsheet computer program. The responses to each question from each questionnaire section were entered into the spreadsheet program and the percentages of the responses to each question were calculated. The responses to each question were then presented in a graphical or a narrative format as appropriate.

Summary

This chapter was included to provide background and a functional description of the research study. In that vein, selection of the population, the data collection instrument, research design, analysis of the collected data and the presentation of the findings was addressed. The educational institutions that met the research criteria were listed for reference and the IRB status of the study was stated.
CHAPTER IV
RESULTS OF THE STUDY

Introduction

The first three chapters of this research study have provided an overview of the study, a review of related literature and the associated methodology. In this chapter, the data as gathered are presented from the questionnaire survey of Collegiate Aviation Maintenance Training Programs certified under 14CFR part 147 who are members of the Aviation Technician Education Council.

The data gathered from the questionnaire are presented and reviewed in four parts that correspond to the four research questions. The first part entitled “Administrative Organization” presents data from the questionnaire designed to provide the answer to research question number 1. This section of the questionnaire was made up of eight related inquiry areas that when reviewed collectively inform the associated research question. See Table 9. The second part of the questionnaire entitled “Management of Aviation Maintenance Training” presents data from the questionnaire designed to provide the answer to research question number 2 and is made up of a nine related inquiry areas that when reviewed collectively inform the associated research question. See Table 10.
TABLE 9. INQUIRY AREAS RELATED TO RESEARCH QUESTION #1

<table>
<thead>
<tr>
<th>Placement of aviation maintenance education program within university structure.</th>
<th>Oversight of aviation technical education.</th>
<th>Legislative mandates.</th>
</tr>
</thead>
<tbody>
<tr>
<td>College, program, department or other structural affiliation.</td>
<td>Financial support through endowment.</td>
<td>Industry relationships.</td>
</tr>
<tr>
<td>Financial support through alumni associations.</td>
<td></td>
<td>Financial Sources.</td>
</tr>
</tbody>
</table>

TABLE 10. INQUIRY AREAS RELATED TO RESEARCH QUESTION #2

<table>
<thead>
<tr>
<th>Title of individual responsible for overseeing operational aspects of aviation technical education programs.</th>
<th>Percentage of tenure-track to non tenure-track faculty.</th>
<th>Use of adjunct/part-time faculty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational requirements for tenure-track faculty.</td>
<td>Terminal degree requirement for aviation technical education faculty.</td>
<td>Faculty development for aviation technical education faculty.</td>
</tr>
<tr>
<td>Number of aviation technical education faculty.</td>
<td>Research agenda requirement for aviation technical education faculty.</td>
<td>Use of graduate assistants in aviation technical education.</td>
</tr>
</tbody>
</table>
The third part of the questionnaire entitled “Program Infrastructure” presents data from the questionnaire designed to provide the answer to research question number 3 and is made up six related inquiry areas that when reviewed collectively inform the associated research question. See Table 11.

<table>
<thead>
<tr>
<th>TABLE 11. INQUIRY AREAS RELATED TO RESEARCH QUESTION #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program Facilities.</strong></td>
</tr>
<tr>
<td>Classification of aviation technical education programs as budgeted entities or auxiliary operations.</td>
</tr>
</tbody>
</table>

The fourth part of the questionnaire entitled “Curriculum/Operations” presents data from the questionnaire designed to provide the answer to research question number 4 and is made up of eighteen related inquiry areas that when reviewed collectively inform the associated research question. See Table 12.
### TABLE 12. INQUIRY AREAS RELATED TO RESEARCH QUESTION #4

<table>
<thead>
<tr>
<th>Source of FAA certified curriculum.</th>
<th>Approach to “live work” within the curriculum.</th>
<th>Integration of FADEC into aviation technical education curriculum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of the aviation maintenance training program.</td>
<td>Number of students in program.</td>
<td>Integration if EFIS/EICAS into aviation technical education curriculum.</td>
</tr>
<tr>
<td>Number of instructional hours within the curriculum.</td>
<td>Enrollment trend.</td>
<td>Integration of Ballistic Parachute technology into aviation technical education curriculum.</td>
</tr>
<tr>
<td>FAA required record keeping compliance methodology.</td>
<td>Types of aircraft used to support the aviation technical education program.</td>
<td>FAA certification process.</td>
</tr>
<tr>
<td>Method of complying with math/physics requirement.</td>
<td>Source for training aids and mock-up system trainers.</td>
<td>Regional wage average.</td>
</tr>
</tbody>
</table>

#### Responses to Questionnaire

A copy of the research questionnaire was sent electronically to the manager/administrator of each institution identified in the sample group. Eleven questionnaires were sent out and eight were completed and returned for a response average of 72.7%. The responses to each question are reported here with related discussion:
Research Question #1-Administrative Organization

For the purpose of determining the organizational placement of each program within the respective university or college the following question was asked; “Is your aviation maintenance training program a stand-alone entity or is it a part of a larger aviation department”?

All but one of the respondents (87.5%) indicated that their program was part of a larger overarching aviation program. The one respondent (12.5%) that indicated otherwise stated that their program was a stand-alone aviation maintenance training program. See figure 1.

Figure 1. Aviation Maintenance Training Program Administrative Configuration
To determine how each respondent described the particular organizational structure of their program the study asked; “Is your collegiate aviation operation a program or department”?

All respondents except two (62.5%) identified the organizational structure as a department with one respondent (12.5%) identifying theirs as a program and one respondent (12.5%) indicated “other”. See Figure 2.

Figure 2. Program or Department

In order to establish the administrative location of the aviation maintenance training program within the various colleges and universities the questionnaire asked; “What college is your aviation program connected to administratively”? 
Three of the respondents (37.5%) indicated that they were situated within colleges of aviation. The others were dispersed within other colleges that were related on general grounds involving applied sciences, technology and engineering. The various colleges where the aviation maintenance training program is located are presented in Table 13.

<table>
<thead>
<tr>
<th>College of Arts and Sciences</th>
<th>(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Applied Arts and Sciences</td>
<td>(1)</td>
</tr>
<tr>
<td>College of Engineering</td>
<td>(1)</td>
</tr>
<tr>
<td>College of Aviation</td>
<td>(3)</td>
</tr>
<tr>
<td>College of Technology and Aviation</td>
<td>(1)</td>
</tr>
<tr>
<td>College of Basic and Applied Science</td>
<td>(1)</td>
</tr>
</tbody>
</table>

The next two questions applied to administrative and budgetary oversight of the aviation maintenance training program, specifically making inquiry with regard to who in the program was responsible for these logistical areas.

The first question asked “Who has administrative oversight of the aviation maintenance training program?”

One half of the respondents (50%) reported that administrative oversight was provided by a department chair and 12.5% reported direct oversight by a Dean. 37.5%
responded to the “other” option with administrative oversight being provided by an individual identified as “147 Coordinator”, “AVM Program Lead” and “Director of Aviation”. See Figure 3.

![Figure 3. Administrative Oversight of Aviation Maintenance Training](image)

Related to administrative oversight of a program is budgetary oversight. The study posed the question “Who has budgetary oversight of the aviation maintenance training program”?

The majority of responses (62.5%) indicated that the department chair provides budgetary oversight of the training program. 16% indicated that the Dean provided this
function and 12.5% indicated “other” and additionally indicated that the “program Lead” was responsible for budgetary oversight. See Figure 4.

![Figure 4. Budgetary Oversight of Aviation Maintenance Training](image)

Related to the budgetary/revenue related aspect of an aviation maintenance training program, five additional questions probed the existence of: 1) endowments 2) legislative mandates that may exist that would affect program funding 3) the existence of any relationships or partnerships with industry that may provide a financial benefit to their programs 4) the financial involvement of alumni foundations or related associations and 5) the primary source of program financial resources. The first question addressed the
existence of an endowment and was stated thus, “Are there any endowments for the aviation maintenance training program”?

While 75% of the respondents indicated that no endowment funding existed for their programs, 25% indicated that endowments did exist, with one of the respondents indicating that the endowment for their respective program was $1,000,000.00. See Figure 5.

Figure 5. Endowments for Aviation Maintenance Training Program

The second related question was; “Are there any state legislative mandates with regard to aviation maintenance training?”
In this case, all respondents (100%) indicated that no state legislative mandates existed for their aviation maintenance training program.

With regard to partnerships with industry entities, the study asked the third question; “‘Does your aviation maintenance training program maintain any relationships with an airline, manufacturer or other industry entity?’”

Sixty-two point five percent (62.5%) of the respondents indicated that their programs maintained a partnership or relationship to some extent with the aviation industry. 37.5% indicated that they did not. For those who indicated that they did maintain industry relationships they additionally indicated that these relationships were in the form of 1) donations of equipment 2) internship opportunities 3) scholarships and 4) placement upon graduation programs. See Figure 6.

Figure 6. Industry Relationships with Aviation Maintenance Training Program
The fourth question in this line of inquiry asked; “What level of financial support for the aviation maintenance training program comes from alumni foundations or associations?”

Eighty-seven point five percent (87.5%) of respondents indicated that financial support from alumni foundations or associations was minimal. 12.5% indicated a “no responds” to the question. See Figure 7.

Figure 7. Alumni Support of Aviation Maintenance Training
The last question in this line of inquiry asked; “Is the aviation maintenance training program funded solely through student tuition generated funds”

Fifty percent (50%) of respondents indicated that their program was funded solely through tuition generated and 50% indicated that there were other sources of revenue for the program in addition to tuition generated finds. The “other” source of funds was further identified as “State Funding”. See Figure 8.

![Figure 8. Tuition Only Funding for Aviation Maintenance Training Program](image-url)
Research Question #2-Management of Aviation Maintenance Training

The second research question focused on the faculty of the aviation maintenance training program and posed ten questions.

The first question asked; “What is the title used for the individual who is responsible for overseeing the operational aspects of the aviation maintenance training program?”

There were a variety of titles used to identify individuals responsible for operational oversight with 62.5% indicating “Other” to the question. 25% responded “Section Head” and 12.5% indicated “Director. See Figure 9 and Table 14.

Figure 9. Title of Individual Who is Responsible for Operational Oversight of Aviation Maintenance Training
TABLE 14. TITLES OF ADMINISTRATORS OF AVIATION MAINTENANCE TRAINING PROGRAMS

<table>
<thead>
<tr>
<th>Position</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation Maintenance Training Director</td>
<td>(1)</td>
</tr>
<tr>
<td>Aviation Maintenance Program Coordinator</td>
<td>(1)</td>
</tr>
<tr>
<td>Aviation Maintenance Section Head</td>
<td>(2)</td>
</tr>
<tr>
<td>Aviation Maintenance Program Manager</td>
<td>(1)</td>
</tr>
<tr>
<td>Aviation Maintenance Department Chair</td>
<td>(2)</td>
</tr>
<tr>
<td>Aviation Maintenance Program Lead</td>
<td>(1)</td>
</tr>
</tbody>
</table>

The next question asked; “What are the educational requirements for a tenure-track faculty member?”

