AU/ACSC/AY2012

AIR COMMAND AND STAFF COLLEGE

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# THE NEED FOR INCREASED CRITICAL TECHNICAL SKILLS: INTEGRATING FEDERAL AVIATION ADMINISTRATION AIRFRAME AND POWERPLANT CERTIFICATION IN AIRCRAFT MAINTENANCE FORCE DEVELOPMENT

by

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A Research Report Submitted to the Faculty
In Partial Fulfillment of the Graduation Requirements

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18 December 2011

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## Preface

During my 22 years of service in active duty United States Air Force aircraft maintenance, I was passionate about our maintenance technicians having the skills and ability to assist other maintenance shops when they became overburdened with heavy workloads. As a crew chief, my goal was for all my crewmembers to be capable of taking on maintenance tasks beyond their area of responsibility. My thinking was not to wait for a specialist when I could do the job myself. As a Production Superintendent, I experienced many situations where maintenance actions for an aircraft were on hold because specialists responsible for maintaining a particular system were working on another aircraft. While one shop of specialists would be overloaded with work, another shop would be idle because the systems within their responsibility required little to no maintenance. My extensive practical experience indicated our maintenance technicians should be trained to perform maintenance across other systems, which would provide more technicians available to balance workloads and increase productivity. It also became clear from an operational perspective that a narrowly specialized maintenance workforce does not effectively manage and utilize human resources.

This research project provided the opportunity to explore the feasibility of the Air Force developing multi-skilled technicians to be more effective and efficient in supporting the mission goals and objectives of aircraft maintenance units.

I would like to thank my wife for her support as I worked on this research paper. I would also like to thank my instructor and advisor, Dr. Richard Smith, who helped me maintain focus on my research and guide me in the right direction when I got off path. Finally, I would like to thank the Air University Library staff for their assistance in locating the reference material needed to complete my research.

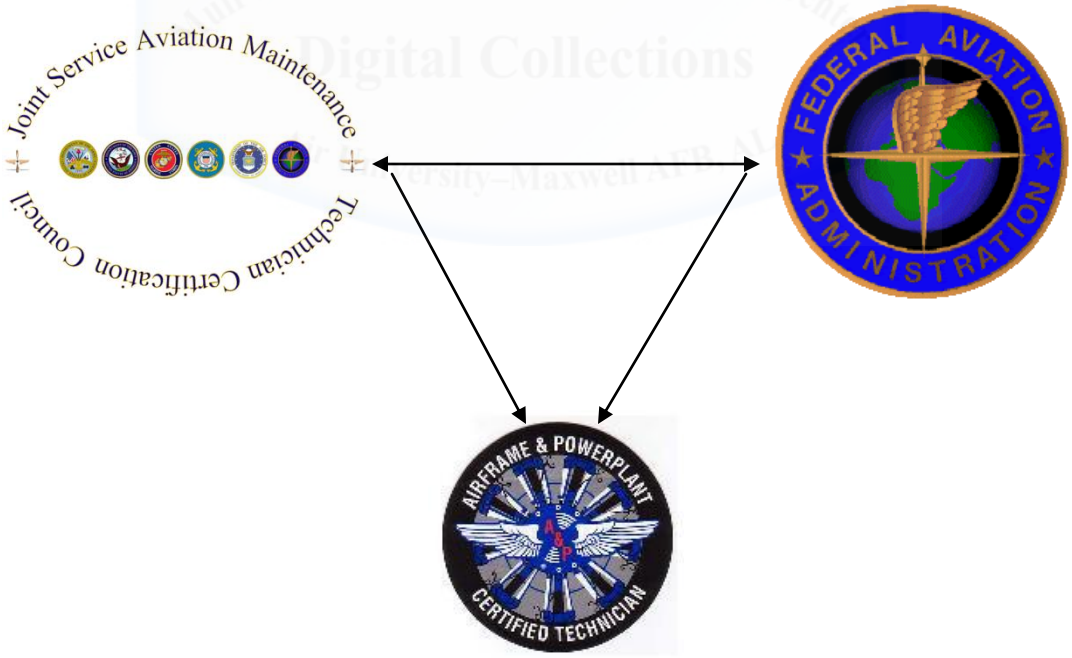
## Abstract

Imagine yourself being the commander of an aircraft maintenance unit deployed to a forward operating location in support of OPERATION X. You are responsible for the three shift maintenance operation of ten B-52 aircraft with 100 maintenance technicians from twelve different occupational specialties. As each week passes, the scheduled sorties increase. As the flying schedule increases, the amount of periodic inspections and required maintenance increase. During a single day of maintenance activity, six B-52's require four engines to be replaced, two spoiler actuators are leaking beyond limits, a landing gear fails to retract, an in-flight refueling receptacle fails to lock on to the refueling probe, a generator failed, and a radar antenna problem has driven the avionics technicians to wits end. At the same time, you must have five aircraft loaded and ready for the next day's mission. You observed that several maintenance actions are delayed due to some of the specialists being overburdened with maintenance actions. You see an unbalanced workload, but can't utilize the idle technicians because they are not trained to work on other systems beyond their responsibility. This is a common scenario, but not highlighted very often. Wouldn't maintenance operations be more efficient and effective in meeting mission objectives if aircraft maintenance technicians were trained and qualified to perform tasks across other specialties?

The purpose of this research is to evaluate and determine the feasibility of incorporating the Federal Aviation Administration (FAA) Airframe and Powerplant (A&P) training and certification process into Air Force aircraft maintenance training and force development, which could provide tangible benefits to the Air Force and the technician. In result, mission effectiveness could be enhanced. The FAA A&P Certification is one of the most difficult professional credentials to earn, encompassing strict FAA eligibility requirements, training, practical experience, and examination processes. The FAA A&P Certification process may

provide our aircraft maintenance technicians with broader and multi-skill sets to benefit Air Force in peacetime and wartime operations; reduce maintenance deployment manning packages; increase mission readiness; increase aircraft mission capability; and increase productivity. As the Air Force evaluates force development and force reductions, the multi-skilled and FAA-credentialed technician may be the key for maintenance efficiency and support of simultaneous local and deployment operations.

