

AIRLINE TRANSPORT PILOT
CERTIFICATION TRAINING PROGRAM (ATP CTP)
FOR THE AEROSPACE DEPARTMENT OF MIDDLE TENNESSEE STATE
UNIVERSITY

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This research is dedicated to the passionate educators and aviators who have made my aviation dreams a reality, and to the next generation of student pilots for whom I wish to do the same.

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ABSTRACT

On August 1, 2010, the United States Government enacted Public Law 111-216, which affected a number of changes to the certification requirements for Airline Transport Pilots (ATPs), and to the rules governing their employment with air carriers. Based on an extensive lobby effort throughout the industry, primarily in response to the crash of Colgan Air flight 3407, all pilots operating for a public air carrier were required to hold an ATP certificate. Further, any pilots wishing to obtain an ATP airplane multiengine certificate were also now required to complete the Airline Transport Pilot Certification Training Program (ATP CTP). This course, offered by FAA certificate holders under 14 Code of Federal Regulations (CFR) parts 121, 135, 141, or 142, was designed to bridge the “knowledge gap” for pilots transitioning from small, general aviation aircraft to large, high-performance and complex turboprop or jet aircraft. In order to provide graduates of the Aerospace Department at Middle Tennessee State University with the most relevant and industry-focused training, this capstone project seeks to establish the feasibility and present a draft of a training course outline (TCO) for the Airline Transport Pilot Certification Training Program (ATP CTP) to be used with Professional Pilot students.

TABLE OF CONTENTS

LIST OF FIGURES	viii
CHAPTER 1: BACKGROUND INFORMATION	1
Introduction.....	1
History of the ATP Certificate	2
The Restricted ATP (R-ATP)	8
The Airline Transport Pilot Certification Training Program (ATP CTP).....	9
ATP CTP Submission, and FAA Initial and Final Approval	13
Summary	14
CHAPTER 2: METHODOLOGY	15
Introduction.....	15
Review of FAA Requirements for ATP CTP	16
ATP CTP Courses Offered by Other Entities	19
Embry Riddle Aeronautical University	19
ABX Air, Inc. with Sporty’s Academy.....	20
Aerosim Training Solutions	21
CAE SimuFlite.....	21
Flight Safety International	22
Aerostar Training Services	22
Pan Am International Flight Academy	23
Higher Power Aviation (ATP Flight School)	24
Flight Training International.....	25
Existing Curriculum of Professional Pilot V, AERO 4250	25
Survey of Current Professional Pilot Concentration Students.....	26
Business Proposal Sent to Flight Safety International.....	30
Summary	30

CHAPTER 3: ANALYSIS	32
Introduction.....	32
Training Course Outline	33
Summary of Training Course Outline Sections	33
Lesson Details – Academic Training.....	36
Lesson Details – Flight Simulation Training	39
Lesson Details – End of Course.....	45
Compatibility of ATP CTP Course with High Altitude Crew Coordination Course ..	46
Survey Results of Current Professional Pilot Concentration Students	48
Response to Business Proposal from Flight Safety International	53
Summary	54
CHAPTER 4: DISCUSSION AND FUTURE RESEARCH	56
Introduction.....	56
Efficacy of Capstone Project	56
Significance of Capstone Project	59
Recommendations and Future Research.....	60
Summary	63
REFERENCES	64
APPENDICES	69
APPENDIX A: IRB Approval Letter	70
APPENDIX B: Professional Pilot Student Survey	72
APPENDIX C: Flight Safety Business Proposal Letter	74
APPENDIX D: Training Course Outline – General	76
APPENDIX E: Training Course Outline – Syllabus	83
APPENDIX F: Training Course Outline – Assessment	127
APPENDIX G: Training Course Outline – Appendix.....	131

LIST OF FIGURES

Figure 1 Biographical questions establishing the student's relative progress	28
Figure 2 Likert-scale questions concerning the student's opinions	29
Figure 3 Averaged responses to the first section of the student survey	49
Figure 4 Averaged response to the second section of the student survey	50
Figure 5 Detailed distribution of student responses to Likert-scale (Q1)	51
Figure 6 Detailed distribution of student responses to Likert-scale (Q2)	51
Figure 7 Detailed distribution of student responses to Likert-scale (Q3)	52
Figure 8 Detailed distribution of student responses to Likert-scale (Q4)	52

CHAPTER 1: BACKGROUND INFORMATION

Introduction

The Federal Aviation Administration (FAA) is tasked with the continuing mission, “to provide the safest, most efficient aerospace system in the world” (FAA 1, 2016). There are several main areas in which the FAA focuses its efforts, including safety regulation, airspace and air traffic management, air navigation facilities, civil aviation, commercial space transportation, and various research and development programs (FAA 1, 2016). Among these, one of the FAA’s central roles is the certification and oversight of airmen, the people directly involved in the most safety-sensitive operational areas of the industry. In terms of pilot certification, the FAA grants several unique certificates based on an airman’s level of proficiency, knowledge, skill, and experience. The Airline Transport Pilot (ATP) certificate – the FAA’s highest – is a prerequisite for those airman engaged in commercial airline or air carrier service, along with many other pilot in command (PIC) positions in air commerce operations. Recently, the FAA has enacted many changes to the certification process for ATP applicants in response to new regulations formulated by the United States Government under Title 14 of the Code of Federal Regulations (14 CFR) part 61, which outlines the requirements for airman certification. This capstone project seeks to establish a draft of a training course outline (TCO) for the ATP certificate, and specifically the Airline Transport Pilot Certification Training Program (ATP CTP) – a newly mandated course by the FAA – to be used by the Aerospace Department of Middle Tennessee State University for students enrolled in the Professional Pilot concentration.

History of the ATP Certificate

The current certification requirements for an ATP certificate with airplane category and multiengine class ratings, as found in 14 CFR part 61, took effect on August 1, 2014, although the associated legislative changes occurred several years prior. Additionally, a large cross section of the aviation industry, led by the Aviation Accreditation Board International (AABI) and under the watchful eye of the FAA, undertook a large research effort for several years leading up to the drafting and publication of the new ATP rules. In effect, several large changes were made to the ATP certification and qualification requirements, along with changes for the certification requirements of pilots operating for an air carrier (FAA 2, 2012, p. 1). Previously, pilots flying for an air carrier certified under part 121 – which includes most large airlines in the United States – were only required to hold an ATP certificate if serving as pilot in command (Captain). A pilot serving as second in command (First Officer) was only required to hold a Commercial Pilot certificate with the appropriate ratings (FAA 2, 2012, p.1). Additionally, the training requirements for an ATP were straightforward and similar to those of other FAA certificates; the pilot must learn the appropriate areas of aeronautical knowledge and demonstrate proficiency through written and practical tests. This led to the natural progression of a pilot entering service with the airlines as a First Officer and while holding a Commercial Pilot certificate, and then continuing to the ATP certificate once awarded a Captain upgrade to act as pilot in command; in effect, there was no reason to earn an ATP certificate sooner.

What catalyzed these changes to the ATP certification requirements? The National Transportation Safety Board (NTSB), an independent government agency

tasked with transportation safety and investigatory roles, suggests the February 12, 2009 crash of Colgan Air flight 3407, a Bombardier DHC-8-400 operated for Continental Airlines under the Continental Connection banner, to be the primary event that caused “public and Congressional attention on multiple aspects of current air carrier requirements, include the level of training and experience of pilots in part 121 air carrier operations” (FAA 2, 2012, p.4). The Colgan Air flight crashed while conducting an instrument approach to Buffalo-Niagara International Airport in Buffalo, New York. During the accident sequence, both pilots lost their situational awareness and failed to recognize their aircraft’s decaying indicated airspeed and its low energy situation (NTSB 1, 2010, p. 151). As the aircraft approached an aerodynamic stall, neither pilot responded to the presence of multiple warning indications, including a significant change in the aircraft’s pitch attitude, a decreasing airspeed trend vector, and the airspeed indicator’s low-speed cue (NTSB 1, 2010. p.151). Finally, the aircraft’s stick shaker and stick pusher activated, but the Captain made inappropriate aft control inputs putting the aircraft into an unrecoverable stall (NTSB 1, 2010, p.151). All of the 45 passengers, 2 flight attendants, and 2 pilots on board the aircraft were killed in the crash, along with one person on the ground. The NTSB initiated an in-depth investigation into the Colgan Air accident and determined that four probable causes contributed to the accident’s occurrence (NTSB 1, 2010, p. x). NTSB investigators elaborated these factors to be, “(1) the flight crew’s failure to monitor airspeed in relation to the rising position of the low-speed cue, (2) the flight crew’s failure to adhere to sterile cockpit procedures, (3) the Captain’s failure to effectively manage the flight, and (4) Colgan Air’s inadequate

procedures for airspeed selection and management during approaches in icing conditions” (NTSB 1, 2010, p. x).