Eighty seven point five percent (87.5%) of respondents indicated that the master of science degree was the minimum requirement for tenure with their institutions. Twelve point five percent (12.5%) indicated that the doctoral degree was the minimum requirement for tenure. See Figure 10.
The next question inquired regarding the minimum educational requirement for a non-tenure track faculty member and asked; “What are the educational requirements for a non-tenure track aviation maintenance faculty member?”

Fifty percent (50%) of respondents indicated that a bachelor of science degree was the minimum requirement for a non-tenure track faculty member. Twelve point five percent (12.5%) indicated that the master of science degree was the minimum degree required. Twelve point five percent (12.5%) indicated that FAA mechanic certification was the minimum educational requirement for a non-tenure track faculty member. 25% did not respond further indicating that no faculty positions in their particular programs were designated “non-tenure track”. See Figure 11

Figure 10. Educational Requirements for Tenure
The next question asked for the number of faculty members that made up the aviation maintenance program instructional component; “How many aviation maintenance faculty members does your program have?”

The average number of faculty members across the spectrum of respondents was 6. The largest number of faculty members at a respondent’s institution was 12 and the smallest number of faculty members at a respondent’s institution was 2. See Table 15.
The next question was related to the previous question that made inquiry into the number of aviation maintenance faculty members. This question related to the number of faculty member who were in tenure-track positions and was stated; “What percentage of your aviation faculty members are tenure-track?”

Sixty-three percent (63%) of respondents stated that all (100%) of their aviation maintenance training faculty members were tenure-track. 13% of respondents indicated that the majority (66%) of their faculty members were in a tenure-track position. Twenty-five percent (25%) indicated that none (0%) of their faculty members were in a tenure-track position.

The next point of inquiry related to the aviation maintenance training faculty asked if a doctoral degree was required for tenure at their institution; “Is there a doctoral degree requirement for tenure within the aviation maintenance program?”
Seventy-five percent (75%) of respondents indicated that no doctoral degree requirement for tenure existed at their particular institution. Twenty-five percent (25%) indicated that a doctoral degree was required for tenure at their institution. See Figure 12.

Figure 12. Doctoral Degree Requirements for Tenure

The next question in this line of inquiry probed the existence of an established research agenda requirement for aviation maintenance faculty members; “Is an established research agenda a required part of your aviation maintenance faculty work load?”

The responses to this question were evenly divided with 50% of respondents indicating that an established research agenda was a required part of their faculty
workload and 50% of respondents indicating that an established research agenda was not a required part of their faculty workload. See Figure 13.

Figure 13. Research Agenda as Part of Normal Faculty Workload

An additional question was posed related to the doctoral degree and the related research agenda. The question utilized a Likert scale format and was designed to be an indicator of the opinion of those involved directly with aviation technical education regarding the importance of the doctoral degree and its associated research requirement.
The respondent was asked to respond to the following statement:

“An established research agenda should be an integral part of the aviation maintenance faculty workload”.

The question used a five point response format and was structured to allow the respondent to indicate, 1) Strongly agree, 2) Somewhat agree, 3) Undecided, 4) Somewhat disagree and 5) Strongly disagree. None of the respondents indicated a strong support for the research agenda. 37.5% of respondents indicated “Somewhat agreement”. 25% of respondents indicated they were undecided on the issue. 12.5% of respondents indicated “Somewhat disagree” and 25% indicated that they strongly disagreed with an established research agenda requirement for aviation maintenance faculty members. See Figure 16.

<table>
<thead>
<tr>
<th></th>
<th>1 Strongly Agree</th>
<th>2 Somewhat Agree</th>
<th>3 Undecided</th>
<th>4 Somewhat Disagree</th>
<th>5 Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response</td>
<td>0%</td>
<td>37.5%</td>
<td>25%</td>
<td>12.5%</td>
<td>25%</td>
</tr>
<tr>
<td>Mean</td>
<td>(0)</td>
<td>(3)</td>
<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
</tr>
</tbody>
</table>

Response Mean: 3.25
The responses to the previous series of questions regarding the doctoral degree, the research agenda and the question addressing perceptions regarding the research agenda indicate that the theory verses applications debate is certainly affecting collegiate aviation technical education programs and the findings corroborate the existing literature related to this subject in that there has been increasing pressure from upper administration being brought to bear on the technologies/applied sciences to generate more research and move in a more theoretical direction.

The use of adjunct or part-time instructors was addressed in the next question; “Are adjunct/part-time faculty members used to support coursework in your aviation maintenance training program?”

Fifty percent (50%) of respondents indicated that adjunct/part-time instructors were utilized on occasion. 37.5% indicated that adjunct/part-time instructors were regularly used in their programs. 12.5% indicated that no adjuncts/part-time instructors were used in their particular programs. See Figure 14.
Related to the use of adjunct/part-time instructors the next question made inquiry with regard to the use of graduate assistants within the program; “Are graduate assistants used in any capacity within your aviation maintenance training program?”

Seventy-five percent (75%) of respondents indicated that no graduate assistants were used in their particular program. 25% indicated that graduate assistants were used in some capacity, although it was indicated that they were not used to deliver primary instruction but were primarily utilized in ancillary functions such as “Lab Assistants” and “Computer Support Technicians”. See Figure 15.
Figure 15. Use of Graduate Assistants in Aviation Maintenance Training Program

The last question related to the management and personnel aspects of the collegiate aviation maintenance training program makes inquiry with regard to continuing education opportunities for aviation maintenance training faculty members; “Does your aviation maintenance training program have a system in place that encourages the aviation maintenance training personnel to attend industry schools or training seminars?”

All respondents (100%) indicated that funds were available for continuing education for aviation maintenance training faculty.
Research Question #3-Program Infrastructure

The third research question addressed programmatic infrastructure related issues such as facilities, revenue sources and profitability, equipment procurement and support and instructional contact hours.

The first question in this section asked about facilities being used to support the aviation maintenance training program; “What facilities are used in support of the aviation maintenance training program?”

Sixty-three point five percent (62.5%) indicated that their particular program utilized a combination of campus and airport facilities to support their program. 25% indicated that their programs utilized an airport located facility only. 12.5% indicated that their program utilized a campus located facility only. See Figure 16.

Figure 16. Type of Facilities Used for Aviation Maintenance Training Program
The next related question sought information with regard to the ownership status of the facilities that were used in the aviation maintenance training program; Are any of the program’s facilities/space rented or leased?”

Twenty-five percent (25%) of respondents indicated that they rent or lease office space. 25% of respondents indicated that they rent or lease classroom space. 37.5% indicated that they rented or leased airport hangar space. 12.5% indicated that they wholly owned all of the facilities used in the delivery of their aviation maintenance training program. See Figure 17.

Figure 17. Program Facilities that are Rented or Leased
The follow up question asked the respondents to indicate what to what extend their facilities were owned; “Does the institution own any of the following facilities?”

Eighty-seven point five percent (87.5%) of respondents indicated that they owned the office space required to support the aviation maintenance training program. Eighty-seven point five percent (87.5%) indicated that they owned the maintenance training facilities. Fifty percent (50%) indicated that they owned the airport where the aviation maintenance training facility was located. Twelve point five percent (12.5%) indicated that they owned no part of the facilities utilized to support the aviation maintenance training program. See Figure 18.

Figure 18. Facilities that are Owned by the Institution
The next line of questions made inquiry into the revenue stream aspects of the collegiate aviation maintenance training program; “Is the aviation maintenance training program an auxiliary operation that is held to a profitability standard?” In technical education, “profitability standard” means that the program must operate as a revenue generating entity and must show a financial profit or meet a certain profit baseline at the end of each fiscal year in order to continue to function as a business would operate.

Eight-seven point five percent (87.5%) of respondents indicated that their programs were not held to a profitability standard or requirement. Twelve point five percent (12.5%) indicated that they were held to a profitability standard of some type. See Figure 19.

Figure 19. Existence of Profitability Standard
The next revenue related question dealt with the billing format for students in the program; “How is the student billed for the program?”

All respondents (100%) indicated that the students in their particular aviation maintenance training program were billed on a per semester basis.

The next question made inquiry into the source of funds for faculty salaries; “What budget provides for faculty salaries?”

The respondents were evenly split in their responses to this question with 50% indicating that the funds for faculty salaries came from the university budget and the other 50% indicating that faculty salary funding came from an aviation departmental source.

Next the survey inquired with regard to budgetary shortfalls, particularly, if one should occur, how the shortfall is made up for; “How are budgetary shortfalls covered?”

On this question, the respondents indicated that budgetary shortfalls are covered by obtaining additional funding from a variety of sources. They are as follows: 62.5% indicated that the university budget was a source of funding; 50% indicated that the department was a source of funding; 37.5% indicated that the program itself had contingency funds available; 12.5% indicated that the regents were a funding source; 12.5% indicated that the state legislature was a source of funds. 50% of respondents also indicated that a fee/tuition increase was also a strategy to be implemented should a budgetary shortfall occur. See Figure 20 and Table 17.
Figure 20. Source of Funds for Budgetary Short-Falls

TABLE 17. FUNDING SOURCES FOR BUDGETARY SHORTFALLS

<table>
<thead>
<tr>
<th>Source of Funds</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Funds</td>
<td>62.5%</td>
</tr>
<tr>
<td>Department</td>
<td>50.0%</td>
</tr>
<tr>
<td>Program</td>
<td>37.5%</td>
</tr>
<tr>
<td>Board of Trustees/Regents</td>
<td>12.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of Funds</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Funds</td>
<td>(5)</td>
</tr>
<tr>
<td>Board of Trustees/Regents</td>
<td>(1)</td>
</tr>
<tr>
<td>College Budget Funds</td>
<td>(4)</td>
</tr>
<tr>
<td>Legislature Funding</td>
<td>(1)</td>
</tr>
<tr>
<td>Program Specific Funds</td>
<td>(3)</td>
</tr>
<tr>
<td>Student Tuition/Fee Increase</td>
<td>(4)</td>
</tr>
</tbody>
</table>
The last question related to aviation maintenance training program funding address the funding source/s for equipment and training materials; “How is equipment/training materials paid for?” As with the previous question related to funding sources for budgetary shortfalls, the respondents indicated that the source of funding for equipment and training materials came from a variety of sources. 50% of respondents indicated that the university budget was a source of funding. 62.5% indicated that the college was a funding source. 37.5% indicated that funds were available from the program budget. 50% of respondents indicated that student fees constituted a revenue stream for equipment and training material procurement. 21.5% indicated that funds from the state legislature were available for equipment and training materials. 37.5% indicated that in their situation equipment and training materials were obtained through donations and grants. See Figure 21.