The results of the research revealed that there is a cost-effective method of incorporating FAA training and certification processes in Air Force aircraft maintenance training and force development and has proven to be successful.



## Section 1: Introduction

The basic knowledge and initial skills of Air Force aircraft maintenance technicians are developed through the fundamental core task training requirements. These core tasks are identified in the specialty training standard (STS) portion of the Career Field Education and Training Plan (CFETP), which designate the minimum technical school and on-the-job (OJT) training requirements for skill-level upgrade in an Air Force Specialty Code (AFSC).[1] These core tasks have changed significantly in the past 30 years and the changes are based on decisions made at the AFSC Utilization and Training Workshop (U&TW) conducted by Air Force Career Field Managers, MAJCOM Functional Managers, and career field subject matter experts. However, it is understandable that the fundamental tasks may be adjusted to train technicians to maintain new aircraft that enter the Air Force inventory. In civil aviation, the maintenance training requirements have been stable for a number of years and have been quite successful in developing the skills for technicians to maintain civilian aircraft. The Federal Aviation Administration (FAA) establishes the minimum curriculum requirements for future Airframe and Powerplant (A&P) mechanics attending Aviation Maintenance Technician Schools (AMTS) and its requirements have not changed significantly in over 50 years.[2] This is indicative of a process that works well for a profession that ensures the safety of the American public.

Students who graduate from an AMTS are eligible to a pursue FAA Mechanic Certificate with Airframe and Powerplant ratings, commonly referred to as "A&P".[3] The A&P certification is a civil aviation industry standard and is the professional development goal for most military and civilian maintenance technicians. AMTS graduates perform quite well during the certification testing processes and are well-qualified to perform in the civil aviation sector. However, for Air Force aircraft maintenance technicians to be eligible to pursue A&P

certification, he or she must provide the FAA with documented evidence of 30 months experience maintaining airframe and powerplant systems, and complete an interview process to determine eligibility. Air Force technicians, civilian fixed-based operations, and major airline technicians maintain similar systems, use similar tools and equipment, and conduct maintenance using similar practices and procedures. However, there is a disparity between Air Force and AMTS training requirements, as well as the Air Force technician's eligibility to pursue FAA A&P certification.

In the profession of aircraft maintenance, an important question that must be addressed, and the topic of this paper: "Would the Air Force benefit by integrating FAA A&P curriculum and certification processes in aircraft maintenance training?" To help answer this question, this research paper will use the evaluation framework to identify the aircraft maintenance issues, explain what areas need evaluation, describe how the data was collected, and justify any recommendations. The results of this research will help inform key Air Force personnel how developing FAA-credentialed technicians may help provide the critical skill-sets needed to sustain aircraft maintenance in multiple environments, increase mission readiness, and improve productivity and efficiency.

The research conducted to complete this paper will distinguish the major differences between Air Force and established AMTS training requirements. It will also examine the possible advantages and disadvantages of integrating FAA A&P training curriculum and certification processes in Air Force aircraft maintenance training. An evaluation of Air Force and FAA aircraft maintenance training requirements and FAA A&P certification procedures will be conducted. Air Force and FAA directives, as well as the author's 30 years of aircraft maintenance and management experience, will be utilized to identify the possible technical

training effectiveness, technical skill qualifications and cost-saving benefits the Air Force would gain by integrating FAA training and certification processes in maintenance force development.

Some forward-thinking leaders maintain that Air Force aircraft maintenance technicians should possess broader training and skill-sets to effectively support concurrent local and deployed flying operations, increase mission training and combat readiness, increase aircraft mission capability, and increase maintenance productivity of legacy and advanced technological aircraft. However, there are significant budgetary concerns to sustain an aircraft maintenance force at this level of competency. One option for the Air Force to consider is to integrate the FAA A&P training and certification processes in aircraft maintenance force development. This process would help mold more diverse and multi-skilled aircraft maintenance technicians and may possibly satisfy these operational concerns. The FAA A&P certification requires training in aircraft airframe and powerplant systems, practical experience maintaining major aircraft systems, and examination processes to validate the technician's capability to perform within FAA regulatory practices and aircraft manufacturer procedures. FAA certified Air Force technicians would possess the skills to maintain systems beyond his/her specialty, resulting in more technicians trained and qualified to perform broader tasks. Maintenance supervisors would be more capable of effectively and efficiently managing human resources and maintenance production when technicians are trained and qualified in broader aircraft systems. Additionally, it may assist technicians to transition to other weapon systems easily.

However, some critics argue that industry-based certification is not necessary to maintain Air Force assets and would not be cost effective. It is correct that the Air Force aircraft and Air Force maintenance concept do not require FAA certified technicians to repair or maintain its aircraft and systems. Military aircraft are categorized as "public aircraft" and therefore are not

FAA certificated, nor are they required to be maintained by an approved FAA maintenance program.[4] However, as the Air Force continues to evaluate force development and force reductions, the multi-skilled and FAA-credentialed technician may be a key ingredient to sustain maintenance efficiency for an aging aircraft fleet when the workforce is being considered for reduction and the operations tempo remains high.

## Section 2: Background of Aircraft Maintenance Training and Utilization Issues

To meet the demands of "doing more with less," Air Force leadership should seriously consider changing the way it currently trains aircraft maintenance technicians. To sustain maintenance efficiency and productivity in high operations environments with a smaller force, multi-skilled technicians are needed. Outlined in Air Force Instruction (AFI) 36-2232, *Maintenance Training*, the traditional Air Force aircraft maintenance training concept provides technicians the developmental knowledge and skills to maintain aircraft systems within the technician's specialized career field.[5] Technicians are trained and qualified to perform only the tasks within their Air Force occupational specialty.