Interestingly, the NTSB did not directly blame the flight crew’s experience level, past training programs, or certifications as probable causes of the accident; however, these areas were discussed in-depth throughout the report. Investigators commented through the report’s executive summary, “the safety issues discussed in this report focus on [...] pilot professionalism [...] pilot training records [...] safety recommendations concerning these issues are addressed to the FAA (NTSB 1, 2010, p. x). Further, the NTSB discussed Colgan’s minimum flight time requirements for pilot applicants to be, “600 hours total flight time with 100 hours multiengine time” (NTSB 1, 2010, p. 33). Following the accident, Colgan increased its minimum flight time requirements for pilot applicants to be, “1,000 hours total flight time and 100 hours in multiengine aircraft. Q400 Captains were also then required to have 3,500 hours total flight time and one of the following: 1,000 hours as a PIC at Colgan, 1,500 hours in aircraft type, or 2,000 hours at Colgan” (NTSB 1, 2010, p. 34). The NTSB appears to use this change as an observation that Colgan Air recognized the need for its pilots to have a higher level of experience.

Shortly after the Colgan Air accident, a group of family members of those killed in the crash – Families of Continental Flight 3407 – began an exhaustive lobbying effort aimed at “hopes of developing tougher safety rules for the aviation industry” (Turner, 2010, para. 2). This lobby group focused their efforts on reducing perceived safety gaps between major airlines and regional airlines operating through codeshare agreements (Turner, 2010, para. 4). The crux of their argument was a need for “stricter training

qualifications for commercial pilots,” along with “tougher regulations to prevent pilot fatigue” (Turner, 2010, para. 5). Throughout 2009 and 2010, the group met with many senior-level government officials, including President Barack Obama, the offices of all 100 Senators and over 200 Representatives, and with various officials in the Department of Transportation, Federal Aviation Administration, and several House and Senate Aviation Subcommittees (FCOF 1, n.d.).

In addition to the lobby efforts made by the Families of Continental Flight 3407 group, efforts to improve airline safety also came from within the government in response to the Colgan Air crash. The NTSB releases annually a list of their “Most Wanted” safety improvements across unique modes of transportation. The NTSB’s aviation section is directed at the FAA, the agency responsible for regulation of civil aviation, and thus, the agency able to affect the recommended changes (NTSB is not a regulatory agency). For the 2008 list – published prior to the Colgan Air accident – the NTSB recommended the following actions be taken by the FAA to: “improve safety of emergency medical services flights, improve runway safety, reduce dangers to aircraft flying in icing conditions, improve crew resource management, require image recorders, and reduce accidents and incidents caused by human fatigue” (NTSB 2, 2009, pp. 8-9). For the 2009 list – published in the immediate months after the Colgan Air crash – the NTSB recommended the following actions be taken by the FAA to: “**improve oversight of pilot proficiency**, require image recorders, improve the safety of emergency medical services flights, improve runway safety, reduce dangers to aircraft flying in icing conditions, improve crew resource management, and reduce accidents and incidents caused by human fatigue in the aviation industry” (NTSB 3, 2010, pp. 8-9) (note: bold

text represents changes between 2008 and 2009 “Most Wanted” safety improvements). Clearly, the Colgan Air accident significantly shifted the NTSB’s paradigm to include a previously unmentioned “Most Wanted” improvement of pilot proficiency oversight.

Along with the NTSB’s recommendations, the FAA also began to consider possible regulatory changes in response to the Colgan Air accident. According to the FAA 2 (2012), “the FAA evaluated recent accidents in parts 121 and 135 to determine whether current certification requirements are sufficient to produce pilots who can enter an air carrier environment and train and perform their duties effectively” (p. 4). The FAA further determined, “the accident reports revealed deficiencies in several areas involving training in aircraft manual handling skills, stall and upset recognition and recovery, high altitude operations, pilot monitoring skills, effective CRM, stabilized approaches, and operations in icing conditions” (FAA 2, 2012, p. 4). This led to the FAA issuing an advance notice of proposed rulemaking (ANPRM), the first rulemaking step in which the FAA gathers input from industry and the public. The core questions in the ANPRM were as follows: (1) Should all part 121 pilots hold an ATP certificate and should they have 1,500 flight hours even without holding an ATP certificate? (2) Could academic training substitute for required flight hours, and if so, how much? Further, what types of training and how much credit should a pilot receive for the training? (3) Should there be specific ground or flight training required of part 121 pilots? (FAA 2, 2012, p. 4). Based on these actions, the FAA seemed to be moving in the positive direction of requiring more training and experience for pilots flying for part 121 air carriers.

Pressed for action by the Families of Continental Flight 3407 group, the NTSB's recommendations, and the FAA's initial rulemaking undertakings, the United States Congress chose to enact new legislation specifically aimed at increasing the safety of the general public in air carrier transportation. Public Law 111-216, enacted on August 1, 2010, mandated a number of changes to 14 CFR and the regulations concerning the certification of pilots and air carriers (FAA 2, 2012, p. 4). Two specific parts of Public Law 111-216, sections 216 and 217, required the FAA to initiate a rulemaking process under certain terms. Section 216 carried the following mandates: (1) Require part 121 air carriers to develop and implement means and methods for ensuring flight crew members have proper qualification and experience. (2) Require all flight crew members in part 121 air carrier operations to hold an ATP certificate and to have obtained appropriate multiengine flight experience, as determined by the [FAA] Administrator, by August 2, 2013. (3) Require prospective flight crew members to undergo comprehensive pre-employment screening of, including an assessment of the skills, aptitudes, airmanship, and suitability of each applicant for a position as a flight crew member in terms of functioning effectively in the air carrier's operational environment (FAA 2, 2012, pp. 7-8). Section 217 carried the following mandates: (1) Require sufficient flight hours, as determined by the [FAA] Administrator, to enable a pilot to function effectively in an air carrier operational environment. (2) Require flight training, academic training, or operational experience that will prepare a pilot to function effectively in a multipilot (multicrew) environment in adverse weather conditions, during high altitude operations, in an air carrier environment, and to adhere to the highest professional standards. (3) Require sufficient flight hours, as determined by the [FAA] Administrator, in difficult

operational conditions that may be encountered by an air carrier to enable a pilot to operate safely in such conditions. (4) The minimum total flight hours to be qualified for an ATP certificate shall be at least 1,500 flight hours. Notwithstanding the stated minimum, the section permits the [FAA] Administrator to allow specific academic training courses to be credited towards the 1,500 total flight hours, provided the [FAA] Administrator determines that specific academic training courses will enhance safety more than requiring the pilot to comply fully with the flight hour requirement (FAA 2, 2012, p. 8). Together, these two sections of Public Law 111-216 paved the way for the introduction of the requirement for all pilots at an air carrier to have the “New ATP,” as prescribed by the changes to 14 CFR part 61, along with the creation of a new training requirement dubbed the Airline Transport Pilot Certification Training Program (ATP CTP) for future ATP certification events.

The Restricted ATP (R-ATP)

Through the ANPRM (anticipated notice of proposed rulemaking) and the NRPM (notice of proposed rulemaking) processes mentioned above, the FAA ultimately drafted and enacted several changes to 14 CFR parts 61, 121, 135, 141, and 142, all of which effected “new certification requirements for pilots in air carrier operations” (FAA 3, 2013, p. 2). In summary, “a second in command (First Officer) in domestic, flag, and supplemental operations must now hold an Airline Transport Pilot certificate and an airplane type rating for the aircraft to be flown” (FAA 3, 2013, p. 2), and this requires the pilot to be at least 23 years of age, and have accumulated a total of 1,500 flight hours. The FAA does make allowances for credit against the 1,500 flight hours as well as the necessary age – now reduced to 21 years of age – through a special Restricted ATP (R-

ATP) certificate. Pilots who graduate from a flight training program through the Armed Forces qualify for an R-ATP at 750 flight hours, pilots who graduate with a bachelor's degree and an aviation major (at least 60 credit hours) from an accredited institution of higher learning with a part 141 training program qualify for an R-ATP at 1,000 flight hours, and pilots who graduate with a bachelor's or an associate's degree and an aviation major (at least 30 credit hours) from an accredited institution of higher learning with a part 141 training program qualify for an R-ATP at 1,250 flight hours. If a pilot has not attended any of these special training programs, he or she may still apply for the R-ATP at 21 years of age, but must have attained 1,500 flight hours (FAA 3, 2013, p. 31).

The Airline Transport Pilot Certification Training Program (ATP CTP)

Along with the new 750, 1,000, 1,250, and 1,500 flight hour experience levels for the R-ATP, the FAA also instituted a new eligibility requirement for obtaining either an R-ATP or ATP certificate. "This rule also adds to the eligibility requirements for an airline transport pilot certificate with an airplane category multiengine class rating or an airline transport pilot certificate obtained concurrently with a type rating. To receive an airline transport pilot certificate with a multiengine class rating a pilot [...] must have completed the new FAA-approved Airline Transport Pilot Certification Training program" (FAA 3, 2013, p. 2). The FAA describes this course to be a compilation of classroom and flight simulator training, and many of the key objectives mirror the deficiencies found of the pilots in the Colgan Air flight 3407 accident report. In fact, the FAA describes the ATP CTP to be "training necessary to overcome the knowledge gap between the Commercial Pilot certificate and the knowledge required for an air carrier second in command" (FAA 3, 2013, p. 46). Further, the ATP CTP training program must

be approved and maintained by a certificate holder under 14 CFR parts 121, 135, 141, or 142 (FAA 4, 2013, p. 1). Thus, with the passage of Public Law 111-216 and the FAA's subsequent rulemaking process, a large necessity was created for certificate holders with the ability to conduct the training necessary for the ATP CTP.