Figure 21. Source of Funds for Equipment and Training Materials
The last two questions in the area of program infrastructure made inquiry into time of program offering and into the number of contact hours per week that constituted a full faculty load.

“Does your program offer both a day and a night program?”

On this question the respondents were evenly divided in that 50% of them indicated the presence of both a day and night program at their institution and 50% indicated that their particular program offered course instruction during the day only.

The next question addressed the number of contact hours that a full time faculty member is required to maintain in order to fulfill their academic responsibility to the institution. The question was; “How many contact hours per week constitutes a full academic load for faculty members in your aviation maintenance training program?”

With regard to this question, three respondents indicated that 12 contact hours per week constituted an academic full load while one indicated 15 contact hours, one indicated 20 hours, one indicated 27 hours, one indicated 40 hours and another indicated that it varied by semester.

Research Question #4-Curriculum/Operations

The final area of inquiry address in the research questionnaire gathered information regarding the aviation maintenance training curriculum and the operational aspects of delivering the instruction and conducting the technical aspects of the training.

The first question asked whether the FAA approved curriculum utilized by the aviation maintenance training program was one that was constructed by the institution or on that was procured from a commercial source. The question was; “Is your approved
In response to this question, 87.5% of the respondents indicated that they utilized an FAA approved curriculum that was constructed by their particular program. 12.5% of the respondents indicated that their program utilized an FAA approved curriculum that was commercially available.

In order to obtain an historical perspective of the collegiate aviation maintenance training programs involved in this study, the next question asked how long their particular program had been in existence. The oldest collegiate aviation maintenance training program began operations in 1906 and the latest one began operations in 1975. The remainder indicated a range of start dates that ran from the early 1930’s to the mid-1970’s. The responses to this question indicate that collegiate aviation maintenance education programs began operations at periods that correspond to the literature with regard to the historic milestones that fostered the growth of aviation. These programs, for the most part can trace their roots to the late 1920’s during the aviation boom fostered by the Lindbergh flight, the CPTP era of the Second World War, the G.I. Bill era of the early 1950’s or the G.I. Bill era of the mid-1970’s. The concern indicated is that there have been no new collegiate aviation technical education programs developed in the last 35 years. This may be the result of societies perception change with regard to technical professions, the increasing bias against applied science programs in the baccalaureate setting, the inefficient and frustrating nature of the FAA certification and operating protocols, or most probably a combination of all three.
The next area of inquiry investigated the number of instructional hours that made up their particular aviation maintenance training program. 14CFR part 147, the code of federal regulation that establishes the requirements for an approved aviation maintenance training program requires a minimum of 1,900 hours of instruction. Related to that, the next question asks “Does your 14CFR part 147 curriculum exceed the 1,900 hour regulatory requirement?” With regard to this question, 75% of the respondents indicated that their FAA approved aviation maintenance training curriculum exceeded the minimum of 1,900 hours. 25% of respondents indicated that their particular program did not exceed the FAA established minimum. Of those programs that indicated that their program exceeded the 1,900 hour minimum, the amount of hours that they exceeded the minimum ranged from a low of six hours to a high of 130 hours with an average of 1,957 hours. See Figure 22.

Figure 22. FAA Approved Instructional Hour Requirement Exceeds The 1900 Hour Minimum
The next question probed for information regarding the means in which the collegiate aviation maintenance training program complied with the regulatory record keeping requirement as stated in 14CFR part 147. The question asked; “How are the record keeping requirements of 14CFR part 147 complied with in your program?”

Twelve point five percent (12.5%) of respondents indicated that their particular aviation maintenance training program maintained their FAA mandated records in hard-copy format. 87.5% of respondents indicated that their aviation maintenance training program maintained the FAA mandated records in both hard-copy and in electronic form. No respondents indicated that they maintained the required records using an electronic format alone. See Figure 23.

Figure 23. FAA Required Record Keeping Compliance Format
The next question made inquiry with regard to the schedule for delivery of aviation maintenance training with regard to the academic semester format. “Does your aviation maintenance training program offer classes year round? (Fall/Spring and Summer Semester).

With regard to this question, 50% of respondents indicated that they delivered aviation maintenance training instruction in a year-round format consisting of a fall, spring and summer semester arrangement. 50% of respondents indicated that they did not operate on a year-round schedule.

Continuing a line of questioning regarding curriculum and instructional aspects of collegiate aviation maintenance training, the FAA requirement for a mathematics course and a physics course were addressed with the next question. “How are the math and physics requirements of 14CFR part 147 delivered in your aviation maintenance training program?”

With regard to this question, 25% of respondents indicated that the math/physics courses were delivered within the aviation maintenance program utilizing aviation maintenance training faculty. 62.5% of respondents indicated that these courses were outsourced to the math/physics departments of their respective institutions. 12.5% indicated that they used a combination approach in that the physics requirement was met with the aviation maintenance training program and the math requirement was met utilizing the mathematics department of their institution. See Figure 24.
The integration of actual aviation maintenance performed on airworthy aircraft into the collegiate aviation maintenance training program was investigated with the next question. “Is “live” work performed as a part of your aviation maintenance training program?”

Seventy-five percent (75%) of respondents indicated that actual “live” work was regularly conducted with their respective collegiate aviation training programs. 25% of respondents indicated that “live” work was not a part of their collegiate aviation maintenance training programs. One respondent indicated that airworthy aircraft were utilized in the Aircraft Inspection component of their maintenance training curriculum. See Figure 25.
As a follow up to the previous question related to the integration of airworthy or “live” aircraft into the aviation maintenance training curriculum, a question was posed using a Likert scale format and was designed to be an indicator of professional opinion regarding the issue.

The respondent was asked to respond to the following statement:

“Performing “live” work on airworthy aircraft should be integrated into the Experience of the student mechanic to the greatest extent possible”.

The question used a five point response format and was structured to allow the respondent to indicate 1) Strongly agree, 2) Somewhat agree, 3) Undecided, 4) Somewhat disagree and 5) Strongly disagree.
The responses to this question were evenly dispersed across the spectrum. 25% of respondents indicated that they “Strongly Agree” with the statement. 25% indicated that they “Somewhat Agree” with the statement. 25% indicated “Somewhat Disagree” and 25% indicated “Strongly Disagree” with regard to the statement. See Table 18.

### TABLE 18. INTEGRATION OF “LIVE WORK” OPINION ANALYSIS

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>Somewhat Agree</td>
<td>Undecided</td>
<td>Somewhat Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>25%</td>
<td>25%</td>
<td>0%</td>
<td>25%</td>
<td>25%</td>
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<tr>
<td>(2)</td>
<td>(2)</td>
<td>(0)</td>
<td>(2)</td>
<td>(2)</td>
</tr>
</tbody>
</table>

Response Mean: 3.0

The next set of questions related to student numbers and enrollment trends. The first question asked for the number of students currently enrolled in their respective aviation maintenance training programs. “How many students are currently enrolled in your aviation maintenance training program?” Respondents to this question indicated a high of 150 students and a low of 50 students. The average number of aviation maintenance students among the respondents was 90. See Table 19.
The related question in this area made inquiry with regard to enrollment trends over the previous 5 years. “Have the number of students in your aviation maintenance training program (over the last 5 years) Increased?; Decreased?; Remained the same?” 37.5% of respondents indicated that their particular aviation maintenance training program had experienced an increase in student enrollment over the past 5 years. 37.5% of respondents indicated that their aviation maintenance training program had experienced a decrease in student enrollment over the same period of time. 25% of respondents indicated that over the past 5 years, the student enrollment numbers have remained steady. See Figure 26.
The next area of questioning addressed training equipment and technology related issues. The first question in this series asked respondents to provide a listing of what type of aircraft by class were used as training platforms for their collegiate aviation maintenance training program. The responses to this question were a solid indication that collegiate aviation maintenance education programs are equipped with a range of aircraft that represent the entire spectrum of current aviation technology. See Table 20.
The next question related to training aircraft inquired as to the source for these aircraft; “The primary source for the aircraft used in support of your aviation maintenance training program is/are? The respondents indicated that the primary source for training aircraft was through military surplus, with manufacturers and salvage sources also being indicated. Donations and outright purchases were also indicated. See Table 21.

### TABLE 20. TRAINING AIRCRAFT UTILIZED BY AIRCRAFT CLASS

<table>
<thead>
<tr>
<th>Aircraft Class</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Engine Piston</td>
<td>(8)</td>
</tr>
<tr>
<td>Business Class Turbo-Propeller</td>
<td>(6)</td>
</tr>
<tr>
<td>Multi-Engine Light Piston</td>
<td>(8)</td>
</tr>
<tr>
<td>Business Class Turbo-jet/Turbo-Fan</td>
<td>(8)</td>
</tr>
<tr>
<td>Multi-Engine Cabin Class Piston</td>
<td>(6)</td>
</tr>
<tr>
<td>Transport Category Turbo-Fan</td>
<td>(3)</td>
</tr>
</tbody>
</table>

### TABLE 21. SOURCES FOR TRAINING AIRCRAFT

<table>
<thead>
<tr>
<th>Source</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military Surplus</td>
<td>(7)</td>
</tr>
<tr>
<td>Salvage</td>
<td>(4)</td>
</tr>
<tr>
<td>Government Surplus</td>
<td>(1)</td>
</tr>
<tr>
<td>Outright Purchase</td>
<td>(1)</td>
</tr>
<tr>
<td>Manufacturers</td>
<td>(4)</td>
</tr>
<tr>
<td>Private Donation</td>
<td>(1)</td>
</tr>
</tbody>
</table>
The next question related to training equipment and materials inquires regarding the source for training aids, mock-ups etc. “The primary source of the training aids and mock-ups used in support of your aviation maintenance training program is/are?”

Respondents indicated that the majority of training aids and mock-ups were constructed in-house. Proprietary sources were also indicated as leading sources as was the military. The airlines were also indicated as minor sources.

The next line of questioning probed the area of new technology integration into the aviation maintenance training curriculum. The first question was posed regarding the integration of Full Authority Digital Engine Control (FADEC) technology into the curriculum; “Does your program currently have a FADEC equipped powerplant in the curriculum?”