Often, maintenance production is not equalized. The workload of some technicians of a specific maintenance AFSC may be relatively small when the aircraft systems within their area of responsibility are functioning properly. Technicians of other maintenance AFSC's may have heavy workloads due to high maintenance activities within the area of responsibility.

To demonstrate an unbalanced workload, an example is the aircraft maintenance structure of the B-2 Bomber located at Whiteman AFB. The B-2's quad-redundant hydraulic system is very reliable and requires a small amount of maintenance actions compared to the four-engine propulsion system. During a typical shift, the engine technicians (AFSC 2A6X1) are fully engaged in maintenance actions to control their maintenance backlog to support the weekly

flying schedule. The hydraulic technicians (AFSC 2A6X5), in contrast, may have few maintenance actions to perform. Additionally, maintenance actions are often delayed pending availability of specialized technicians assigned to other maintenance tasks. This unbalanced workload creates an unnecessary maintenance prioritization for supervisors and results in ineffective utilization and management of human resources. If hydraulic technicians were trained in propulsion systems and propulsion technicians trained in hydraulic systems, a larger pool of qualified technicians would be available to balance the workloads, resulting in improved utilization of human resources. As the Air Force aircraft maintenance community is considered for reduction, it is critical to train and develop technicians in multiple skill-sets to increase maintenance troubleshooting and repair efficiencies, as well as support concurrent local flight training and deployed combat operations.

To support force development and reduction initiatives, the Air Force should consider integrating the FAA A&P curriculum and certification processes in Air Force aircraft maintenance training. The FAA A&P certification process requires multi-disciplined training, practical experience in a wide range of major aircraft systems, and a two-phase examination process that validates the technician's knowledge and skills.[6] Integrating this concept could develop the multi-skilled and credentialed technicians needed to sustain maintenance efficiency and productivity in the high operations tempo environment. The benefits the Air Force would gain by adopting this process could include increased workplace efficiency by eliminating idle labor-hours, streamlined utilization and management of human resources, and developing multi-skilled technicians.

## Section 3: Discussion

Training is one of the most important responsibilities of commanders and supervisors because it is critical to improving and sustaining a unit's capability in accomplishing its mission. Wing commanders with a flying mission depend heavily on weekly flying schedules to ensure flight crewmembers maintain their qualification and skills in the assigned aircraft. The Air Force spends a large amount of their operating budget for flight training to ensure its flight crewmembers maintain proficiency and combat readiness to meet mission requirements. This is a necessary investment of resources to ensure mission success.

Training and enhanced skills are equally important in the profession of aircraft maintenance. AFI 36-2232, *Maintenance Training*, establishes training policy and procedures for personnel assigned to aircraft, munitions, and missile maintenance organizations throughout the Air Force. The instruction provides guidance for initial, upgrade, proficiency, qualification, and recurring training needed by technicians to perform in their AFSC. The instruction recognizes the criticality of maintenance training and the overall capability of a maintenance unit depends on the training of assigned maintenance personnel.[7] When balancing resources (aircraft, equipment, personnel, etc.), maintenance training has an equal level of priority with the operational training mission.

Each aircraft maintenance AFSC has a CFETP, which outlines the training that technicians should receive in order to develop and progress throughout their career. The CFETP identifies initial skill, upgrade, qualification, advanced and proficiency training. Initial skill training is the specialty-specific training an individual receives for award of the 3-skill level (Apprentice), and is typically completed at Air and Education Training Command (AETC) technical training schools. Upgrade training identifies the mandatory courses, task qualification

requirements, and correspondence course requirements for award of advanced skill levels. Qualification training is hands-on task performance training that qualifies a technician to perform a specific task. Advanced training is formal specialty training used for selected technicians. Proficiency training is additional training to increase the technician's skills and knowledge beyond the minimum requirements. A concern is that the different types of training specified for maintenance training relates only to the tasks a technician needs to perform within his/her Air Force occupational specialty. There is no requirement to broaden a technician's knowledge and skills beyond his/her occupational specialty.

The current training and qualification philosophy creates a narrowed specialization within the aircraft maintenance workforce, resulting in unbalanced production and ineffective utilization of manpower. For example, hydraulic specialists (AFSC 2A6X5) are trained and qualified to maintain only the aircraft hydraulic systems. The workload of these technicians may be relatively small when the hydraulic systems of the wing's fleet are functioning properly. Furthermore, propulsion specialists (AFSC 2A6X1) are trained and qualified to maintain only the propulsion systems. The workload of these technicians may be heavy due to the complexity of the engine systems and high maintenance activities. Finally, the workload of a C-17 aircraft crew chief (AFSC 2A5X1) may be heavy due to aircraft inspections, maintenance actions, and launch/recovery operations. This narrow specialization of maintenance technicians contribute to unbalanced productivity and often results in delayed maintenance actions. This observation is also perceived by the civilian aviation industry. Raymond Goldsby[1] mentioned in his aviation

[1] Raymond Goldsby was the Director of Maintenance Operations Training and Director of Maintenance for United Airlines (UAL). After retirement from UAL, he was an independent aviation industry advisor and conducted several special research studies and regulatory projects for Flight Safety International and HQ FAA.

industry report, "The perception of both the FAA and the civilian aviation community was that military aviation maintenance had become very specialized in both training and personnel assignments." [8] The common culprit for delayed maintenance actions stems from the low availability of specialized technicians that are assigned to other maintenance priorities or tasks. This unbalanced productivity also creates an unnecessary maintenance prioritization for supervisors. These inefficiencies can result in a unit's incapability to meet mission requirements due to ineffective utilization and management of human resources. To counteract these inefficiencies, technicians who are trained across other specialties may provide the Air Force a larger pool of qualified technicians to balance the workload. Raymond Goldsby supported and recommended a similar view in his report,