14 CFR part 61, under §61.156, provides the regulatory framework for the ATP CTP course and prescribes two categories of necessary training along with minimum hour requirements: 30 hours of classroom instruction and 10 hours of flight simulation training device (FSTD) instruction. The 30 hours of classroom instruction is further delineated to include: 14 hours of air carrier operations to include: physiology, communications, checklist philosophy, operational control, minimum equipment list (MEL) and configuration deviation list (CDL), ground operations, turbine engines, transport category aircraft performance, and automation and flight path warning systems; 8 hours of aerodynamics and high altitude operations; 6 hours of leadership, professional development, crew resource management (CRM), and safety culture; and 2 hours of meteorology, adverse weather, and weather detection systems. The 10 hours of flight simulation training device (FSTD) instruction is further delineated to include: at least 6 hours of training in a Level C or higher full flight simulator (FFS) that represents an airplane with a maximum takeoff weight of at least 40,000 pounds, to include: low energy stalls/states, upset prevention and recovery techniques, and adverse weather conditions including: icing, thunderstorms, and crosswinds with gusts; and the remaining hours of training in a Level 4 or higher flight training device (FTD) to include: navigation, flight management systems (FMS), and automation including autoflight (eCFR 1, 2016).

In addition to the text published under §61.156, the FAA has also released Advisory Circular (AC) 61-138, which “provides information and coursework guidelines to authorized providers, to aid in the development of a training program which meets the requirements of Title 14 of the Code of Federal Regulations (14 CFR) part 61, §61.156” (FAA 4, 2013, p. 1). The broader purpose of this Advisory Circular is to take the dense, choppy format of the regulations and provide an easy-reading guide for the certificate holder. A review of AC 61-138 reveals several more requirements for the ATP CTP program. First, an instructor assigned to the program must meet certain requirements, which are found in full under 14 CFR part 141, under §141.33. The instructor must have an ATP certificate with airplane category and multiengine class ratings, and have at least 2 years of experience as pilot in command under qualifying roles in 14 CFR parts 91, 121, or 135, or as second in command under 14 CFR part 121 (eCFR 2, 2016). If the instructor is providing classroom or FFS/FTD training, he or she must receive initial training on the following items: the fundamental principles of the learning process; elements of effective teaching, instruction methods, and techniques; instructor duties, privileges, responsibilities, and limitations; training policies and procedures; and evaluation. Additionally, if the instructor is providing FFS/FTD instruction, a type rating for the aircraft represented by the FFS/FTD is required, and he or she must receive training every 12 months on the following items: proper operation of flight simulator and flight training device controls and systems, proper operation of environmental and fault panels, data and motion limitations of simulation, minimum equipment requirements for each curriculum, and the maneuvers that will be demonstrated in the flight simulation training device (eCFR 2, 2016). Lastly, the FAA recognizes the benefit of subject matter

experts (SME) in delivering content within the ATP CTP course, and thus there is an allowance for an SME to give training under the supervision of a qualified ATP CTP instructor. For example, an aerospace engineer or meteorologist would most likely give a more informational lecture on their particular areas of study than the ATP CTP qualified instructor would; thus, certificate holders retain a high level of flexibility in ensuring the ATP CTP students receive the highest quality of instruction possible (FAA 4, 2013, pp. 4-5).

AC 61-138 then describes in detail the necessary course objectives and learning outcomes for each knowledge area. The FAA differentiates between the broad introduction of a topic, referred to as an “overview,” and the more in-depth discussion of a topic, which “should be taught with sufficient detail to impart knowledge, meet the learning objective, and enable the applicant to correctly answer questions in both the academic evaluation of the course and pass the ATP knowledge test” (FAA 4, 2013, p. 6). The FAA further reiterates, “The intent of the academic training portion of the ATP CTP is to bridge the gap between the knowledge of a Commercial Pilot and that which is expected of an ATP certificate holder. This knowledge is the academic foundation for ATP applicants to begin understanding the complexities they will face in the next phase of their professional development” (FAA 4, 2013, p. 6) Once the student transitions to the FFS/FTD portion of the course, the FAA explains, “the intent of the FSTD training portion of the ATP CTP is to reinforce the air carrier concepts and principles taught in the academic portion of the course. Although somewhat different from typical FSTD training courses, the applicant will not be expected to perform maneuvers to proficiency with psychomotor skills. The objective is to demonstrate and allow the student to

experience the high-level concepts of larger, faster, and more complex transport category airplanes. Since the student is not being trained how to fly a specific aircraft type, the expectation is the applicant will learn the expected outcomes and understand concepts shown to be true to all transport category airplanes” (FAA 4, 2013, p. 17). At the conclusion of the ATP CTP course, the student should be prepared to pass a written exam over the course content, as well as be able to demonstrate an understanding of the expected outcomes of the maneuvers, events, and scenarios presented during the simulator training (FAA 4, 2013, p. 17).

ATP CTP Submission, and FAA Initial and Final Approval

For a 14 CFR part 141 flight school (certificate holder), an application for approval of an ATP CTP program must be coordinated through their FAA Principal Operations Inspector (POI). Once the POI determines the program meets FAA requirements, it is forwarded to the appropriate FAA Regional Office (RO) for further review, and then finally to AFS-800, the Commercial and General Aviation Branch of the FAA’s Flight Standards Service. An ATP CTP program will first be approved under initial approval, which lasts for a duration of one year. During the one-year period, AFS-800 will inspect and audit the certificate holder’s ATP CTP program, and if the training requirements and objectives consistently satisfy FAA guidance, AFS-800 will issue final approval of the ATP CTP program (FAA 4, 2013, p. 4). The FAA directs the certificate holder’s POI to review the ATP CTP program in comparison to §61.156, AC 61-138, and an internal FAA document entitled “ATP CTP Course Approval Job Aid” (FAA 4, 2013, p. 4), (FAA 5, 2013). The submitted training program must include a training course outline (TCO) and detailed syllabus of the subject areas and information to be taught

(FAA 4, 2013, p. 6). Together, all of these items and processes make up the certification requirements for an ATP CTP course.

Summary

The creation of the ATP CTP is just one of the effects felt after the Colgan Air flight 3407 accident and the subsequent passage of Public Law 111-216; however, it represents a significant shift from the traditional training methods used to certify pilots with an ATP. Given its limited ability to be conducted (only by certificate holders), highly technical nature (FFS and FTD simulation), and relative infancy, there exists a large need for educational institutions, like Middle Tennessee State University, that offer aviation education to respond to this new training need. Students in the Professional Pilot concentration already receive the advantage of qualifying for the R-ATP at 1,000 hours, so the addition of an ATP CTP course to the curriculum would be an excellent step. Educational institutions must continually modify and improve their programs to meet the training needs of industry, and the ATP CTP represents such a challenge.

CHAPTER 2: METHODOLOGY

Introduction

The development and implementation of an ATP CTP course is a natural progression of the Professional Pilot concentration curriculum within the Aerospace Department of Middle Tennessee State University. In 2011, the department purchased a Frasca International Level 5 flight training device (FTD) representing the Bombardier CRJ-200, a 50 seat jet used by many regional airlines throughout the United States and worldwide. The CRJ-200 FTD compliments the department's other simulator used for advanced pilot training, a Frasca International FTD representing the Beechcraft 1900, a 19 seat turboprop. Currently, the Beechcraft 1900 FTD is utilized for Professional Pilot IV, AERO 3240, and the CRJ-200 FTD is utilized for Professional Pilot V, AERO 4250 (MTSU 1, 2016). Additionally, the CRJ-200 FTD serves as part of the department's Flight Operations Center – Unified Simulation (FOCUS) Lab, a multi-department research effort aimed at “improving the understanding of interactions between aviation professionals” (MTSU 2, 2016). Students completing Professional Pilot IV and V gain a working knowledge of the systems, procedures, and operational requirements of the Beechcraft 1900 and CRJ-200, while students completing the FOCUS Lab interact with the CRJ-200 primarily for decision-making and crew resource management (CRM) skills enhancement.

Currently, Professional Pilot V, AERO 4250, acts as the capstone of the Professional Pilot series, enabling students to acquire “an experiential view of the duties of a professional pilot” (MTSU 1, 2016). AERO 4250 involves discussion of, “turbojet aircraft systems, advanced avionics and flight management systems, transport aircraft

flight techniques (including operations in all flight regimes and in difficult operational conditions), and stall and upset recognition and recovery in transport category aircraft, crew resource management (CRM), aeronautical decision making, and professionalism developed” (MTSU 1, 2016). Additionally, the students complete, “aircraft training in the format employed by air carriers, including LOFT [line oriented flight training] scenarios in the department’s CRJ-200 FTD” (MTSU 1, 2016). Lastly, students complete the required training for the issuance of a High Altitude Endorsement, allowing pilot in command (PIC) operations of certain pressurized aircraft.

Once Public Law 111-216 was passed and the FAA implemented its changes to 14 CFR part 61, and introduced the ATP CTP course, the researcher observed the department’s current curriculum and training program for Professional Pilot V, AERO 4250, could be adapted to meeting the requirements outlined for the ATP CTP course. A brainstorming session and research of the applicable regulations resulted in a hypothesis that it would be feasible for the department to modify AERO 4250 to meet the requirements of ATP CTP course. By taking the existing course material from Professional Pilot V, AERO 4250, and the appropriate FAA guidance, the researcher thus endeavored to construct a new curriculum for the ATP CTP course.