Twenty-five percent (25%) of respondents indicated that they did have FADEC technology capability within their aviation maintenance training curriculum, while 75% indicated that they did not. See Figure 27.
The next question asked regarding the integration of “Ballistic Recovery Parachute Technology” into their aviation maintenance training curriculum; “Does your program currently address ballistic recovery parachute technology at any place within the curriculum?”

Twenty-five percent (25%) of respondents indicated that they did have “Ballistic Recovery Parachute Technology” integrated into their curriculum. 75% of respondents indicated that they did not have any “Ballistic Recovery Parachute” technology capability. See Figure 28.
The final question related to state-of-the-art technology integration was posed regarding the integration of “EFIS/EICAS” or “Glass Cockpit” technology into their aviation maintenance training curriculum; “If “glass cockpit” technology a component of your program curriculum?”

With regard to this question, 12.5% of respondents indicated that they did integrate “glass cockpit” technology into their aviation maintenance training curriculum. 87.5% of respondents indicated that they did not have “glass cockpit” technology capability within their aviation maintenance training curriculum. See Figure 29.
The previous three questions related to the integration of new technologies into the collegiate aviation maintenance education program represent a concern that corresponds to the technology gap indicated in current literature. At present, full authority digital engine control (FADEC), ballistic recovery parachute technology and electronic flight instrumentation systems (EFIS/EICAS) are at the leading edge of technology. As indicated in the data, the majority of collegiate aviation technical education programs are not addressing these critical areas within their curriculum. This most probably is caused by 1) the expense associated with the technology involved, 2) the difficulty involved with amending or changing FAA approved curriculum. In reality it is most likely a combination of the two. For those that are addressing these new technologies, it is highly
likely those programs are collocated with collegiate flight programs that operate new
generation training aircraft that are equipped with one or more of these technologies and
these aircraft are available to the maintenance training program as instructional platforms.

The final inquiry area asked a series of questions related to FAA certification and
employment related issues. The first question asked about the existence of affiliated FAA
Designated Mechanic Examiners (DME) within the collegiate aviation maintenance
training program; “Does your program have “affiliated DMEs” to administer the oral and
practical tests required for FAA certification?”

With regard to this question, 100% of respondents indicated that their particular
program utilized affiliated DME’s to administer the FAA certification testing.

The next question asked whether the cost of the FAA certification testing was
included within the overall program cost or did it represent an additional expense to the
student; “Is the cost of the testing required by the FAA certification part of the program
cost or an additional expense covered by the student?”

With regard to this question, 12.5% of respondents indicated that the cost of the
FAA certification testing was part of the total program cost for the student. 87.5% of
respondents indicated that the cost of the FAA certification testing represented an
additional expense to be borne by the student. See Figure 30.
The final question related to FAA certification made inquiry as to the actual cost of the testing: “What is the cost for the oral/practical test for your graduates. (General/Airframe and Powerplant sections)?”

With regard to this question, respondents indicated that the cost for the FAA certification testing (oral/practical) ranged from a low of $100/section ($300 total) to a high of 480/section (1,440 total). The average cost of the FAA certification testing was $322.50/section (967.50 total). See Table 22.
The last two questions made inquiry regarding the employers of collegiate aviation maintenance training program graduates and the average starting salary for a new hire graduate from a collegiate aviation maintenance training program. The first question; “Who is the major employer of the graduates from your aviation maintenance training program?”

Respondents indicated that the primary employers for graduates from their particular collegiate aviation maintenance education program were; 1) airline operators 2) FAA certified repair stations 3) manufacturers and 4) general aviation/fixed base operators.

The final question made inquiry regarding the average starting salary for a graduate from the respondents particular collegiate aviation maintenance training program; “What is the average hourly wage for an Airframe and Powerplant Mechanic with a Bachelors degree in your region?” Respondents indicated a range that spanned
from a low of $18/hour ($34,560/year) to a high of $23/hour ($44,160/year). In addition, one respondent indicated that although the starting salaries for floor mechanics was low in their region, graduates from their program typically moved into aviation maintenance management positions quickly as their experience grew within their organizations and that this move upwards within the organization initiated a substantial increase in salary.

Summary

This chapter presented findings from the survey questionnaire on collegiate aviation maintenance training programs certified under 14CFR part 147 that are members of the Aviation Technician Education Council. The data obtained from the survey instrument were descriptively presented in this chapter in four sections that corresponded with the four research questions.

The first section contained responses from institutions concerning the administrative organization of collegiate aviation maintenance training programs. The second section contained responses with regard to the management of aviation maintenance training within the collegiate arena. The third section contained responses regarding program infrastructure within collegiate aviation maintenance training programs. The fourth and final section contained responses relating to the curriculum and operations of collegiate aviation maintenance training programs.

All of the results presented were obtained from the survey instrument responses.

Chapter V addresses conclusions derived from this study from analysis of the respondents indications recorded on the survey instrument and recommendations derived from the research findings.
CHAPTER V

CONCLUSIONS, RECOMMENDATIONS AND SUMMARY

Introduction

The purpose of this study was to gather and assimilate data from aviation maintenance training programs that confer bachelor of science degrees and that are members of the Aviation Technician Education Council (ATEC). This facilitates the construction of a baseline data source that represents current trends, points of comparison/contrast and current approaches to collegiate aviation technical education. This information comprises a source document that can aid in decision making for policy makers, administrators and associated stake-holders. One aim of this study was to document current practices and approaches within collegiate aviation technical education so that a basis for programmatic improvement could be established. An additional aim of the study was to analyze the data gathered in order to formulate conclusions with regard to collegiate aviation technical education so that recommendations could be made that, if implemented, would influence not only collegiate aviation technical education but aviation technical education as a whole, in a substantive and positive way.
Conclusions

Research Question #1

Administrative Organization of Collegiate Aviation Maintenance Training

The typical collegiate aviation maintenance training program is integrated into a larger aviation organization with the departmental structure being the most commonly encountered. Although one respondent indicated that their program was connected to upper administration through a free standing college of aviation, the relationship of the aviation department to the overarching institutional structure is most commonly maintained through an administrative connection to a related college. The broad applied science foundation of aviation makes integration into related colleges possible, if not necessarily ideal. Common administrative connections between aviation departments and upper administration are: College of Arts and Sciences, College of Engineering, College of Technology, College of Applied Arts and Sciences and College of Basic and Applied Science. In this respect, collegiate aviation technical education is structured administratively like other technical education programs that are commonly found in higher education.

Administrative oversight and leadership is provided by a department chair or a person in a leadership position that reports to the department chair. The title of that individual varied by program but director of aviation, program lead and coordinator were the most commonly encountered. Except for the title “program lead”, the other titles for those in positions of administrative oversight are higher education derived indicating the level of integration of the technical education program into the higher educational
framework. In contrast, “program lead”, is an industry derived title and may be indicative of the industry influenced culture in which this program operates. From a budgetary standpoint, a small change will be noted with regard to budgetary control, or responsibility for financial management. Most programs have their budgetary control resting with the department chair. The data indicated that the Dean of the college has minimal involvement in both the administrative and the budgetary aspects of the collegiate aviation maintenance education program. This may be an indication of the level of autonomy experienced by the collegiate technical education program. This relates to the findings that indicated these programs, for the most part were connected to larger aviation programs and as such were components of a larger entity that possesses a high degree of operational autonomy. In addition, the data indicated that the majority of collegiate aviation programs are connected to upper administration by being grouped into a college made up of other non-aviation related programs. In that light, the Dean may have no expertise in aviation education related matters and, therefore, relegates much of the administrative and financial decision making to those who possess expertise in those matters.

One area that needs improvement in collegiate aviation maintenance training is related to the establishment of endowments for the aviation maintenance training program. Although the existence of an endowment for a collegiate aviation maintenance training program may be encountered, they are not a common occurrence. In addition there are no legislative mandates regarding aviation maintenance training at the collegiate level indicated in the data. This indication was somewhat surprising since some states, with Oklahoma as an example, have established aerospace initiatives which include
aviation maintenance training, although in this instance they are mandated and supported at the certificate and associates degree levels only. Also, within this area, there is minimal alumni support for collegiate aviation maintenance training. One contributing factor here may be the amount of time it commonly takes for aviation mechanic salary levels to rise to a significant level. Also, travel and frequent moves are an integral part of the aviation maintenance profession and this makes it difficult for relationships to be maintained between institutions and alumni. Rounding out this area with regard to funding, about half of the collegiate aviation maintenance training programs are funded internally solely by student tuition. The others are funded through student tuition and a state derived revenue stream.

With regard to institution/industry relationships, the majority of collegiate aviation maintenance training programs maintain a relationship at some level with the aviation industry as a whole. As indicated by the comments provided by the respondents to this question, this relationship manifests itself in the form of equipment donations, internship opportunities for students, scholarship funding and possible student placement upon graduation and FAA certification.

Research Question #2

Management of Aviation Maintenance Training

The individual responsible for the oversight of a collegiate aviation maintenance training program possesses a title that varies depending upon the administrative structure of the program and the inherent culture of the program. Only one respondent indicated that the person responsible for operational oversight was the director of training. A
common title for the person responsible for the oversight of a collegiate aviation maintenance training program is department chair. Closely related to this title is program lead and section head, with these titles reflecting the industry’s influence on the culture of the maintenance training program. These titles are ones that will be familiar to FAA certified aviation mechanics working within an airline structure or an FAA certified repair station environment. They are also indicative of an overall aviation program that is divided into educational facets. In this case there would be a flight section head or lead, a maintenance section head or lead and most likely an avionics section head or lead. Again, this title choice reflects industry influence upon programmatic culture.

Titles that are more reflective of the academic nature of collegiate aviation technical education are aviation maintenance department chair for those programs in which the aviation maintenance training program represents a free-standing department and program coordinator or program manager for programs that are but one part of a larger aviation program. Within the collegiate environment, these, more academically derived titles for the individual responsible for oversight of aviation maintenance training are the most commonly encountered.

The collegiate aviation maintenance training program typically requires the master of science degree as the terminal degree for tenure. For some time, the requirement for a doctoral degree has been a topic of debate within collegiate aviation. Although the research indicated that the master of science degree was considered the terminal degree for tenure and for academic standing related issues, there is an indication from at least one participant in this study that the doctoral degree was the required terminal degree for tenure at that particular institution. The unsettled nature of this issue
is further reflected in the related question asking if the doctoral degree was required for tenure. 75% of respondents indicated “No”, and 25% indicated “Yes”.