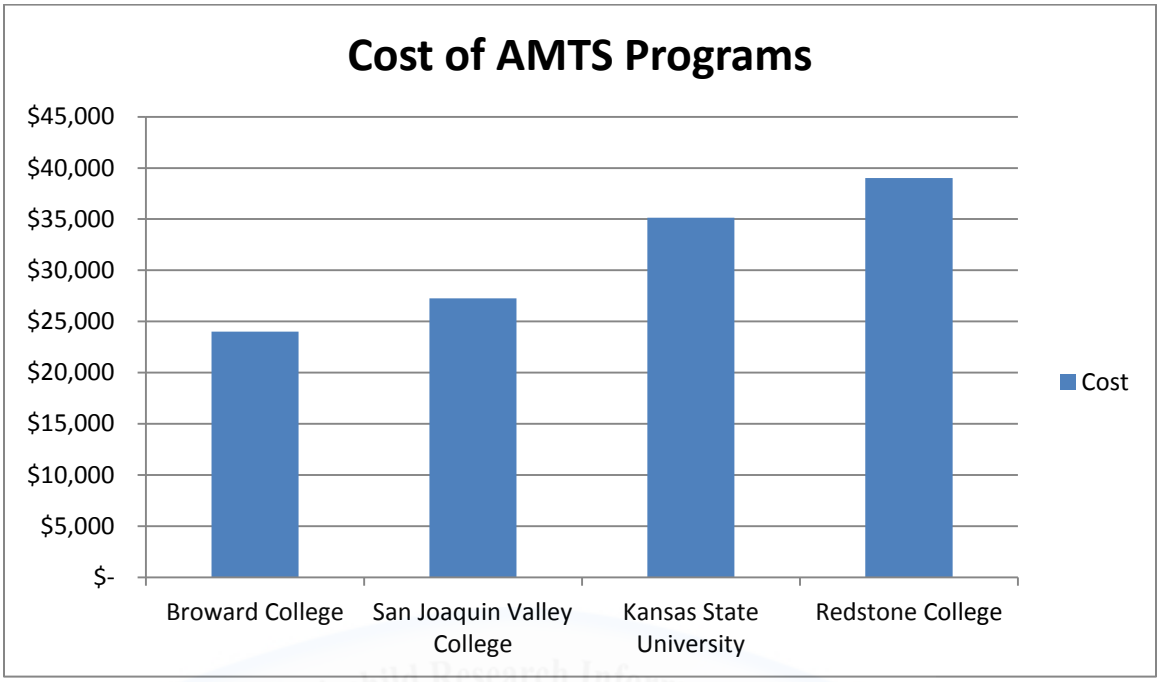
> *"As the Armed Forces decrease in size and become more expeditionary, the need for multi-skilled aviation mechanics will increase. In the past, our large military forces required a high degree of specialization. Specialization allowed the military services to conduct their mission and training in the most efficient way for the demands placed upon them. Today, this situation has changed. The decrease in overseas presence and increased deployment demand has driven a greater need for aviation mechanics with more skills. Experienced mechanics that have higher levels of training in all facets of aircraft maintenance are more valuable to the services in meeting the increased deployment demand with leaner logistics requirements. The skills sought for experienced mechanics parallel favorably with the Federal Aviation Administration (FAA) Airframe and Powerplant (A&P) Certification requirements."*
>
> - *Raymond Goldsby, Aviation Industry Advisor*[9]

The Air Force maintenance technician's counterpart within the civilian sector are the A&P certified maintenance technicians employed at local airports (fixed-based operations), regional air carriers (Skyways, Frontier, etc.), maintenance-repair-overhaul facilities (TIMCO, Lufthansa, etc.), and major air carriers (United, Delta, etc.). Broadly specialized, the A&P

mechanic is all-systems trained and qualified to perform airworthiness inspections, fault-isolation, rigging, maintenance, repair, and operational checkout of all aircraft systems and subsystems. These systems include flight controls, powerplant, auxiliary power units, hydraulic, landing gear, electrical, environmental, fuel, position and warning, and ice/rain control systems. The A&P mechanic also performs routine maintenance and replacement of aircraft parts, and sheet metal and composite repairs on aircraft surfaces.[10]

The FAA establishes the minimum curriculum requirements for A&P mechanics attending an approved AMTS. These requirements are regulated in Title 14, CFR, Part 147, *Aviation Maintenance Technician Schools*, which requires at least 1,900 hours of formal education in subject areas encompassing aircraft general, airframe, and powerplant systems.[11] Additionally, AMTS graduates earn an associate in an applied science degree upon completing the program. AMTS graduates also complete the FAA A&P certification, a civil aviation industry standard and a requirement for employment with most civilian aviation maintenance companies. However, the AMTS course of study and FAA A&P certification can be expensive. The average cost of AMTS programs nation-wide is about $30,000 per student. For example, the total cost for the Broward College's 2-year AMTS program is $24,000[12], while the Redstone College's AMTS program is $39,000.[13] The length of time for program completion and the costs involved is a deterrent for most military aircraft maintenance technicians to enroll in an AMTS program. Refer to Figure 1 for analysis of average costs of FAA-Approved AMTS Programs.

*Figure 1: Cost Analysis of FAA AMTS Programs*[14]




In some cases, the level of required training between Air Force technicians and A&P mechanics are comparable. However, for most AFSC's, there is a huge gap in the required curriculum subjects and level of knowledge and skills gained. For instance, the KC-135 aircraft crew chief (AFSC 2A5X1) is trained in the hydraulic and propulsion systems at the fundamental level for award of the 5-skill level (Journeyman). The technician should know and understand aircraft system fundamentals and servicing. However, the student attending an FAA AMTS must know, understand, and apply the practice of inspection, troubleshooting, servicing, operation, and repair of hydraulic and powerplant systems and components. When considering the Air Force hydraulic (AFSC 2A6X5) and propulsion (AFSC 2A6X1) technicians, he or she is trained to an equivalent level as received by an FAA AMTS student. However, Air Force hydraulic and propulsion technicians are only trained and qualified in his or her respective aircraft systems.