Review of FAA Requirements for ATP CTP

The first step in developing the ATP CTP program for the department was a comprehensive overview of the pertinent regulations located under 14 CFR, along with the FAA guidance published in the form of Advisory Circulars (ACs). Beginning with 14 CFR part 61, the necessary areas of compliance were reviewed. Additionally, the question was asked if it would be feasible for the department to offer the ATP CTP

course, and if students would be eligible to enroll and graduate through the course given the strict nature of many pilot certification regulations. Thus, 14 CFR part 61 was evaluated under the following conditions: (1) Aerospace Department eligibility to offer the ATP CTP, (2) student eligibility to enroll and graduate through the ATP CTP, and (3) other impacts from regulations. For the purpose of simplicity, all research was conducted with the assumption that the student will be applying for an ATP certificate with an airplane category and multiengine class rating.

Concerning department eligibility, §61.156 describes that a training provider for the ATP CTP course must be certified under 14 CFR parts 121, 135, 141, or 142 (eCFR 1, 2016). The department meets this requirement as it currently holds a 14 CFR part 141 pilot school certificate. Additionally, §141 Appendix K grants the authority for a certificate holder to offer an ATP CTP course, provided it complies with the academic and FSTD training requirements along with the minimum hours for both, as prescribed in §61.156 (eCFR 2, 2016). Thus, the department is currently qualified under the regulations to offer the ATP CTP course.

Concerning student eligibility, §61.153 describes that students must graduate from an ATP CTP course in order to apply for the ATP knowledge test, which is a requirement for students to pass before applying for the ATP practical test. The regulations provide no minimum age, certification level, or experience requirements for students to enroll in an ATP CTP course. In order to take the ATP knowledge test, accomplished once the ATP CTP course is complete, §61.35 specifies that students must be at least 18 years old. §61.39 specifies that the results of the ATP knowledge test are valid for 60-calendar months. §61.153 specifies that students who apply for the R-ATP

(primary certification path for students in the Professional Pilot concentration) must be at least 21 years old (eCFR 1, 2016). Thus, so long as students complete the ATP CTP course, take the ATP knowledge test, apply for the R-ATP practical test within 60 months of passing the ATP knowledge test, and meet the applicable age requirements, there should be no eligibility issues for Professional Pilot students.

Concerning other impacts from regulations, the main areas of consideration for the department are as follows. First, §61.156 requires that part of ATP CTP course's FSTD training be completed in a full flight simulator (FFS) (eCFR 1, 2016). The department does not currently have the capability of purchasing or maintaining an FFS, so this portion of the training must be contracted through another provider. Second, §141.33 specifies that any instructor used for the ATP CTP course must hold an ATP certificate with airplane category and multiengine class ratings, have at least 2 years of experience as pilot in command under 14 CFR parts 91, 121, and 135, or at least 2 years of combined experience as pilot in command or second in command under 14 CFR part 121, and must receive training on the course material for the ATP CTP course to be taught. The regulations allow for the use of subject matter experts (SME) who do not meet these requirements, provided they are supervised by a qualified ATP CTP instructor. Further, an instructor who provides FSTD training must hold a type rating for the aircraft represented by the FSTD, and must receive initial and recurrent training on aspects of the FSTD training. The department currently employs faculty and professional instructors with experience levels at or above these requirements. In sum, there are no specific impacts from the regulations that preclude the implementation of an ATP CTP course by the department.

ATP CTP Courses Offered by Other Entities

The next step in developing the ATP CTP program was a review of all currently offered programs by other entities, including universities, flight schools, flight simulation training centers, and air carriers. The FAA (6, 2016) publishes a publically available list of all certificate holders authorized to conduct the ATP CTP course. As of September 2016, there are 17 certificate holders authorized, including one university (with two separate campuses), seven flight schools or flight simulation training centers, and eight air carriers. Each program offering was analyzed to determine cost, duration, availability, and any other pertinent factors. The eight air carrier training programs were not considered due to their proprietary nature, as they are intended for company employees and there is no information readily available to the public concerning their specific makeup, course materials, or training resources.

Embry Riddle Aeronautical University

Embry Riddle Aeronautical University is an accredited institution of higher learning with two main campuses in the United States: Daytona Beach, FL and Prescott, AZ. In addition, Embry Riddle offers courses through their “Worldwide” program via satellite campuses throughout the United States and other foreign countries. Based on FAA data, Embry Riddle is currently authorized to conduct ATP CTP training at both the Daytona Beach and Prescott campus locations (ERAU 1, 2016).

Embry Riddle was among the first providers authorized by the FAA to offer the ATP CTP. The stated cost for the ATP CTP course is \$5,000 in simulation fees, along with the standard course-credit fees charged by the university, and it is available only to students enrolled in one of Embry Riddle’s degree programs (ERAU 2, 2016). The

university uses a Level 6 FTD representing the CRJ-200, along with a Level D FFS representing the CRJ-200. Additionally, Embry Riddle provides training hours beyond the minimums required by the regulations: students complete 20 hours of simulator training, 8 of which are in the Level 6 FTD and 12 of which are in the Level D FFS (Bergqvist, 2015). Embry Riddle was authorized by the FAA to conduct ATP CTP training on July 24, 2014.

ABX Air, Inc. with Sporty's Academy

Sporty's Academy is a flight school and aviation supply company based in Batavia, OH, and at the Clermont County/Sporty's Airport (I69) Sporty's Academy offers a variety of flight training programs and even manages the flight training program for the University of Cincinnati. Sporty's Academy started operations in 1987, and began by producing videos, training courses, and instructional materials before expanding into flight training (Sporty's 1, 2016).

Sporty's Academy has developed a partnership with ABX Air, Inc., a cargo and charter air carrier, to offer an ATP CTP course. Sporty's markets the course and ABX Air, Inc. conducts all of the classroom and simulation training. The stated cost for the ATP CTP course is \$4,595, the duration of the course is six days, and all training is conducted at ABX Air, Inc.'s facility in Wilmington, OH. ABX Air, Inc. uses a Level C FFS representing a DC-9. Students complete the minimum training hours as required by the regulations: 30 hours of classroom training and 10 hours of simulator training, 4 of which are in the Level C FFS with motion turned off and 6 of which are in the Level C FFS with the motion turned on (Sporty's 2, 2016). ABX Air, Inc. was authorized by the FAA to conduct ATP CTP training on September 3, 2014.

Aerosim Training Solutions

Aerosim Training Solutions is a flight school and aviation technology company with a primary base of operations in Orlando, FL, along with several other training centers across the United States. Aerosim began in 1993 as a technology company with the mission to provide a computer-based training program for flight management systems (FMS). The company also has produced aviation courseware, training devices, and FSTDs. In 2009, Aerosim acquired the Delta Connection Academy and began to offer flight training (Aerosim 1, 2016).

Aerosim offers the ATP CTP course and conducts all of the classroom and simulator training. The stated cost for the ATP CTP course is \$4,995, the duration of the course is seven days, and training is conducted at Aerosim locations in Orlando, FL; Las Vegas, NV; Minneapolis, MN; and Fort Lauderdale, FL. Aerosim uses a Level 4 FTD and Level D FFS, representing the A-320, B-737NG, or the ERJ-190. Students complete the minimum training hours as required by the regulations: 30 hours of classroom training and 10 hours of simulator training, 4 of which are in the FTD and 6 of which are in the FFS (Aerosim 2, 2016). Aerosim was authorized by the FAA to conduct ATP CTP training on October 3, 2014.

CAE SimuFlite

CAE SimuFlite is a flight simulation and training company with locations worldwide. CAE began as Canadian Aviation Electronics (CAE) in 1947 and by the 1960s had evolved into a flight simulation company benefitting mostly from military contracts. Throughout the 1970s, CAE grew to provide many flight simulation products and training programs (CAE 1, 2016).

CAE offers the ATP CTP course and conducts all of the classroom and simulator training. The stated cost for the ATP CTP course is \$4,995 (Bergqvist, 2015), the duration of the course is seven days, and training is conducted at CAE's facility in Dallas, TX. CAE uses an FTD and FFS, although the specific certification levels and types are not disclosed on their website. Students complete more than the minimum training hours as required by the regulations: 32 hours of classroom training and 12 hours of simulator training, 4 of which are in the FTD and 8 of which are in the FFS (CAE 2, 2016). CAE was authorized by the FAA to conduct ATP CTP training on October 20, 2014.

Flight Safety International

Flight Safety International is a flight simulation and training company with locations worldwide. Flight Safety began in 1951 by offering instrument training in the Link Trainer, and by the 1960s the company had grown to include the first type-specific flight simulator. Today, Flight Safety contracts with many airlines, corporations, and governments for simulation training, and additionally the company also produces flight simulators and other training devices. (Flight Safety International, 2016).

Flight Safety International offers the ATP CTP course and conducts all of the classroom and simulator training. Their website describes the course to be offered at Flight Safety International's facility in Atlanta, GA, but provides no further information on the cost, types of simulators, or training program contents and hours of study. Flight Safety was authorized by the FAA to conduct ATP CTP training on December 11, 2014.