A further indication of the debate within collegiate aviation maintenance regarding the requirement for a doctoral degree is found in the responses to a related follow-up question. In that question related to the existence of a required research agenda as part of the normal faculty work load, half of the respondents indicated that an established research agenda was a required part of the aviation maintenance faculty workload and half indicated that no research agenda was required. The implication indicated by the research instrument was that there are more responding institutions that require an established research agenda than there were institutions requiring the doctoral degree for tenure. Since an established research agenda is an integral part of doctoral level scholarly activity, there is an indication that if a particular collegiate aviation maintenance training program does not currently require the doctoral degree for tenure, it probably will in the very near future. A further indication of the nature of the ongoing debate that exists between the collegiate aviation maintenance training program and the traditional academic environment in which they exist was further investigated with a question asking the respondents opinion related to the requirement of an established research agenda as a part of the aviation maintenance faculty workload. In response to this question, no respondent strongly agreed with the requirement of an established research agenda, while 37.5% were somewhat supportive. 25% strongly disagreed with the requirement of an established research agenda and 12.5% somewhat disapproved of the requirement. 25% were undecided. The mean response of this particular question
indicated that the aviation technical education community is undecided on the issue at best and tends to be in some disagreement with regard to the issue.

The requirement of a doctoral degree as the terminal degree for an aviation maintenance faculty member with the commensurate research agenda is a debatable issue that the collegiate aviation community and technical education as a whole has grappled with for some time. The necessity for further research in this area is indicated by this study.

Regarding the issue of tenure, the majority of collegiate aviation maintenance training programs are made up of faculty lines that are tenure-track positions. There are some to be encountered in which there is a combination of tenure and non-tenure track positions and in a significant number of cases (25% of responding institutions) indicated that their particular collegiate aviation maintenance training programs are made up of faculty lines that are not tenure-track at any level.

For those collegiate aviation maintenance training programs that utilize non-tenure track faculty members, the minimum educational requirement for hiring is the bachelors degree, although one institution indicated that the master’s degree was the minimum educational requirement for a non-tenure track faculty member and another institution indicated that FAA mechanic certification was the minimum educational requirement for a non-tenure track faculty appointment.

Collegiate aviation maintenance training programs are comprised of a faculty body ranging from 5-6 members. Most of these individuals possess the master of science degree and are in tenure track positions, although the use of non-tenure track faculty members is not uncommon. Adjunct faculty members are commonly used as needed.
The use of graduate assistants is not a common occurrence although there are some found in ancillary roles such as computer support personnel or as lab assistants. This is a logical indication since a graduate of a collegiate aviation maintenance training program possess a degree and FAA mechanics certification but the lack of practical experience precludes their use in a classroom environment. Respondents indicated that one area where graduate assistants may be encountered is in the role of lab assistant. This is logical from an economical standpoint. The FAA specifies in 14CFR part 147.23 that an instructor possessing the appropriate mechanic certification must be available for each 25 students in each laboratory environment. In this case, it is not uncommon to use a graduate assistant as a laboratory assistant in large classes, since they will be under the direct supervision of the faculty member and it is much more economically viable for a program to pay a graduate assistant to function in that role rather than an individual who possesses faculty or adjunct credentials.

The collegiate aviation maintenance training program excels in the area of faculty development. Every responding institution indicated that funding was available for the development of faculty capability. This ranged from travel funds for manufacturer’s training schools and FAA seminars to tuition for the attainment of advanced degrees.

Research Question #3

Program Infrastructure of Collegiate Aviation Maintenance Training

The program infrastructure of a collegiate aviation maintenance training program is made up of a combination of campus and airport facilities. Most programs own their office space and maintenance hangar. Half of the programs own and operate the airport
on which they are located. It is not uncommon to encounter programs that rent or lease
 certain facilities as needed such as office space, classroom space and in one instance the
 maintenance hangar facility at the airport.

 Salaries for the aviation maintenance training faculty are provided directly
 through a university budget line for programs that are stand-alone entities. These funds
 are derived from a departmental budget line for those programs that are part of a larger
 aviation department.

 Should budgetary shortfalls occur within a collegiate aviation maintenance
 training program, the funds to cover the shortfall may be derived from a variety of
 sources. The primary source for shortfall funds is the university itself. The college to
 which the aviation maintenance training program is attached is also a source as well as
 the program itself. In minor instances, the board of regents/trustees or the state legislature
 may also be funding sources. In the case of half of the responding institutions, an increase
 in tuition for aviation maintenance courses was indicated should a budgetary shortfall be
 encountered. Related to this line of thought, the majority of responding institutions
 (87.5%) indicated that their particular aviation maintenance training program was not
 held to a profitability standard.

 Equipment and materials to support the collegiate aviation maintenance training
 program are provided using funds that are derived from the college that the program is
 administratively connected to. University funds and funds derived from student fees are
 also sources to be encountered. Grants and donations are also a source, but in most cases,
 rather than donating funds that can be used to procure equipment and materials, donations
 especially tend to be actual equipment and materials. Whole aircraft, components and
consumable materials are commonly donated by manufacturers and suppliers and in the case of whole aircraft, individual donations are not uncommon.

Most programs follow a standard academic schedule with a fall/spring semester. Most of the programs, in order to fit the 1,900+ hours required in a certified aviation maintenance training program into a standard four year degree calendar run classes during a summer semester as well. Half of the program offered both a day and a night program. By offering day and night classes, additional options are available to traditional students and the program can be offered more conveniently to non-traditional students, although it is usually not possible to complete the entire program within four academic years through a night program alone. By offering a night program a new level of flexibility is made available to traditional students and an additional non-traditional student base can be accessed that allows a larger segment of society to be served by the institution. In addition it avails the program of another source of revenue by serving this non-traditional student base thereby enhancing program sustainability and viability.

**Research Question #4**

*Curriculum and Operations of Collegiate Aviation Maintenance Training*

The FAA approved curriculum that forms the basis of a collegiate aviation maintenance training program approval certification is developed by the institution itself. The majority of programs exceed the FAA mandated 1,900 hours of instruction as specified in 14CFR part 147.21 (b) (3). The average number of instructional hours for a collegiate aviation maintenance training program as indicated by the data, is 1,957 hours. This is common for a collegiate program as degree requirements and additional required
courses that define the bachelor’s degree educational experience add hours to the overall curriculum. Additional hours in particular areas of instruction are an increasing trend as new developments in technology necessitate additional hours of instruction and as institutions are emphasizing the importance of theory in the applied sciences as indicated in the related literature.

With regard to the FAA requirement for a minimum level of academic achievement in mathematics and physics, the collegiate aviation maintenance training program tends to meet these requirements by outsourcing these classes to an appropriate area within their university. Depending upon the administrative structure of the aviation maintenance training program this may be within the program’s college or within a separate college within the university as appropriate.

The year of inception of each of the collegiate programs corresponds with pivotal years in technology education. Several of the institutions started their aviation maintenance training programs during the buildup of aviation prior to the Second World War. More programs were certified during the early 1950’s when the integration of technology into the educational mainstream was encouraged. The last wave of aviation maintenance training program development occurred within the 1965-1975 timeframe and corresponds to the G.I. Bill era of the Viet Nam war era. There have been no new collegiate aviation maintenance training programs certified since 1975.

The FAA requires that certain permanent records be kept by any approved aviation maintenance training program. The manner in which the collegiate aviation maintenance training program complies with this section of the regulations (14CFR part 147.33) is typically in both hard copy and in an electronic format. This seeming
incongruity stems from the fact that the collegiate environment lends itself to a proactive approach with regard to technology and the use of computer-based technology for record keeping is commonplace in that environment. In contrast, the FAA suffers from a technology deficit and an overall philosophical inertia that resists the move from paper to computer. Since there is no standardization within the FAA regional offices that oversee aviation maintenance training programs within their jurisdiction, there is a disparity of opinion with regard to the format in which the records must be kept in order to comply with the regulation. In response, most collegiate aviation maintenance training programs tend to keep records in both formats, the electronic form for in-house use and in the older hard-copy format for FAA compliance.

The integration of “live” or airworthy aircraft varies by institution. Most (75%) collegiate aviation technical education programs integrate “live” work into the curriculum. 25% indicated that they did not. Further investigation of the issue of “live” work for student maintenance instruction was polarized with 50% of respondents indicated some level of agreement with the integration of “live” work into the curriculum and 50% of respondents indicating some disagreement with the concept. Further investigation into the importance of exposing aviation maintenance students to the critical nature of actual maintenance practices and procedures is warranted.

The enrollment trend across the collegiate aviation maintenance training spectrum is mixed. 37.5% of responding institutions indicated that enrollment had increased over the past five years while an equal number of institutions indicated that enrollment had decreased over the past five years. 25% of responding institutions indicated that enrollment had remained stable over the past five years. Enrollment trends may be
affected by program region and location in relation to primary employers and the current economic health of those employers. Further research is warranted in this area.

Training aircraft, equipment, mock-up systems trainers, and related educational material are an important part of the collegiate aviation maintenance training program. The collegiate aviation maintenance training program has a broad spectrum of training aircraft that serve as training platforms. Light single-engine and multi-engine piston powered-aircraft are the staple of the training program. Turbo-prop and turbo-fan powered high performance aircraft are available, with corporate/business class aircraft being the norm here. 37.5% of responding institutions indicated that they had transport category aircraft capability within their programs with one having a Boeing 737.

The source for the aircraft used in collegiate aviation programs varies with the class of aircraft involved. Light single-engine and multi-engine piston powered aircraft are commonly procured from manufacturers and from salvage sources. Turbo-prop and turbo-fan powered aircraft are most commonly procured through military/government surplus sources although private donations of this class of aircraft are not uncommon. This is particularly true with older generation turbine powered aircraft such as the Lear 25 and the Sabre 65. Although these aircraft are high performance aircraft, the cost of engine replacement exceeds the value of the total aircraft; therefore, many private operators donate these aircraft to aviation maintenance training programs and receive positive tax advantages for doing so.

Training aids, mock-ups and system training devices used in collegiate aviation maintenance training programs are most commonly constructed within the program itself, although this type of material is also procured through proprietary sources when
available. Surplus military training equipment is also integrated in the program and, to a lesser degree, airline/operator derived equipment may be found.

The integration of new technology into collegiate aviation maintenance training programs is typically lagging and the implementation process is inefficient. With regard to the integration of full authority digital engine control (FADEC) technology, 75% of responding institutions indicated that there was no level of integration of this now commonplace technology into their training curriculum. With regard to the integration of Ballistic Parachute Recovery Systems technology into the approved curriculum, 75% of collegiate aviation maintenance training institutions indicated that they did not address this at any point in their training curriculum. Electronic flight instrumentation (EFIS) technology is another area of weakness in collegiate aviation maintenance training. 87.5% of responding collegiate aviation maintenance training programs do not address this technology at any point within their approved curriculum.