## Section 4: Methodology and Explanation of Evaluation Criteria

The research conducted to complete this paper distinguishes the major differences between Air Force and established AMTS training requirements. It also examined the advantages and disadvantages of integrating FAA A&P training curriculum and certification processes in Air Force aircraft maintenance training. An evaluation of Air Force and FAA aircraft maintenance training requirements and FAA A&P certification procedures was conducted. Air Force and FAA directives, as well as the author's 30 years of aircraft maintenance and management experience, were utilized to identify the possible technical training effectiveness, technical skill qualifications and cost-saving benefits the Air Force would gain by integrating FAA training and certification processes in maintenance force development.

A comparative analysis was conducted of sampled key tasks contained in the FAA-required curriculum and the 5-skill level (Journeyman) upgrade training requirements for three Air Force aircraft maintenance career field CFETP's. The goal was to determine the differences of aircraft systems knowledge and skill-sets gained by Air Force maintenance technicians at the 5-skill level compared to a student completing an FAA AMTS program.

## Section 5: Evaluation Results and Analysis

The analysis of this research revealed that there are significant differences in the subject areas taught, as well as the required level of required demonstrated proficiency. Figure 2 reflects the analysis results of the education and training requirements for a KC-10 aircraft crew chief (AFSC 2A5X1) to be qualified for award of the 5-skill level and the curriculum subjects delivered to an FAA AMTS student. The KC-10 was chosen due to its similar airframe and systems of the DC-10 used in the civilian aviation industry. The data collected from the 2A5X1 CFETP and Title 14, CFR, Part 147, *Aviation Maintenance Technician Schools*, demonstrates the

KC-10 aircraft crew chief is trained in similar tasks as compared to a FAA AMTS student. However, there are significant differences. The FAA AMTS student is trained and qualified to perform maintenance in broader aircraft systems than the KC-10 aircraft crew chief as the FAA AMTS student receives additional education and training in the hydraulic, landing gear, flight control, and powerplant subject areas.

*Figure 2: Example of KC-10 Crew Chief*[15] *and FAA A&P Curriculum*[16]

| | ***2A5X1 KC-10 Aerospace Maintenance CFETP (Trained to 5-Skill Level)*** | | ***CFR Part 147 AMTS Curriculum*** |
|---|---|---|---|
| **A.** | **Hydraulic Systems** | **A.** | **Hydraulic Systems** |
| 1. | System fundamentals and inspection | 1. | Repair hydraulic and pneumatic power systems components. |
| 2. | Service reservoirs and accumulators | 2. | Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems. |
| **B.** | **Aircraft Landing Gear Systems** | **B.** | **Aircraft Landing Gear Systems** |
| 1. | System fundamentals, servicing, and inspect landing gear systems | 1. | Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems. |
| 2. | Inspect, remove/install wheel and tire assembly and brakes | **C.** | **Assembly And Rigging** |
| **C.** | **Flight Control Systems** | 1. | Assemble aircraft components, including flight control surfaces. |
| 1. | System fundamentals and component identification | 2. | Balance, rig, and inspect moveable primary and secondary flight control surfaces. |
| 2. | Inspect and operate flight controls | **D.** | **Powerplant Systems** |
| **D.** | **Powerplant Systems** | 1. | Reciprocating and Turbine Engines |
| 1. | System fundamentals | 2. | Engine Inspection |
| 2. | Component identification | 3. | Engine Instrument Systems |
| 3. | Oil system servicing | 4. | Engine Fire Protection Systems |
| 4. | Joint Oil Analysis Program | 5. | Engine Electrical Systems |
| 5. | Engine and Auxiliary Power Unit components and system operation | 6. | Lubrication Systems |
| 6. | Inspect engine, engine inlets/exhausts | 7. | Ignition And Starting Systems |
| | | 8. | Fuel Metering Systems |
| | | 9. | Engine Fuel Systems |
| | | 10. | Induction And Engine Airflow Systems |
| | | 11. | Engine Cooling Systems |
| | | 12. | Engine Exhaust And Reverser Systems |
| | | 13. | Propellers |
| | | 14. | Auxiliary Power Units |

Figure 3 reflects the analysis results of the education and training requirements for an Air Force hydraulic specialist (AFSC 2A6X5) to be qualified for award of the 5-skill level and the curriculum subjects delivered to an FAA AMTS student. The data collected from the 2A6X5 CFETP and Title 14, CFR, Part 147, *Aviation Maintenance Technician Schools*, demonstrates the Air Force hydraulic specialist is equally trained and qualified in aircraft hydraulic systems as the FAA AMTS student. However, the FAA AMTS student receives education and training in the powerplant subject areas. Again, the FAA AMTS student is trained and qualified to perform maintenance in broader aircraft systems than the Air Force hydraulic specialist.

*Figure 3: Example of Air Force Hydraulic Specialist [17] and FAA A&P Curriculum [18]*

| | ***2A6X5 Hydraulic Specialist CFETP (Trained to 5-Skill Level)*** | | ***CFR Part 147 AMTS Curriculum*** |
|---|---|---|---|
| **A.** | **Hydraulic Systems** | **A.** | **Hydraulic Systems** |
| 1. | Hose and Tube Assemblies | 1. | Repair hydraulic and pneumatic power systems components. |
| 2. | Electrical/Electronic Fundamentals | 2. | Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems. |
| 3. | Hydraulic Fundamentals | **B.** | **Aircraft Landing Gear Systems** |
| 4. | Repair hydraulic power systems components. | 1. | Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems. |
| 5. | Inspect, check, service, troubleshoot, and repair hydraulic power systems. | **C.** | **Assembly And Rigging** |
| 6. | Remove/install hydraulic components | 1. | Assemble aircraft components, including flight control surfaces. |
| 7. | Landing Gear Systems | 2. | Balance, rig, and inspect moveable primary and secondary flight control surfaces. |
| 8. | Nose Wheel Steering Systems | **D.** | **Powerplant Systems** |
| 9. | Wheel Brake Systems | 1. | Reciprocating and Turbine Engines |
| 10. | Flight Control Systems | 2. | Engine Inspection |
| 11. | Weapons/Cargo Door Systems | 3. | Engine Instrument Systems |
| 12. | Air Refueling Receiver Systems | 4. | Engine Fire Protection Systems |
| | | 5. | Engine Electrical Systems |
| | | 6. | Lubrication Systems |
| | | 7. | Ignition And Starting Systems |
| | | 8. | Fuel Metering Systems |
| | | 9. | Engine Fuel Systems |
| | | 10. | Induction And Engine Airflow Systems |
| | | 11. | Engine Cooling Systems |
| | | 12. | Engine Exhaust And Reverser Systems |
| | | 13. | Propellers |
| | | 14. | Auxiliary Power Units |