AeroStar Training Services

AeroStar Training Services is a flight simulation and training company based in Orlando, FL, with several other locations across the United States. AeroStar began in

2008 with the goal of providing state-of-the-art flight training with a timely and cost effective approach. The company mainly targets professional pilots by offering type ratings and jet transition courses along with interview preparation workshops (Aerostar 1, 2014).

Aerostar offers the ATP CTP course and conducts all of the classroom and simulator training. The stated cost for the ATP CTP course is \$4,800, the duration of the course is six days, and the training is conducted at AeroStar locations in Fort Lauderdale, FL; Miami, FL; and Las Vegas, NV. Aerostar uses a Level D FFS representing the A-320. Students complete more than the minimum hours as required by the regulations: 32 hours of classroom training and 10 hours of simulator training, 4 of which are in the FFS with the motion turned off and 6 of which are in the FFS with the motion turned on (Aerostar 2, 2014). Aerostar was authorized by the FAA to conduct ATP CTP training on March 24, 2015.

Pan Am International Flight Academy

Pan Am International Flight Academy is a flight simulation and training company headquartered in Miami, FL, with additional locations worldwide. Pan Am traces its roots to the historic Pan American World Airways and the historical beginning of flight training for air carriers. Pan Am opened its current Miami location in 1980 and offers professional pilot training such as type ratings, along with training in other disciplines like dispatch and maintenance (Pan Am 1, 2016).

Pan Am offers the ATP CTP course and conducts all of the classroom and simulator training. The stated cost for the ATP CTP course is currently \$3,995, which Pan Am describes as a limited-time offer. The duration of the course is six days, and the

training is conducted at Pan Am locations in Miami, FL and Las Vegas, NV. Pan Am uses an FTD and FFS representing the A-320. Students complete the minimum hours as required by the regulations: 30 hours of classroom training and 10 hours of simulator training, 4 of which are in the FTD and 6 of which are in the FFS (Pan Am 2, 2016). Pan Am was authorized by the FAA to conduct ATP CTP training on August 5, 2015.

Higher Power Aviation (ATP Flight School)

Higher Power Aviation, owned and operated by ATP Flight School, is a flight simulation and training company based in Dallas, TX. For years, Higher Power catered to professional pilots by offering type rating courses, specifically the Boeing B-737 type rating required for employment by Southwest Airlines. In 2014, ATP Flight School purchased Higher Power Aviation to enable the joint companies to offer an ATP CTP program. ATP Flight School is known for its extensive flight training offerings, including accelerated career track opportunities for those seeking to become airline pilots (Twombly, 2014).

Higher Power offers the ATP CTP course and conducts all of the classroom and simulator training. The stated cost for the ATP CTP course is \$4,995, the duration of the course is seven days, and the training is conducted at ATP Flight School locations in Atlanta, GA; Dallas, TX; Las Vegas, NV; Phoenix, AZ; and Fort Lauderdale, FL. Higher Power uses an FTD and FFS, although the specific certification levels and types are not disclosed on their website. Students complete the minimum hours as required by the regulations: 30 hours of classroom training and 10 hours of simulator training, 4 of which are in the FTD and 6 of which are in the FFS (ATP Flight School, 2016). Higher Power was authorized by the FAA to conduct ATP CTP training on August 10, 2015.

Flight Training International

Flight Training International (FTI) is a flight simulation and training company headquartered in Denver, CO, with additional locations across the United States. FTI started operations in 1993 and specifically caters to professional pilots by offering initial, recurrent, requalification, and specialty flight training (FTI 1, 2016).

As of this writing, FTI has been approved to conduct ATP CTP training, but the company only lists preliminary information about the course. There is no stated cost, the duration of the course is six days, and the training locations are not specified; however, FTI lists Charlotte, NC; Dallas, TX; Denver, CO; and Miami, FL as their training facility locations. FTI plans to use an FTD and FFS, although the specific certification levels and types are not disclosed on their website. Students complete the minimum hours as required by the regulations: 30 hours of classroom training and 10 hours of simulator training, 4 of which are in the FTD and 6 of which are in the FFS (FTI 2, 2016). FTI was authorized by the FAA to conduct ATP CTP training on September 6, 2016.

Existing Curriculum of Professional Pilot V, AERO 4250

The department offers a 14 CFR part 141 course, entitled High Altitude Crew Coordination course, in conjunction with Professional Pilot V, AERO 4250. The existing course contents and materials from this course were evaluated and compared with the requirements for the ATP CTP course. Presently, the High Altitude Crew Coordination course prescribes 54 total hours of training, including both classroom and simulator instruction. This is further defined as five classroom lessons lasting for 19 hours, two cockpit procedures lessons lasting for 4 hours, five FTD lessons lasting for 20 hours, and three stage check lessons lasting for 11 hours (3 in the classroom and 8 in the FTD). The

syllabus is divided into two stages – stage one encompasses the classroom lessons and cockpit procedures lessons, and is concluded with a written and practical exam. Stage two encompasses the FTD lessons, and is concluded with an oral and practical exam. The entire course is concluded with an end of course assessment consisting of an additional oral and practical exam (MTSU 3, 2016, p. 5).

In comparison, the ATP CTP, defined under §61.156, prescribes 40 total hours of training, including both classroom and simulator instruction. This is further defined as classroom lessons lasting for 30 hours, and FSTD lessons lasting for 10 hours (4 in the FTD and 6 in the FFS) (eCFR 1, 2016). Additionally, an academic evaluation in the form of a written test is required, and it must be comprehensive in nature and include evaluations of the individual academic sections along with a cumulative final exam (FAA 4, 2013, para 13). Thus, a comparison of the two courses yields a substantially similar hour-load requirement: High Altitude Crew Coordination course at 54 hours and ATP CTP course at 40 hours. This resulted in the determination that it would be feasible for an ATP CTP course to be taught within one semester at Middle Tennessee State University, as the High Altitude Crew Coordination course and AERO 4250 currently operate.

Survey of Current Professional Pilot Concentration Students

In addition to the proposed ATP CTP course being realistic in comparison to the current course offering of Professional Pilot V, AERO 4250, High Altitude Crew Coordination course, it must have student support in order to succeed within the department. As part of this capstone project, a survey instrument was developed and administered to students within the department (Appendix B). Institutional Review

Board (IRB) approval of the survey instrument, entitled “Airline Transport Pilot Certification Training Program (ATP CTP) for the Aerospace Department of Middle Tennessee State University” was obtained on September 28, 2016 under protocol number 17-1046 (Appendix A). The survey instrument was submitted by Principal Investigator (PI) Leland Thomas Waite and Faculty Advisor (FA) Dr. Wendy S. Beckman, both members of the Aerospace Department at Middle Tennessee State University.

The survey instrument was designed to gauge the opinion current students held concerning the department’s possible development of an ATP CTP course. It provided a brief, five-paragraph summary of the current regulations and FAA policy concerning the ATP CTP, and then asked a series of biographical and opinion questions concerning the ATP CTP course. The biographical questions consisted of five simple-response statements establishing the student’s relative position of progress within the department, along with the student’s career aspirations immediately upon graduation, as seen in Figure 1. The purpose of these questions was to both establish the qualification of the student responding, and allow for stratified analysis of the survey.

Student Information

What is your current class status at Middle Tennessee State University?

Freshman Sophomore Junior Senior Graduate Student

Are you currently enrolled in a Flight Lab at Middle Tennessee State University? (If yes, which one?)

Yes No Current Flight Lab: _____

Which of the following certificates/ratings have you completed? (Check Ride with FAA is complete)

Private Pilot Instrument Rating Commercial Pilot Multiengine Rating
 CFI CFII MEI

What is your current total time in flight hours (approximately)? _____ hours

After graduation, which professional sector do you plan to pursue? (Do not include CFI for time building)

Regional Airline Part 135/Charter Part 91/Corporate Military

Other: _____

Figure 1. Biographical questions establishing the student’s relative progress throughout the Professional Pilot concentration, relative experience level, and career aspirations immediately upon graduation.

The opinion questions consisted of four Likert-scale questions establishing various student opinions about the ATP CTP course, along with one open-response question concerning the cost of the ATP CTP course. The first Likert-scale question (Q1) evaluates student interest in taking the course while enrolled in the department. The second Likert-scale question (Q2) evaluates whether students believe the ATP CTP will be provided to them “free of charge” by a future employer after graduation from the university. The third Likert-scale question (Q3) evaluates whether students believe the proposed ATP CTP course would be more beneficial than the current course taught in Professional Pilot V, AERO 4250 – the High Altitude Crew Coordination course. The fourth Likert-scale question (Q4) evaluates whether students would be willing to expend the time and resources necessary for a one or two day trip to an off-campus site that hosts a full flight simulator (FFS). Lastly, the open-response question asks students to respond

with the maximum (reasonable) cost they would pay for the ATP CTP, provided that similar programs range to be approximately \$5,000.