For those few programs that do address leading edge technologies, especially ballistic parachute recovery and electronic flight instrumentation systems these aviation maintenance training programs are a component of larger aviation departments that include flight operations that use aircraft that are equipped with this technology. Therefore these programs effectively integrate these technologies into the appropriate places in their approved curriculum since they have the technology available to them. In addition, the modification or amendment of the FAA approved curriculum has historically been a difficult proposition. As indicated in the literature, it is imperative that the FAA move quickly on the restructuring of the applicable regulations to facilitate
efficient integration of technology in order to maintain the levels of safety required within the aviation infrastructure (Hawkins, 2006).

The FAA utilizes an examiner designation system for the testing and certification of airmen. Within collegiate aviation maintenance training programs, the use of affiliated examiners (an individual associated at some level with the institution) is present in all cases. That designated examiner acts on behalf of the FAA while carrying out the duties of the designated mechanic examiner (DME) and is compensated for those duties. It is most common for the student to directly pay the designated mechanic examiner for their services as an additional cost associated with their aviation maintenance education. One respondent indicated that the cost for the certification testing was part of the overall program cost.

The cost for the certification process is broken out to reflect the individual sections of associated with the FAA certification/rating process. The average fee for each section of the testing process (made up of the general, airframe and powerplant sections) is $322 per section with an indicated high of $480 per section and an indicated low of $100 per section. Regional economic norms may play a role in the disparity in cost and bears additional research.

The collegiate aviation maintenance training program provides FAA certified aviation mechanics for the two extremes of the industry; with the flow of graduates evenly dividing between the airlines and general aviation. A few graduates from collegiate aviation maintenance training programs find employment with manufacturers and repair stations certified under 14CFR part 145.
The average starting wage for the graduate of a collegiate aviation maintenance training program ranges from $38,400 per year to $44,160 per year with a regional influence related to local cost of living being anticipated within the data. Although the annual salary for an FAA certified mechanic tops out at $53,683 according to the U.S. Bureau of Labor Statistics, the collegiate aviation maintenance training program graduate tends to advance higher within the structure of their organization because of the possession of the bachelors degree. In many cases transitioning to specialty areas of expertise or becoming inspectors, maintenance leads or moving into management roles with their commensurate increases in salary.

Recommendations

The data generated by this study provide a description of the current configuration of collegiate aviation technical education programs and the methods used to deliver instruction within these programs. Based upon this descriptive model, recommendations have been fomented that could be implemented by the associated stakeholders for the purpose of enhancing program quality. The recommendations generated by this research will be presented in four categories that correspond with each of the four research question areas. The recommendation categories are: 1) administrative organization of collegiate aviation technical education, 2) management structure of collegiate aviation technical education, 3) program infrastructure of collegiate aviation technical education, and 4) curriculum/operations of collegiate aviation technical education.
Research Question #1

_Administrative Organization of Collegiate Aviation Maintenance Education_

The fact, established in the data, that the majority of collegiate aviation maintenance training programs are a component of larger aviation departments which in turn are connected in a variety of ways to the larger academic system serves to confirm the lack of overall standardization or uniformity identified in the problem statement for this study. Currently there are no FAA guidelines or systematic information from any academic body that provides guidance or offers criteria for the organizational placement of aviation training with regard to the overarching academic organizational structure. This broad dissimilarity across the collegiate aviation training spectrum has a negative effect upon collegiate aviation maintenance education in that it can lead to isolation as well as impede the growth of relationships across the academic system.

**Recommendation #1:** Based upon the findings, it is recommended that additional research be undertaken to produce a best practices based document that would provide useful insight to collegiate institutions with regard to aviation training program placement within the overarching academic administrative structure. This would lead to standardization and optimization with regard to program development, alliance building, and program stability.

**Recommendation #2:** The lack of alumni financial support, endowments and industry relationships are interrelated. Industry relationships serve as pathways to equipment donations and grants, internship opportunities, placement opportunities, and direct financial gifts. Alumni support contributes to program esprit de corps, grant and
gift opportunities, and potentially the procurement of aircraft and equipment through direct donation. Development in these areas that would facilitate more support from these entities is encouraged. In addition, the formation of alumni associations for aviation technical education graduates would go far in helping to track alumni and create a forum for their ongoing interaction and participation with the program that, in turn, could foster the donation of funds and resources.

**Recommendation #3:** This study recommends the construction of aviation maintenance training program advisory councils that are made up of industry representatives and associated stakeholders that are not limited to local entities, but are made up of regional and national elements. In this vein, curricular content, internships, agreements, placement issues and grants/donations can be facilitated in a more efficient manner.

**Research Question #2**

*Management Structure of Collegiate Aviation Maintenance Education*

Within the management area of this study, there is one issue that is most prominent: the ongoing debate surrounding the requirement of a doctoral degree as the terminal degree within aviation education and within aviation maintenance training in particular. Although the majority of collegiate aviation maintenance training programs require the master of science degree for tenure within the discipline, other indicators show that there is a growing trend of requiring a doctoral degree as the baseline component of the tenure process. There is a lack of unanimity with regard to the requirement of a doctoral degree and the associated research agenda. As a result, the
issue generates spirited debate. The doctoral requirement issue stems from the overall friction that has existed for quite some time between the academic and the technical fields (Hansen, 2007). In addition, the issue is further exacerbated by the fact that aviation programs in general tend to be interdisciplinary in nature and are usually embedded within related academic administrative structures made up of loosely related programs rather than existing as free-standing colleges or institutes with intrinsic administrative autonomy. Therefore the academic culture of the overarching administrative structure is applied to the aviation program irrespective of the unique nature of aviation education with the inherent clash of opinion and view.

Recommendation #1: Further research is warranted in this area primarily to investigate the trend towards the doctoral degree as the terminal degree required for academic tenure and promotion in the higher education environment. This research should be made up of inquiry made across both the aviation and the technical education spectrum in order to gain the proper insight with regard to the issue. This research should include input from individuals within the overarching academic structure in which the aviation technical education program is imbedded, the individuals that are primarily in leadership positions within the aviation technical program itself, and the faculty members that make up the unit. In this way a greater understanding of the issue can be created that can lead to consensus within the educational community.

It is further recommended that the possibility of theoretical and practical faculty positions be identified in order to allow the necessary research regarding aviation technical education to proceed while not placing the universal expectation of a research agenda upon those faculty members who are primarily engaged in the practical
application side of the equation. This approach has been used with success in the Nursing education discipline to delineate the research related faculty from the practitioner related faculty (Lenz, Andreoli, Gilliss, Edwardson, & Honig, 2004). This distinction can be made at the faculty position line level that will allow faculty members to specialize in either area as appropriate to maintain an educational balance.

**Recommendation #2:** It is recommended that collegiate aviation education programs investigate the possibilities of achieving accreditation from the Accrediting Board of Engineering and Technology (ABET) under the recent ABET 2000 protocols (“ABET 2000,” 2010). This would reconnect the application facet of applied science to the theoretical part of the overall educational process and increase the standing and political footing of aviation technical education within the higher educational environment.

**Research Question #3**

*Program Infrastructure of Collegiate Aviation Maintenance Education*

**Recommendation#1:** Ownership of the facilities utilized by a collegiate aviation maintenance training program varies among the individual institutions in this study. At least one respondent indicated that the entire airport infrastructure was owned and operated by that institution. In others situations, the institution leased or rented their entire infrastructure. Although owning and operating an entire airport is unusual in today’s economy, it is recommended that institutions make investments in the required infrastructure to support their aviation maintenance training programs. This investment by the institution is tangible evidence of support by upper administration and it facilitates
the growth of relationships and opportunities that stabilize a program and create long-term commitments within the organization. It also communicates to potential students the commitment of the institution to the science and to the students themselves.

In addition, this would foster positive connectivity for the faculty, assure long term commitment and create a pride within the students that could potentially carry over to later involvement by the alumni in later years.

**Recommendation #2:** With regard to training aircraft and equipment, this study indicated that the funds for these items come from a variety of sources from the program level all the way up to the university level. It is encouraging the see this cross-programmatic commitment to this degree. One recommendation is that there be additional inroads made in the area of donations and grants from industry. Historically the aviation industry has been sporadic and noncommittal with regard to direct financial gifts to aviation maintenance training, although obsolete and surplus materials have been routinely donated. One area of concern within collegiate aviation maintenance training is the lack of state-of-the-art technology integration into the curriculum. This can be seen in light of the high cost of aircraft and components and the difficult economic environment that the aviation industry must operated within.

**Recommendation #3:** This study indicated that there was a division in practice with regard to this issue of evening class scheduling, with half of the responding institutions indicating that they offered night courses and half indicating that they did not. It is recommended that additional research be done in this area to draw viable conclusions with regard to night and other off-schedule course formats. There may very well be a group of non-traditional students and individuals currently working within the aviation
industry that would be inclined to receive collegiate aviation maintenance training and the associated FAA certifications if that program was available outside of the standard work hour format.

Research Question #4

_Curriculum/Operations of Collegiate Aviation Maintenance Education_

Within collegiate aviation maintenance training programs that participated in this study, the most recent program to begin operation was FAA certified in 1975. There have been no additional collegiate aviation technical education programs certified in the last 35 years and there have been many programs close in the same time frame. The prestigious aviation maintenance training program at the College of the Ozarks in Point Lookout, Missouri and the program at the University of Central Missouri are two such program within the region that have ceased operations in recent years. This trend has developed in spite of the fact that several economic and industry indicators predict a shortage of qualified aircraft mechanics in the coming years. This trend has several potential sources including the move of society away from mechanical interests; the expenses associated with the operation of aviation related training programs, and the tension that has developed within the academic community with regard to applied sciences and technology (Thom, & Thom, 2006).

_Recommendation #1:_ It is recommended that additional research in this area be conducted in cooperation with the FAA that can identify measures that would enhance the development of new collegiate aviation maintenance training programs.
Recommendation #2: Related to the aforementioned issue is the requirement for a minimum of 1,900 hours of instruction in an approved aviation maintenance training program. This requirement has historically created challenges that are difficult to overcome in the collegiate environment, especially in light of the fact that the student must complete these 1,900 hours and take additional hours that fulfill the requirement for the academic major. This situation was indicated in the data as the average number of hours in the aviation maintenance major was 1,975. These FAA required hours coupled with the academic hours associated with the general education requirements make it difficult for them to be completed in the traditional four years unless steps are taken to make the situation workable. This usually involves starting classes before 8:00 a.m., running classes five days per week and/or requiring some courses to be taken over the summer. This condition erodes student interest and enthusiasm for the major and taxes the faculty and associated personnel. Therefore, it is recommended that the entire aviation maintenance training process be reevaluated both by the FAA and associated stakeholders.