Figure 4 reflects the analysis results of the education and training requirements for an Air Force propulsion specialist (AFSC 2A6X1) to be qualified for award of the 5-skill level and the curriculum subjects delivered to an FAA AMTS student. The data collected from the 2A6X1 CFETP and Title 14, CFR, Part 147, *Aviation Maintenance Technician Schools*, demonstrates the Air Force propulsion specialist is equally trained and qualified in aircraft propulsion or powerplant systems as the FAA AMTS student. However, the FAA AMTS student receives education and training in the hydraulic, landing gear, and flight control subject areas. Therefore, the FAA AMTS student is trained and qualified to perform maintenance in broader aircraft systems than the Air Force propulsion specialist.

*Figure 4: Example of Air Force Propulsion Specialist [19] and FAA A&P Curriculum [20]*

| | ***2A6X1 Propulsion Specialist CFETP (Trained to 5-Skill Level)*** | | ***CFR Part 147 AMTS Curriculum*** |
|---|---|---|---|
| **A.** | **Powerplant Systems** | **A.** | **Hydraulic Systems** |
| 1. | Engine Instrument Systems | 1. | Repair hydraulic and pneumatic power systems components. |
| 2. | Engine Fire Protection Systems | 2. | Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems. |
| 3. | Engine Electrical Systems | **B.** | **Aircraft Landing Gear Systems** |
| 4. | Lubrication Systems | 1. | Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems. |
| 5. | Ignition And Starting Systems | **C.** | **Assembly And Rigging** |
| 6. | Fuel Metering Systems | 1. | Assemble aircraft components, including flight control surfaces. |
| 7. | Engine Fuel Systems | 2. | Balance, rig, and inspect moveable primary and secondary flight control surfaces. |
| 8. | Induction And Engine Airflow Systems | **D.** | **Powerplant Systems** |
| 9. | Engine Cooling Systems | 1. | Reciprocating and Turbine Engines |
| 10. | Engine Augmenter, Exhaust And Reverser Systems | 2. | Engine Inspection |
| 11. | Propellers | 3. | Engine Instrument Systems |
| 12. | Auxiliary Power Units | 4. | Engine Fire Protection Systems |
| 13. | Engine Inspection and Preventive Maintenance | 5. | Engine Electrical Systems |
| 14. | Engine Controls | 6. | Lubrication Systems |
| | | 7. | Ignition And Starting Systems |
| | | 8. | Fuel Metering Systems |
| | | 9. | Engine Fuel Systems |
| | | 10. | Induction And Engine Airflow Systems |
| | | 11. | Engine Cooling Systems |
| | | 12. | Engine Exhaust And Reverser Systems |
| | | 13. | Propellers |
| | | 14. | Auxiliary Power Units |

It is importance to note that the FAA and civilian aviation employers value the level of training and education the AMTS student receives because it provides the flexibility to shift diversely qualified technicians to other maintenance actions to balance productivity. In doing so, idle labor is eliminated because all technicians are utilized. If the Air Force considered training crew chiefs, hydraulic technicians, and propulsion technicians in similar curriculum subjects and knowledge levels required of an FAA AMTS, a larger pool of multi-skilled technicians would be available to balance the workloads of all Air Force maintenance units. As the Air Force aircraft maintenance community is being considered for reduction, it is critical to train and develop technicians in multiple skill-sets to increase maintenance troubleshooting and repair efficiencies, as well as support concurrent local flight training and deployed combat operations.

Several Air Force Career Field Managers of other disciplines are recognizing the value of industry-based training and professional certifications. For instance, in the Information Assurance (IA) career field, DOD 8570.1M requires individuals performing in certain IA positions to hold specific civilian industry certifications. The policy provides the solution to train, certify, and manage the DOD IA workforce. The policy requires IA technicians and managers to be trained and certified to a DOD baseline requirement.[21] Industry-based certifications , such as Computing Technology Industry Association (CompTIA) A+ and Security+, Global Information Assurance Certification (GIAC) Security Essentials Certification (GSEC), and/or International Information Systems Security Certification Consortium, Inc. (ISC)² Certified Information Systems Security Professional (CISSP) have been identified as being mandatory credentials for specific duty positions and also satisfies the DOD 8570.1M requirements. Likewise, the A&P certification is a civil aviation industry standard and is the professional development goal for most military and civilian maintenance technicians.

## Section 6: Conclusion and Recommendations

Increasing technical education standards is a critical part of professional development of all Airmen. For the enlisted force, the Air Force emphasizes higher education for enlisted professional development. It is mentioned throughout AFI 36-2618, *Enlisted Force Structure,* for enlisted Airmen to "…continue to broaden technical skills and pursue professional development through on- and off-duty education."[22] However, another element of professional development, which is often overlooked, is occupational-related professional certification. The topic of this research paper was to emphasize the importance of professional credentialing, how it can strengthen the skill-sets of Air Force enlisted members, primarily within aircraft maintenance, and any benefits the Air Force would gain.