ATP CTP Course at Middle Tennessee State University

Please select one response to the following statement: I would be interested in taking the ATP CTP course through the Aerospace Department at Middle Tennessee State University.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please select one response to the following statement: I believe the ATP CTP course will be provided to me free of charge by a future employer after I graduate from Middle Tennessee State University.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please select one response to the following statement: I believe the ATP CTP course would be more beneficial to Professional Pilot students versus the current AERO 4250 High Altitude course.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please select one response to the following statement: I would be willing to take a 1 or 2 day trip to a nearby flight simulation center to complete the full flight simulator (FFS) training for the ATP CTP.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

If the ATP CTP course was offered, what is the (reasonable) maximum amount it should cost?
(For reference, the ATP CTP cost at other flight schools is approximately \$5000 for a 6-7 day course)

\$ _____

Figure 2. Likert-scale questions concerning the student's opinions of the proposed ATP CTP course, along with an open-response question concerning the maximum amount of money the student would be willing to pay for the ATP CTP.

This survey instrument was distributed to the Professional Pilot I, II, III, IV, and V courses via paper and pencil delivery, with coordination and assistance from Dr. Wendy S. Beckman (Department Chair) and each professor of the individual course sections. Students were given an informed consent packet, an informed consent declaration sheet, and the survey instrument. Per the Institutional Review Board (IRB) approval, the survey instrument was limited to students with a declared concentration of Professional Pilot within the department.

Business Proposal Sent to Flight Safety International

As previously discussed, the department does not have the resources, personnel, or technical expertise necessary to maintain a full flight simulator (FFS) as is required for the ATP CTP course. Thus, the logical conclusion is that the department must provide for the use of an FFS through a contract with a third party provider. An analysis of current 14 CFR part 142 flight simulation training centers found that Flight Safety International was the most logical choice. With training centers located in Atlanta, GA; Cincinnati, OH; and St. Louis, MO, with each location offering the availability of CRJ-200 FFSs, Flight Safety International would be the simplest arrangement for students to travel and complete the required FFS training for the ATP CTP course.

In coordination with Dr. Wendy S. Beckman, Chair of the Aerospace Department, a formal letter was sent to Flight Safety International requesting a business case proposal for Middle Tennessee State University to contract “dry-lease” (basic simulator use rights) usage of a CRJ-200 FFS (Appendix C). The proposal outlined the expected use of the simulator, the number of events per year, and an overall explanation of the ATP CTP course. This formal letter was routed to a sales representative with Flight Safety International for review and response.

Summary

Prior to the passage of Public Law 111-216 and the subsequent changes to 14 CFR part 61, there was no need for specialized ATP training to be given by a provider such as the department. As such, the department was not historically involved in ATP certification or development of training programs for such. Thus, the ATP CTP course presents a new challenge in curriculum development for the department. Acquired

during the ATP rulemaking process in 2011, the CRJ-200 Level 5 FTD represents the insight of the department in acquiring the necessary device to complete some or all of the ATP CTP training. In the interim, the CRJ-200 FTD has been used with the curriculum for Professional Pilot V, AERO 4250, High Altitude Crew Coordination course, which is substantially similar in course content and hour-load to the ATP CTP. Thus, through methodology of analyzing the existing Professional Pilot V, AERO 4250, High Altitude Crew Coordination course, the ATP CTP, and courses offered by other entities, the determination was made would be feasible for the department to develop an ATP CTP course, and relevant for students enrolled in the department's Professional Pilot program.

CHAPTER 3: ANALYSIS

Introduction

The main work of this capstone project in developing an Airline Transport Pilot Certification Training Program (ATP CTP) for the Aerospace Department of Middle Tennessee State University was taking the existing training course outline (TCO) and lesson plans for Professional Pilot V, AERO 4250, High Altitude Crew Coordination course and modifying them to meet FAA requirements for the ATP CTP course. There were several large and multivariate factors to consider in order to assure the viability of the program fitting into the existing course structure within the university. First, the most realistic option would be for at least a majority of the ATP CTP course to fit into one semester, as the Professional Pilot V, AERO 4250, High Altitude Crew Coordination course currently does. Second, the classroom training would need to be accomplished by approximately mid-way through the semester, allowing students the remaining half of the semester to accomplish the flight simulation training device (FSTD) portion of the course. Third, the course would need to accommodate the minimum curriculum areas, course objectives, learning outcomes, and minimum hours of instruction specified in FAA guidance and 14 CFR parts 61 and 141. Fourth, consideration would need to be given to the department either replacing Professional Pilot V, AERO 4250, High Altitude Crew Coordination course with the ATP CTP course, or making accommodations for the department to offer both courses – left to student choice – under the Professional Pilot V, AERO 4250 banner. Lastly, the ATP CTP course would still need to provide a comparable level of instruction and benefit as compared to the current curriculum of Professional Pilot V, AERO 4250, as the course serves as the capstone of the Professional

Pilot series. This would be a necessary conclusion to the course's implementation, as it will enhance student cost and make the training process more complex; however, its benefit arguably outweighs the existing curriculum and overall enhances student learning in the Professional Pilot concentration.

Training Course Outline

The department currently holds Air Agency Certificate CA8S053Q issued by the FAA, allowing the department to offer courses as a pilot school authorized through 14 CFR part 141. The existing course of Professional Pilot V, AERO 4250 is offered by the university in conjunction with an FAA-approved course, High Altitude Crew Coordination course. Each 14 CFR part 141 course is required to have a TCO approved by the FAA. This TCO describes the general nature of the program, details the course curriculum, contains all required documents and forms, and ensures compliance with the applicable regulations by the certificate holder. Using the standard format developed by and in use with the department, along with the requirements for a TCO as specified in 14 CFR par 141, §141.55, a new TCO was developed for the ATP CTP course encompassing three section and an appendix.

Summary of Training Course Outline Sections

Section 1 of the TCO (Appendix C) serves as an executive summary of the document. A letter to the FAA Flight Standards District Office – Nashville (CE-FSDO-19) requesting initial approval of the ATP CTP course is included for use by the department. A revisions control record is provided for further changes to this section of the TCO; in this revision, it provides detail of the creation of the TCO. A list of effective pages (LOEP) serves as the revision control document for the TCO. Finally, the facilities

and training aides to be used, the flight simulation training devices (FSTDs), and the course instructor designations and requirements are listed, including those exclusive to the requirements of the ATP CTP.

Section 2 of the TCO (Appendix D) serves to contain the syllabus and lesson plans for the entire ATP CTP course. Within this section, the syllabus is further divided into three stages of completion. The first stage contains all of the academic training lessons plans. These plans detail an expected time for the lesson, an overview of the knowledge areas to be covered, a statement of the objectives, a detailed description of each lesson element, and the completion standards the students must achieve. The second stage contains all of the FTSD simulation training to be conducted in the flight training device (FTD) operated by the department, representing a CRJ-200. The third stage contains all of the FSTD simulation training to be conducted in the full flight simulator (FFS) which the department will use through a contracted training provider, representing a CRJ-200. These simulator lessons (both FTD and FFS) are similarly designed to include an expected time for the lesson, an overview of the flight training areas to be covered, a statement of the objectives, and a technical description of each event students must perform. Lastly, there are three assessments (stage checks) throughout the training syllabus. The first assessment comes at the conclusion of the academic lessons; students cumulatively complete written exams administered at the end of each academic subject and then complete a practical test of procedures in the FTD. The second assessment requires the students to complete a line oriented flight training (LOFT) session, which evaluates their performance for procedures, multicrew operations, and crew resource management (CRM) in the FTD. The third assessment occurs at the

completion of the course; students complete a cumulative written exam covering all topics and course materials presented during the ATP CTP course.

Section 3 (Appendix D) of the TCO includes details of the assessments used in the ATP CTP course. The overall topics included in assessment are listed, along with the type of testing practices to be used. The FAA requires that students must achieve at least 70% on any test, so there is a policy for student re-training and re-testing in the event of unsatisfactory performance. In the future, this section will be expanded to include a full question bank of at least 30 questions for use during the ATP CTP. At this time, the researcher did not include any questions, as these will be developed jointly with the professor responsible for teaching the course. Furthermore, as the course material and presentations (such as PowerPoints) are further developed by the professor teaching the course, it will allow the questions to be specifically tailored to each presentation. Additionally, a description of the internal evaluation program (IEP) is also included with this section. The FAA requires each ATP CTP course to track student performance on each assessment; this program fulfills that requirement by detailing a procedure to record and analyze student scores in a spreadsheet program (such as Excel). Additionally, the IEP further collects data on student performance in the FTD and FFS lessons, along with cumulative performance throughout the course. Lastly, the IEP provides for active solicitation of student feedback on the academic training, FTD and FFS lessons, instructor performance, and the entire ATP CTP course. This feedback will be especially helpful in further course improvements by the department.

The Appendix (Appendix E) contains all course related materials. Appendix 1 serves to contain the course documents related to enrollment and graduation. An

enrollment certificate is generated for each student upon beginning the course. At the conclusion of the course – after all lessons, checks, and assessments are complete – the student is issued a graduation certificate, which the student may use to demonstrate their completion of the ATP CTP course.

Lesson Details – Academic Training

Within Section 2 of the TCO, the syllabus describes that the classroom lessons are designed to fulfill the 30 hours of classroom training over the necessary knowledge areas of the ATP CTP. Additionally, these lessons also fulfill the required training over the necessary knowledge areas for the High Altitude Endorsement, in order to maintain maximum commonality with the High Altitude Crew Coordination course. There are four classroom lessons, with each mirroring the layout of the lessons as published by the FAA in Advisory Circular (AC) 61-138. This ensures the syllabus meets FAA expectations for the ATP CTP.