As previously noted in the report from the U.S. Government Accountability Office, *Aviation Safety: FAA Needs to Update Curriculum and Certification Requirements for Aviation Mechanics*, the entire aviation maintenance training system is antiquated and modeled on obsolete teaching methodologies (USGAO, 2003). The breakout between classroom instruction and laboratory exercises needs to be revisited and a self-paced program that would allow the student to progress through the training program after attaining identified competencies should be considered. In addition, the existence of state-of-the-art instructional technologies need to be integrated into the
aviation maintenance training pedagogy that will allow superior quality of information transfer without the high number of classroom hours that are traditionally required in a lecture only format. Should modern instructional technologies and pedagogies be implemented, the approved curriculum could be delivered in fewer hours and information and skills could be transferred to a greater degree. This would make for a physically shorter educational process, allowing for additional instructional time to be used to address new technologies without increasing the length of the training program. In addition, this would leave more time for the peripheral coursework and activities that make up the collegiate educational process, make for less stress on the student, and produce a more capable certified aircraft mechanic upon graduation.

**Recommendation #3:** The integration of technology warrants an additional recommendation with regard to the record keeping requirements of 14CFR part 147. The FAA has demonstrated a resistance to change with regard to technology in many administrative areas and this situation is a prime example of that resistance. Although computer technology has advanced to such a degree that the record keeping requirements of the associated regulation could be complied through an electronic means the FAA still insists on records being maintained in hard-copy. Therefore collegiate aviation maintenance training programs that utilize electronic record keeping internally must still maintain a hard-copy version of the records for the benefit of the FAA. It is recommended that the FAA establish a standardization process that recognizes the ability of electronic record keeping technology to establish the required level of compliance with the associated regulations and that the policy when implemented be standardized within the district office system across the United States so that no ambiguity or arbitrary
policies be interpreted and or implemented. This would drastically reduce the time required to maintain these records and reduce the physical space required to store and preserve these records.

**Recommendation #4:** This area addresses the acquisition and implementation of new generation technology into the aviation maintenance training curriculum. This study indicated that full authority digital engine control (FADEC), ballistic recovery parachutes and electronic flight instrumentation technology (EFIS/EICAS) were not, for the most part, being integrated to any real degree into the collegiate aviation maintenance training curriculum even though this technology represents the current state-of-the-art and is currently encountered in modern aircraft from the lightest general aviation aircraft to the highest performance air transport category aircraft. Among institutions that indicated that their particular programs did address these technologies, they further indicated that their aviation maintenance training program was associated with larger aviation departments that contained flight training programs that operated new generation aircraft that utilized these technologies such as the Cessna 172R/G-1000, the Cirrus SR-22 and the Diamond DA-42/44. For those programs that do not have access to these aircraft, there is a gap in their training curricula that needs to be addressed. It is recommended that relationships be established between the aircraft manufacturer and the collegiate aviation maintenance training program that will allow for the flow of training materials, system trainers, and components from that manufacturer and the training program. In addition, research relationships between the university and the manufacturer should be developed that will facilitate the creation of simulation software, and tactile procedure trainers that would benefit both entities involved.
**Recommendation #5:** It is recommended that a repository of equipment, components, materials and even available aircraft be established among manufacturers and the Aviation Technician Education Council (ATEC). The Council would then make these items available to the individual institutions on a reserve or check-out basis. This would allow the institution to address these critical technologies within their curricula without the expense associated with the acquisition of these items. The items could be reserved through ATEC and delivered on-site for the time period set aside for the training on a particular system or technology and then returned to the repository when the training period has ended. The manufacturer will be contributing to the education necessary to efficiently inspect and maintain the type of aircraft they produce and in turn, may be contributing to the education of future employees with a decrease in the amount of time and money necessary to bring a new hire employee to a place where they are a contributing member of the corporate team. This concept has never been explored within the collegiate aviation maintenance training arena and research on the feasibility of this approach should be undertaken.

**Summary**

This study provides information and insight regarding the nature and characteristics of collegiate aviation maintenance education. The data presented in this study comprises a resource that can be used by administrators and policy implementers within collegiate aviation technical education to evaluate current practices and practical methodologies with regard to administrative organization, management structure, program infra-structure, and curriculum/operations.
The study provided historical information regarding the aviation maintenance technician, the advent of federal regulation, and the impetus behind development of formal aviation technical education. In addition, the study provided background information regarding the certification standards of an approved aviation technical education program, the aviation technical education and certification processes, challenges facing collegiate aviation technical education, and the importance of the Aviation Technician Education Council.

As a result of the data gathered, recommendations to enhance efficiency and effectiveness in each of the four areas were provided including the acknowledgement that further research is needed in certain critical areas. In addition, although there is a significant body of research in other areas of aviation and aviation education including flight operations, management, air traffic control and maintenance related human factors, there has been practically no research conducted in the area of aviation technical education. As a result, this research represents a leading edge effort to better understand the nature of collegiate aviation technical education and aviation technical education overall. It has the potential of assisting in the standardization of collegiate aviation technical education and reducing the fragmentation of programs and processes within the institution and across the aviation educational spectrum. With shared knowledge, improved practices and methodologies can be developed that will enhance instructional quality and move the discipline forward. In addition the insight gained from this study can serve as an informational source within the collegiate environment that can shed light on the applied science of aviation maintenance technology and increase the levels of
understanding related to the science that can facilitate the acceptance of aviation technical education within the traditional academic environment.

The penultimate goal of this study is to enhance aviation technical education so that the aviation maintenance student can benefit from the highest quality education possible within an organization that is properly configured with regard to organizational placement, management structure, facilities/staffing and operations within the college/university environment. The United States of America benefits from the safest most effective aviation system in the world. The sustenance of this system is predicated on having the highest quality, best educated individuals available to maintain the standard of excellence at every critical point. The aviation maintenance technician and the aviation technical education program that provides the vital educational processes are foundational in this equation.
REFERENCES


Lederer, Jerome. (1941). *The mechanic’s creed*. Civil Aeronautics Board.


Middle Tennessee State University-Aerospace Technology (2009)) Retrieved 


Pusser, Brian, & Loss, Christopher, P. (2009). Organizational Structure of Colleges 


history.html.

parks.slu.edu/history.html.

*Airline Pilot*, 69, 18-20.

from http://www.faa.gov/history.

edu/history.html.

technology education over the last century*. ATEC Journal, 28(1), 24-30.

Thompson, Raymond E. (2010). Published Letter to ATEC Member Institutions. 
Battle Creek, MI: Western Michigan University.


APPENDIX A

QUESTIONNAIRE
Study: Collegiate Aviation Maintenance Training Programs Certified under 14CFR Part 147 That Are Members of the Aviation Technician Education Council.

Thank you for taking the time to participate in this study. The responses that you provide will be confidential. No data will be identified with any individual respondent or institution. By completing this survey and returning it, you are agreeing to participate and that you are giving informed consent.

Instructions: Please mark the most appropriate box for each selection. If “Other” is selected, please provide a brief comment in the space provided. Feel free to add additional comments as you choose.

Name:                                      Title:

Name of Institution:

Administrative Organization

1. Is your aviation maintenance training program a stand-alone entity or is it part of a larger aviation department?
   - Stand-Alone program
   - Part of a larger Aviation Program
   - Other

   Comment:

2. Is your collegiate aviation operations a program or a department?
   - Program
   - Department

   Comment:

3. What College is your aviation program connected to administratively?

   - The aviation program is not connected to any other college.

4. Who has administrative oversight of the aviation maintenance training program?
   - Dean
   - Assoc. Dean
   - Department Chair
   - Other

   Comment:
5. Who has budgetary oversight of the aviation maintenance training program?
  □ Dean  □ Assoc. Dean  □ Department Chair  □ Other

Comment:

6. Are there any endowments for the aviation maintenance training program?
  □ Yes (If yes, what is the total amount of the endowment/s?)
  □ No

7. Are there any State legislative mandates with regard to aviation maintenance training?
  □ Yes (Please describe briefly)
  □ No

8. Does your aviation maintenance training program maintain any relationships with an
   Airline, Manufacturer or other industry entity?
  □ Yes (Please describe briefly)
  □ No

9. What level of financial support for the aviation maintenance training program comes
   from Alumni Foundations or Associations?
  □ Significant Support  □ Moderate Support  □ Minimal Support

10. Is the aviation maintenance training program funded solely through student tuition
    generated finds?
    □ Yes  □ No (Please describe the nature of the funding source)
**Management of Aviation Maintenance Training**

1. What is the title used for the individual who is responsible for overseeing the operational aspects of the aviation maintenance training program?

   - Director of Training
   - Aviation Section Head
   - Other (Please include title here)

2. What are the educational requirements for a tenure-track aviation maintenance faculty member?

   - Doctorate
   - Master
   - Bachelor
   - FAA Certification Only

3. What are the educational requirements for a non-tenure track aviation maintenance faculty member?

   - Master
   - Bachelor
   - Associate
   - FAA Certification Only

4. How many aviation maintenance faculty members does your program have?

5. What percentage of your aviation maintenance faculty members are tenure track?

   ______%  

6. Is there a Doctoral degree requirement for tenure within the aviation maintenance program?

   - Yes
   - No

7. Is an established research agenda a required part of your aviation maintenance faculty work load?

   - Yes
   - No
7b. Please respond to the following statement:

“An established research agenda should be an integral part of the aviation maintenance faculty workload.”

☐ 1- Strongly Agree  ☐ 2- Somewhat Agree  ☐ 3- Undecided

☐ 4- Somewhat Disagree  ☐ 5- Strongly Disagree

8. Are adjunct/part-time faculty members used to support coursework in your aviation maintenance training program?

☐ Yes  ☐ No  ☐ In Occasion

9. Does your aviation maintenance training program have a system in place that encourages the aviation maintenance training personnel to attend industry schools or training seminars? (Funding available for faculty development)

☐ Yes  ☐ No

10. Are Graduate Assistants (GA’s) used in any capacity within your aviation maintenance training program?

☐ No  ☐ Yes (In what general Capacity)

Program Infrastructure

1. What facilities are used in support of the aviation maintenance training program?

☐ Campus Facilities  ☐ Airport Facilities  ☐ Combination

2. Are any of the program’s facilities/space rented or leased? (Check all that apply)

☐ Office  ☐ Hangar/Ramp  ☐ Classrooms  ☐ Other

Comments:
3. Does the institution own any of its facilities?
   