There are distinct advantages and disadvantages of integrating FAA curriculum and A&P certification in Air Force aircraft maintenance force development. However, this paper maintains that the Air Force should consider integration in some fashion because it would help mold more diverse and multi-skilled aircraft maintenance technicians and increase productivity. The Air Force would benefit by gaining technicians with broadened and advanced knowledge, experience, and skill-sets. Aircraft maintenance units would be more efficient in supporting multiple operational environments. Mission readiness and aircraft maintenance productivity would be increased because a large pool of multi-skilled technicians would be available to handle increased workloads and troubleshooting or repairing complex systems. Additionally, it may be possible to reduce the amount of technicians needed for deployment planning because the larger pool of multi-skilled technicians would eliminate the need for a large amount of specialists that may be underutilized.

The Unit Type Code (UTC) identifies the mission capability and manpower and equipment requirements. According to AFI 10-401, *Air Force Operations Planning and Execution*, "War planners use UTCs to document total Air Force manpower and logistics requirements needed to support the national military strategy during operational planning and execution activities."[23] A right-sized UTC provides optimal support to the combatant commander or component. With aircraft maintenance technicians being capable of doing more, UTCs would not require as many people to make it complete. The smaller the UTC, the amount of people to be sourced for a deployment would be less and the cost of the deployment would be less. This reduced deployment package would also reduce the total operating budget to support contingency operations.

Furthermore, developing multi-skilled technicians may assist senior Air Force leaders in force reduction decisions. For example, the 2A6X1 and 2A6X5 AFSC's could be merged into the 2A5X1, 2A5X2 and 2A3X3 crew chief AFSC's. These mergers could assist leaders in identifying surplus manpower billets in meeting forces reduction targets.

The disadvantages for the Air Force would be the increased formal training requirements and costs. The FAA AMTS curriculum requires at least 1,900 hours of formal education in aircraft general, airframe, and powerplant subject areas. The typical AMTS program is 18 to 24 months and the average cost per student is about $30,000. It is impractical, nor cost-effective, for AETC technical training schools to deliver a 24-month curriculum for all first-term aircraft maintenance technicians in training to the Apprentice level. Therefore, it is not realistic to integrate this advanced level of training during the technician's first term of enlistment. The consideration should be approached during the technician's second enlistment, the point an Airman is categorized as a "Career Airman".

It is feasible to initially provide advanced skills training and qualifications for the second-term technician. This is the year-group that maintenance units need multi-skilled technicians. It is also the point where the Air Force would receive a positive return on its investments. It is critical for technicians in the ranks from Senior Airman to Master Sergeant to master his or her skills and technical competencies. According to AFI 36-2618, *Enlisted Force Structure*, junior enlisted and noncommissioned officers must "…maintain the highest level of readiness to meet mission requirements by being technically ready to accomplish the mission."[24] This same level of competency also applies to a Master Sergeant, as he or she is "…transitioning from being technical experts and first line supervisors to leaders of operational competence skilled at merging subordinates' talents, skills, and resources with other teams' functions to most effectively accomplish the mission."[25]

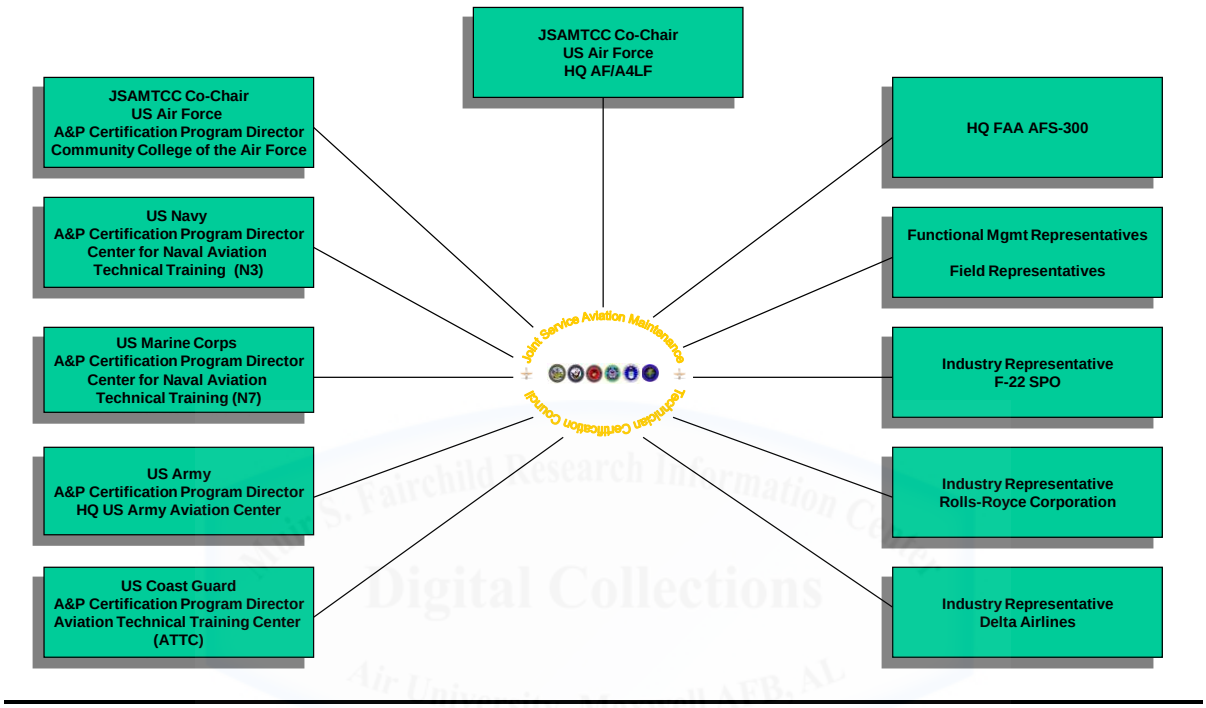
Regardless, it would be a challenge to integrate FAA curriculum and A&P certification in Air Force aircraft maintenance force development due to current national economic instability and Air Force budgetary constraints. However, there is another option and is the formal recommendation of this research and thesis.