Lesson 1 covers the academic area of aerodynamics. The lesson is planned to be 8 hours in duration, which complies with the FAA's minimum hours for this subject in the ATP CTP. There are three main learning objectives: high altitude operations, stall prevention and recovery training, and upset prevention and recovery training. The overall idea of this lesson is to introduce the students to the unique operating environment that a jet or turboprop aircraft encounters at high altitudes, along with the specific atmospheric and aerodynamic differences of high-altitude flight. Additionally, students study the principles of stall occurrence, recovery, and prevention in transport aircraft. Finally, students discuss the factors and causes leading to in-flight upsets, and the necessary steps to guard against these occurrences. The lesson is complete when the

students demonstrate a satisfactory understanding of all topics presented, and achieve a score of at least 70% on a written quiz over these topics.

Lesson 2 covers the academic area of meteorology. The lesson is planned to be 2 hours in duration, which complies with the FAA's minimum hours for this subject in the ATP CTP. There is one main learning objective: meteorology. The overall idea of this lesson is for students to become familiar with weather considerations for the operation of high performance jet and turboprop aircraft. Students learn about the weather products, services, and briefings available during air carrier operations, along with the on-board weather detection and avoidance equipment to use during flight. Additionally, students review a number of topics on weather formation, propagation, and general weather theory. Lastly, students discuss the low-visibility operating environment for air carrier operations, along with low-visibility approach procedures. The lesson is complete when the students demonstrate a satisfactory understanding of all topics presented, and achieve a score of at least 70% on a written quiz over these topics.

Lesson 3 covers the academic area of air carrier operations. The lesson is planned to be 14 hours in duration, which complies with the FAA's minimum hours for this subject in the ATP CTP. This lesson is significantly longer than any other lesson presented in the TCO; the researcher considered breaking this lesson into smaller parts, but decided to keep it as one cohesive unit in order to ensure the TCO met published FAA guidance. Further, the lesson is easily dividable for multiple class sessions while retaining its original intent. There are ten main learning objectives: physiology/fitness for duty, communications, checklist philosophy, operational control, minimum equipment list (MEL) and configuration deviation list (CDL), ground operations, turbine engines,

transport airplane performance, automation, and navigation and flightpath warning systems. Students learn the fundamentals of air carrier operations and all variables involved, including multicrew operations on the flight deck, airline operating procedures (OpSpecs), aircraft systems and performance, and the increasing role of automation in many aspects of air carrier operations. Additionally, students will begin learning the specific procedures and systems relevant to the CRJ-200, the aircraft represented throughout this TCO and the FSTD lessons. Lastly, students are exposed to high altitude physiology and the modern view on fatigue and fitness for duty as a pilot. The lesson is complete when the students demonstrate a satisfactory understanding of all topics presented, and achieve a score of at least 70% on a written quiz over these topics.

Lesson 4 covers the academic area of leadership and professional development, crew resource management (CRM), and safety culture. The lesson is planned to be 6 hours in duration, which complies with the FAA's minimum hours for this subject in the ATP CTP. There are three main learning objectives: leadership and professional development, crew resource management (CRM), and safety culture and voluntary safety programs. Students are introduced to the philosophy behind effective leadership and performance as an air carrier crewmember, along with the necessary steps to meet this objective. Further, students discuss the complex interactions and considerations for crewmembers in air carrier operations and the application of crew resource management (CRM) principles to these situations. Finally, students examine the multitude of voluntary safety reporting programs designed to improve safety and protect pilot interests in air carrier operations, along with industry and company initiatives to collect data and improve safety. The lesson is complete when the students demonstrate a satisfactory

understanding of all topics presented, and achieve a score of at least 70% on a written quiz over these topics.

Throughout lessons 1-4, students complete academic assessments in the form of written quizzes at the conclusion of each topic area. A complete listing of each topic area is detailed in Section 3 – Assessment of the TCO. AC 61-138 requires periodic academic assessment throughout the classroom training portion of the ATP CTP, which ensures satisfactory student progress from both individual and cumulative perspectives. At the conclusion of lessons 1-4, the scores from each written quiz given throughout the lessons are combined, and provided the total scores average to be above 70%, the academic assessments are considered complete. In addition to these written quizzes, students also complete a practical assessment in the FTD, which focuses on procedures, checklist, flows, systems, and the flight management system (FMS). Students will be required to demonstrate their practical knowledge and understanding of the CRJ-200, which was presented during the classroom lessons. The completion of both the written and practical assessments marks the completion of the stage check.

Lesson Details – Flight Simulation Training

Following the classroom training series, students progress into the beginning of the flight simulation training. Within Section 2 of the TCO, the syllabus describes that the FSTD lessons are designed to fulfill the 10 hours of classroom training over the necessary knowledge areas of the ATP CTP. Additionally, these lessons also fulfill the required training over the necessary knowledge areas for the High Altitude Endorsement. There are a total of 10 FSTD lessons – seven of which are conducted in the FTD, two of which are conducted in the FFS, and one of which is conducted in the FTD as a stage

check assessment. Each lesson relatively mirrors the layout of the lessons as published by the FAA in AC 61-138. This ensures the syllabus meets FAA expectations for the ATP CTP course and provides a high quality training experience.

Two preliminary lessons are conducted in the FTD and focus on cockpit procedures; specifically, students practice procedures and do not actually fly or operate the FTD. Each of these two lessons is planned to be two hours in duration, which complies with the FAA's minimum hours for this subject in the ATP CTP. The main objective of both lessons is for students to experience an introduction to the FTD and the CRJ-200's cockpit. Students practice all flows, checklists, and procedures required to operate the airplane, and endeavor to become proficient in basic multicrew operations. At the conclusion of the second lesson, students will be proficient to a high enough level in the FTD to begin flight training.

The next five flight simulations sessions are conducted in the FTD and focus on students actually operating and flying the FTD in a multicrew setting. Lesson 1 (FTD) consists of an entire flight from Nashville, TN (BNA) to Memphis, TN (MEM), and begins with the FTD set to be "cold and dark" at the airline gates in Nashville. The lesson is planned to be 4 hours in duration, with 1 hour dedicated to pre and post briefings. There are three main learning objectives: navigation, automation, and crew resource management. Students practice the flows, checklists, and procedures required to operate the airplane while actually "flying" the FTD for the first time. In addition, there is a focus on the interpretation and use of navigation displays and equipment, and an overview of the automation available in the FTD, including the autopilot, flight management system (FMS), and traffic collision and terrain avoidance systems. These

specific topics satisfy the ATP CTP requirements set by the FAA. Throughout the flight, students practice taxi, takeoff, departure, en-route, arrival, precision approach, and landing procedures. The lesson concludes when students demonstrate consistent and satisfactory performance, with instructor assistance as needed, in the completion of the lesson's elements.

Lesson 2 (FTD) consists of an entire flight from Nashville, TN (BNA) to Detroit, MI (DTW), and begins with the FTD set to be "cold and dark" at the airline gates in Nashville. The lesson is planned to be 4 hours in duration, with 1 hour dedicated to pre and post briefings. There are three main learning objectives: navigation, automation, and crew resource management. Students practice the flows, checklists, and procedures required to operate the airplane while actually "flying" the FTD. There is also a focus on preflight preparation, including weight and balance loading problems encountered during air carrier operations. In addition, there is a focus on the interpretation and use of navigation displays and equipment, and an overview of the automation available in the FTD, including the autopilot, flight management system (FMS), and traffic collision and terrain avoidance systems. Students are also introduced to high-altitude maneuvers, including actual stalls and upset recovery techniques. These specific topics satisfy the ATP CTP requirements set by the FAA. Throughout the flight, students practice taxi, takeoff, departure, en-route, arrival, non-precision approach, and landing procedures. The lesson concludes when students demonstrate consistent and satisfactory performance, with instructor assistance as needed, in the completion of the lesson's elements.

Lesson 3 (FTD) consists of an entire flight from Nashville, TN (BNA) to Atlanta, GA (ATL), and begins with the FTD pre-set on the departure runway through a "quick

start,” which allows for more student practice of airborne maneuvers. The lesson is planned to be 4 hours in duration, with 1 hour dedicated to pre and post briefings. There are three main learning objectives: navigation, automation, and crew resource management. Students practice the flows, checklists, and procedures required to operate the airplane while actually “flying” the FTD. There is also an emphasis on low-visibility operations, rejected takeoff, and airborne abnormal and emergency procedures, to include engine failures and re-starts. In addition, there is a focus on the interpretation and use of navigation displays and equipment, and an overview of the automation available in the FTD, including the autopilot, flight management system (FMS), and traffic collision and terrain avoidance systems. These specific topics satisfy the ATP CTP requirements set by the FAA. Throughout the flight, students practice taxi, takeoff, departure, en-route, holding, arrival, non-precision approach, missed approach, and landing procedures. The lesson concludes when students demonstrate consistent and satisfactory performance, with instructor assistance as needed, in the completion of the lesson’s elements.