   ☐ Office   ☐ Maintenance Training Facilities   ☐ Airport   ☐ Other

   Comments:

4. Is the aviation maintenance training program an auxiliary operation that is held to a profitability standard?
   
   ☐ Yes   ☐ No

5. How is the student billed for the program?
   
   ☐ Per Semester   ☐ By Certification Course   ☐ Other

   Comments:

6. What budget provides for faculty salaries?
   
   ☐ University   ☐ Department   ☐ School or Program   ☐ Other

   Comments:

7. How are budgetary shortfalls covered?
   
   ☐ University   ☐ College   ☐ Program   ☐ Board of Regents/Trustees

   ☐ Fee Increases   ☐ Legislature   ☐ Other

   Comments:

8. How is equipment/training materials paid for?
   
   ☐ University   ☐ College   ☐ Program   ☐ Board of Regents/Trustees

   ☐ Directly from student fees   ☐ Legislature   ☐ Other

   Comments:
9. Does your program offer both a day and a night program?

☐ Yes    ☐ No

10. How many contact hours per week constitutes a full academic load for faculty Members in your aviation maintenance training program?

Curriculum/Operations

1. Is your approved 14CFR part 147 curriculum one that was commercially available or is it one of your institutions own design?

2. In what year did your institution begin to offer aviation maintenance training?

3. Does your 14CFR part 147 curriculum exceed the 1,900 hour regulatory requirement?

☐ No     ☐ Yes (If yes, what are the total hours of instruction in your curriculum?)

Comment:

4. How are the record keeping requirements of 14CFR part 147 complied with in your program?

☐ Hard Copy   ☐ Electronically   Both in hard copy and electronically

5. Does your aviation maintenance training program offer classes year round? (Fall/Spring and Summer Semester)

☐ Yes     ☐ No

Comment:
6. How are the math and physics requirements of 1CFR part 147 delivered in your aviation maintenance training program?

☐ Department/Program Faculty  ☐ Outsourced to another department on campus

Comment:

7. Is “live” work performed as part of your aviation maintenance training program?

☐ No  ☐ Yes

Comment:

7b. Please respond to the following statement:

“Performing “live” work on airworthy aircraft should be integrated into the educational experience of the student mechanic to the greatest extent possible.”

☐ 1- Strongly Agree  ☐ 2- Somewhat Agree  ☐ 3- Undecided

☐ 4-Somewhat Disagree  ☐ 5-Strongly Disagree

8. How many students are currently enrolled in your aviation maintenance training program?

9. Have the number of students in your aviation maintenance training program (over the last 5 years);

☐ Increased  ☐ Decreased  ☐ Remained the same

Comments:
10. What type of aircraft does your aviation maintenance training program have to support the curriculum? (Check all that apply)

☐ Transport Cat.  ☐ Business Class/Mil-Surplus Turbine

☐ Business Class/Mil-Surplus Turbo-Prop  ☐ ME Piston  ☐ SE Piston

Comments:

11. The primary source for the aircraft used in support of your aviation maintenance training program is/are? (Check all that Apply)

☐ Military Surplus  ☐ Manufacturer  ☐ Salvage  ☐ Combination

Comment:

12. The primary source of the training aid and mock-ups used in support of your aviation maintenance training program is/are? (Check all that apply)

☐ Military  ☐ Airlines  ☐ Proprietary Source  ☐ Constructed in house

Comment:

13. Does your program currently have a FACED equipped powerplant in the curriculum?

☐ No  ☐ Yes (Please Describe)

14. Does your program currently address Ballistic Recovery Parachute technology at any place within the curriculum?

☐ No  ☐ Yes (Please Describe)

15. Is “glass cockpit” technology a component of your program curriculum?

☐ No  ☐ Yes (Please Describe)

16. Does your program have “affiliated DME’s” to administer the oral and practical tests required for FAA certification?

☐ Yes  ☐ No
17. Is the cost of the testing required for FAA certification a part of the program cost or an additional expense covered by the student?

☐ Part of the program cost  ☐ A separate expense to the student

Comment:

18. What is the cost for the oral/practical test for your graduates? (General/Airframe and Powerplant)

19. Who is the major employer of the graduates from your aviation maintenance training program?

☐ Airlines  ☐ Manufacturers  ☐ Repair Stations  ☐ GA/FBO

Comment:

20. What is the average hourly wage for an A&P mechanic with a Bachelors degree in your region?
Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

Federal regulations and OSU policy require IRB review of all research involving human subjects. Some categories of research are difficult to discern as to whether they qualify as human subject research. Therefore, the IRB has established policies and procedures to assist in this determination.

1. Principal Investigator Information

<table>
<thead>
<tr>
<th>First Name: Terry</th>
<th>Middle Initial: L.</th>
<th>Last Name: Hunt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department/Division: School of Educational Studies</td>
<td>College: Education</td>
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<td>Phone: 580-455-2442</td>
</tr>
</tbody>
</table>

2. Faculty Advisor [complete if PI is a student, resident, or fellow] □ NA

<table>
<thead>
<tr>
<th>Faculty Advisor’s name: Dr. Steve Marks</th>
<th>Title:</th>
</tr>
</thead>
<tbody>
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<td>Fax: Email: <a href="mailto:steve.marks@okstate.edu">steve.marks@okstate.edu</a></td>
</tr>
</tbody>
</table>

3. Study Information:

A. Title

Collegiate Aviation Maintenance Training Programs Certified under 14CFR part 147 that are Members of the Aviation Technician Education Council

B. Give a brief summary of the project. (See instructions for guidance)

See attached description

C. Describe the subject population/type of data/specimens to be studied. (See instructions for guidance)

15 Program Directors of Aviation maintenance education programs that are members of the Aviation Technician Education Council.

Revision Date: 04/2006 1 of 3
4. Determination of “Research”.
45 CFR 46.102(d): Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy whether or not they are conducted or supported under a program which is considered research for other purposes.

One of the following must be “no” to qualify as “non-research”:

A. Will the data/specimen(s) be obtained in a systematic manner?
   - No  ☒ Yes

B. Will the intent of the data/specimen collection be for the purpose of contributing to generalizable knowledge (the results or conclusions of the activity are intended to be extended beyond a single individual or an internal program, e.g., publications or presentations)?
   - No  ☒ Yes

5. Determination of “Human Subject”.
45 CFR 46.102(f): Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains: (1) data through intervention or interaction with the individual or (2) identifiable private information. Intervention includes both physical procedures by which data are gathered (for example, venipuncture) and manipulations of the subject or the subject’s environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject. Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.

A. Does the research involve obtaining information about living individuals?
   - No  ☒ Yes
   
   If no, then research does not involve human subjects, no other information is required.
   
   If yes, proceed to the following questions.

All of the following must be “no” to qualify as “non-human subject”:

B. Does the study involve intervention or interaction with a “human subject”? 
   - No  ☐ Yes

C. Does the study involve access to identifiable private information?
   - No  ☐ Yes

D. Are data/specimens received by the Investigator with identifiable private information?
   - No  ☐ Yes

E. Are the data/specimen(s) coded such that a link exists that could allow the data/specimen(s) to be re-identified?
   - No  ☐ Yes

   If “Yes,” is there a written agreement that prohibits the PI and his/her staff access to the link?
   - No  ☐ Yes
Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

6. Signatures
Signature of PI: [Signature] Date: 03-24-2009
Signature of Faculty Advisor: [Signature] Date: 3-30-2009
(If PI is a student)

☑ Based on the information provided, the OSU-Stillwater IRB has determined that this project does not qualify as human subject research as defined in 45 CFR 46.102(d) and (f) and is not subject to oversight by the OSU IRB.

☐ Based on the information provided, the OSU-Stillwater IRB has determined that this research does qualify as human subject research and submission of an application for review by the IRB is required.

Dr. Sheila Kennison, IRB Chair

Date: 5/31/09

Revision Date: 04/2009 3 of 3
Terry Lile Hunt
Candidate for the Degree of
Doctor of Education

Dissertation: COLLEGIATE AVIATION MAINTENANCE TRAINING PROGRAMS CERTIFIED UNDER 14CFR PART 147 THAT ARE MEMBERS OF THE AVIATION TECHNICIAN EDUCATION COUNCIL

Major Field: Applied Educational Studies – Aviation and Space Education

Biographical:

Personal Data: Born in Harrison, Arkansas, on May 15, 1964, the son of Richard and Dorothy Hunt.

Education: Graduated from Harrison High School, Harrison, Arkansas in May 1982. Received Bachelor of Science degree in Aviation Science from the School of the Ozarks, Point Lookout, Missouri in May 1986. Received Master of Science degree in Aviation Safety from Central Missouri State University in May 1987. Completed the requirements for the Doctor of Education degree in Applied Educational Studies with an emphasis in Aviation and Space Education at Oklahoma State University, Stillwater, Oklahoma in May, 2010.


Professional Membership: Aircraft Owners and Pilots Association, Professional Aviation Maintenance Association, Experimental Aviation Association.
Name:  Terry Lile Hunt  
Date of Degree:  May, 2010

Institution:  Oklahoma State University

Location:  Stillwater, Oklahoma

Title of Study:  COLLEGIATE AVIATION MAINTENANCE TRAINING PROGRAMS CERTIFIED UNDER 14CFR PART 147 THAT ARE MEMBERS OF THE AVIATION TECHNICIAN EDUCATION COUNCIL

Pages in Study:  159  
Candidate for the Degree of Doctor of Education

Major Field:  Applied Educational Studies - Aviation and Space Education

Scope and Method of Study: The purpose of this study was to construct a descriptive analysis of aviation maintenance training programs that confer the Bachelor of Science degree and who are members of the Aviation Technician Education Council. The sample was comprised of the 11 educational programs within the population that met these criteria. Data was gathered with a questionnaire instrument that was delivered to the administrators of each sample institution. The data were presented in a textual and graphical format in order to establish a baseline database of leading characteristics and practices with regard to four research questions related to (1) administrative organization, (2) management structure, (3) program infrastructure, and (4) curriculum/operational practices.

Findings and Conclusions: A series of salient findings and conclusions were generated through analysis of the data. The findings allowed for a highly detailed description of collegiate aviation technical education programs to be constructed that enhances the knowledge and understanding of these unique programs. In addition, conclusions were drawn based upon the data that were the basis of recommendations that address each of the research question areas. The purpose of the recommendations is to enhance the quality and efficiency of aviation technical education which, in turn, will positively affect the quality and safety of the aviation industry as a whole.

ADVISER’S APPROVAL:  Steven K. Marks