An effort has already taken place to assist military aircraft maintenance technicians in their pursuit of FAA A&P certification. The Joint Service Aviation Maintenance Technician Certification Council (JSAMTCC) created a joint-service A&P Certification Program that was approved in 2002 by HQ FAA, Flight Standards Service - Aircraft Maintenance Division (AFS-300).[26] The joint-service A&P Certification Program consists of standardized program policies and procedures and is administered separately by each branch of the armed services, including the US Coast Guard. The Air Force A&P Certification Program is managed and administered by the Community College of the Air Force.[27] This voluntary enrollment program provides

participants the resources, education, and skill-gap experiences necessary to meet FAA eligibility requirements. The program also includes three specialized courses administered through Air University Online.

Graduates of the joint-service A&P Certification Program are issued a *Certificate of Eligibility*, which is recognized by the FAA for authorization to take the FAA A&P certification exams. As referenced in FAA Order 8900.1, *Flight Standards Information Management System*, Chapter 5, "The applicant may then present the completed Certificate of Eligibility and the FAA Certification Performance of Job Tasks form to a Flight Standards District Office (FSDO) as evidence that he or she qualifies for testing authorization under § 65.77. This certificate will serve the same qualification function as a Certificate of Completion or Graduation from a 14 CFR Part 147 AMTS."[28] Individuals who have graduated from this program have been successful in completing FAA A&P certification exams and attaining this industry professional credential. An added benefit of this existing program is the program is provided at no cost to the military member or unit.

*Figure 5: Joint Service Aviation Maintenance Technician Certification Council*[29]




Additionally, the JSAMTCC established a Memorandum of Agreement with the FAA which authorizes military education centers to become FAA-approved testing centers and administer all FAA knowledge exams. This testing process enables military members, DOD civilians, retirees and military dependents to take the FAA knowledge exams at convenient testing locations and free of charge.[30] Raymond Goldsby, an aviation industry advisor, explained it this way,

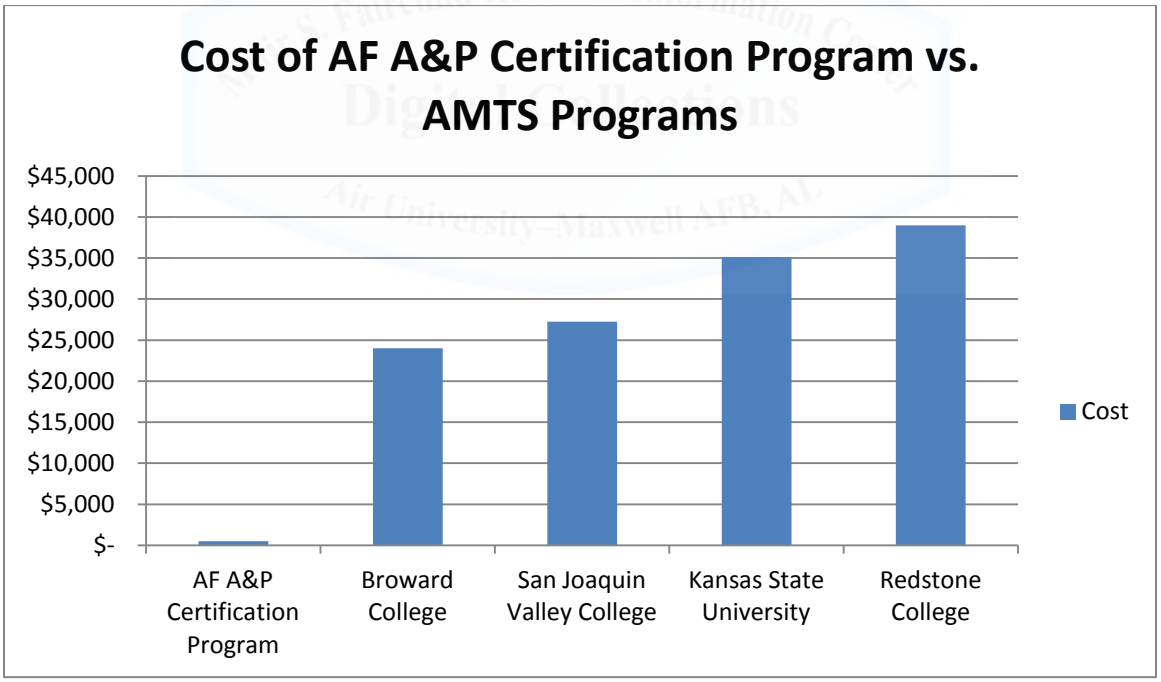
> *"This is a win-win program. The military services win by providing both a pathway for aircraft maintenance personnel to enhance their knowledge and gain a technical certification that is recognized around the world, in addition to providing significant recruitment and retention incentives. The FAA benefits by having in place a validated qualification program for military maintainers to*

*become A&P certificated, a program that reduces FAA workload to administer and oversee. The aviation industry wins with an increased supply of experienced A&P certificated technicians available as they complete active duty requirements or retire from the military."*

*- Raymond Goldsby*[31]

The recommendation of this thesis is for the Air Force Aircraft Maintenance Career Field Manager and senior leaders consider adopting the Air Force A&P Certification Program as a training requirement for specific AFSC's upon first reenlistment. This is a highly cost-effective method of training for the air aircraft maintenance community to meet Air Force end goals and objectives.

*Figure 6: AF A&P Certification Program vs. Cost of FAA AMTS Programs*




The targeted career fields should initially be crew chiefs (2A5X1, 2A5X2, and 2A3X3), hydraulic technicians (2A6X5), and propulsion technicians (2A6X1). A "pilot program" could

be established at select bases to test and validate program procedures with predetermined objectives. Providing these AFSC's with training in similar curriculum subjects and knowledge levels required of an FAA AMTS would produce a larger pool of multi-skilled technicians available to more effectively balance the workloads of all Air Force maintenance units. As the Air Force aircraft maintenance community is being considered for reduction, it is critical to train and develop technicians in multiple skill-sets to increase maintenance troubleshooting and repair efficiencies, as well as support concurrent local flight training and deployed combat operations.

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