Lesson 4 (FTD) consists of an entire flight from Nashville, TN (BNA) to Washington (Dulles), DC (IAD), and begins with the FTD pre-set on the departure runway through a “quick start,” which allows for more student practice of airborne maneuvers. The lesson is planned to be 4 hours in duration, with 1 hour dedicated to pre and post briefings. There are four main learning objectives: navigation, automation, crew resource management, and high altitude operations. Students practice the flows, checklists, and procedures required to operate the airplane while actually “flying” the FTD. There is also an emphasis on high altitude considerations, cabin pressurization, and emergency descents after the loss of cabin pressure (rapid decompression). This fulfills

the requirements set by the FAA for the High Altitude Endorsement. In addition, there is a focus on the interpretation and use of navigation displays and equipment, and an overview of the automation available in the FTD, including the autopilot, flight management system (FMS), and traffic collision and terrain avoidance systems. Students are also introduced to operations in severe weather and active icing conditions. These specific topics satisfy the ATP CTP requirements set by the FAA. Throughout the flight, students practice taxi, takeoff, departure, en-route, holding, emergency, arrival, non-precision approach, missed approach, and landing procedures. The lesson concludes when students demonstrate consistent and satisfactory performance, with instructor assistance as needed, in the completion of the lesson's elements.

Lesson 5 (FTD) consists of an entire flight from Nashville, TN (BNA) to Detroit, MI (DTW), and begins with the FTD set to be "cold and dark" at the airline gates in Nashville. The lesson is planned to be 4 hours in duration, with 1 hour dedicated to pre and post briefings. There are three main learning objectives: navigation, automation, and crew resource management. Students practice the flows, checklists, and procedures required to operate the airplane while actually "flying" the FTD. This fulfills the requirements set by the FAA for the High Altitude Endorsement. In addition, there is a focus on the interpretation and use of navigation displays and equipment, and an overview of the automation available in the FTD, including the autopilot, flight management system (FMS), and traffic collision and terrain avoidance systems. These specific topics satisfy the ATP CTP requirements set by the FAA. Throughout the flight, students practice taxi, takeoff, departure, en-route, holding, emergency, arrival, precision and non-precision approach, missed approach, and landing procedures. The lesson

affords much flexibility to the instructor, as it is the final review before students complete their assessment of the FTD lessons. Thus, the instructor is free to modify and include/exclude any lesson elements. The lesson concludes when students demonstrate consistent and satisfactory performance, with instructor assistance as needed, in the completion of the lesson's elements.

At the conclusion of the cockpit procedure lessons, and FTD lessons 1-5, students then complete an assessment in the form of a line oriented flight training (LOFT) scenario. The LOFT is planned to be four hours in length, with one hour dedicated to students completing an oral quizzing over the FTD lesson elements, CRJ-200 procedures and systems, and high altitude operations. There are three main objectives during the assessment: navigation, automation, and crew resource management (CRM). The exact details of the LOFT, such as departure and arrival city and specific scenarios, are left to the discretion of the instructor. Students are expected to be proficient with all concepts presented throughout the FTD lessons, including normal operating procedures, abnormal or emergency procedures, and high altitude operations. The LOFT will consist of an entire flight, completed with no instructor assistance, and will conclude when students demonstrate consistent and satisfactory performance and mastery of the FTD section.

The final two lessons are conducted in the FFS and specifically target the objectives mandated by the FAA for ATP CTP. Lesson 1 (FFS) consists of a scenario in which students primarily complete ground, taxi, takeoff, approach, and landing procedures. The lesson is planned to be 4 hours in duration, with 1 hour dedicated to pre and post briefings. There is one main learning objective: runway safety and adverse weather. The main purpose of this lesson is an experiential application of these concepts

to the high-fidelity environment in the full motion simulator. These specific topics satisfy the ATP CTP requirements set by the FAA. This lesson is complete when the students experience each component.

Lesson 2 (FFS) consists of a scenario in which students primarily encounter high altitude operations, stalls and low energy states, and upset recovery procedures. The lesson is planned to be 4 hours in duration, with 1 hour dedicated to pre and post briefings. There are two main learning objectives: high altitude operations, and stall and upset prevention and recovery. The main purpose of this lesson is for students to purposefully operate the simulator at the edges of the performance envelope for transport category aircraft, and observe the aircraft's reactions. Additionally, students learn important techniques to prevent upsets, and how to recover from an upset if it happens unintentionally. These specific topics satisfy the ATP CTP requirements set by the FAA. This lesson is complete when the students experience each component.

Lesson Details – End of Course

At the conclusion of the ATP CTP course, students must take a cumulative written exam over all topics presented. A bank of potential questions will be submitted with the final version for FAA approval, as they must closely match with the material taught by the course's professor. Students must score at least 70% on this cumulative exam, and if they do not, then retraining and retesting to achieve a minimum score of 70% is required prior to graduation. Because the FTD and FFS sections are principally based on experience, versus proficiency or mastery, there is no FTD or FFS component in the end of course assessment. At the conclusion of the end of course assessment,

students will receive a High Altitude Endorsement and ATP CTP Graduation Certificate in accordance with the procedures described in the TCO.

Compatibility of ATP CTP Course with High Altitude Crew Coordination Course

When the ATP CTP course is approved by the FAA and implemented by the department, it must be integrated into the Professional Pilot curriculum. There are two realistic options for the department to consider; either creating two parallel paths for a student enrolled in Professional Pilot V, AERO 4250 to choose between the High Altitude Crew Coordination course or the ATP CTP course, or cancelling the High Altitude Crew Coordination course and replacing it in entirety with the ATP CTP course. For the purpose of this capstone, the researcher believes a parallel path will offer the department the greatest flexibility in implementation and allow for a testing and trial phase of the ATP CTP course.

Currently, the High Altitude Crew Coordination course consists of two stages. The first stage encompasses all of the academic training and the second stage encompasses all of the FSTD (FTD) simulation training. Both stages include an assessment (stage check) at their completion, along with an end of course check. The ATP CTP course, as mentioned above, is proposed to consist of three stages. The first stage encompasses all of the academic training, the second stage encompasses all of the FTD simulation training, and the third stage encompasses all of the FFS training. The first and second stages conclude with an assessment (stage check) along with a cumulative end of course check.

The most logical course of action was to construct the TCO for the ATP CTP to have the first stage include all required topics presented in the High Altitude Crew

Coordination course, along with those required by the ATP CTP course. The same logic was used for the second stage and the construction of the FTD lessons. Thus, using the TCO for the ATP CTP as the new standard, the High Altitude Crew Coordination course TCO will be re-written to match the first and second stages of the ATP CTP. Thus, when a student enrolls in Professional Pilot V, AERO 4250, they will choose to enter either the High Altitude Crew Coordination course or the ATP CTP course. The identical TCOs for both courses will allow one professor to instruct both sets of students in a common classroom setting, along with simplifying the FTD lessons conducted in the department's CRJ-200 FTD.

At the conclusion of the second stage, students enrolled in the High Altitude Crew Coordination course would complete their applicable end of course check, receive a Graduation Certificate and High Altitude Endorsement, and receive course credit for AERO 4250. Students enrolled in the ATP CTP course would also receive a High Altitude Endorsement and receive course credit for AERO 4250; however, the ATP CTP students would then continue into the third stage – the FFS training – that would be completed during the semester or into a subsequent semester. The third stage of the ATP CTP would also be linked to another course – the researcher proposes a one-credit flight lab – which would reflect the student's additional devotion of time to the course. Once the students completed the third stage, they would complete their applicable end of course check, receive a graduation certificate, and receive course credit for the one-credit flight lab.

Survey Results of Current Professional Pilot Concentration Students

Along with a plan of integration and eventual replacement of the Professional Pilot V, AERO 4250 curriculum, it is vital to demonstrate student support for the ATP CTP course. The survey instrument (Appendix B) distributed to Professional Pilot concentration students (those with a declared major) enrolled in the Professional Pilot I, II, III, IV, and V courses was analyzed and applied to this capstone project. During the survey phase, 195 survey instruments were distributed among the 5 different course levels. 91 valid responses were obtained; of those, 45 were lower class students (freshman & sophomore) and 46 were upper class students (junior & senior). As this survey was intended to be a simple supplement to the ATP CTP proposal, rather than a theoretical cornerstone, it was analyzed by the researcher only on a level of descriptive statistics. In essence, the researcher felt there are other components of ATP CTP program than demand significantly more attention than conclusive survey results, so this was the extend of the analysis deemed to be beneficial to the ATP CTP proposal for the department.

Within the survey, students first answered five simple-response statements establishing the student's relative position of progress within the department, along with the student's career aspirations immediately upon graduation.

Student Information**45 Freshman & Sophomores, 46 Juniors & Seniors**

What is your current class status at Middle Tennessee State University?

____ Freshman ____ Sophomore ____ Junior ____ Senior ____ Graduate Student

Are you currently enrolled in a Flight Lab at Middle Tennessee State University? (If yes, which one?)

____ Yes ____ No Current Flight Lab: _____

Which of the following certificates/ratings have you completed? (Check Ride with FAA is complete)

____ Private Pilot ____ Instrument Rating ____ Commercial Pilot ____ Multiengine Rating
____ CFI ____ CFII ____ MEI **Between Instrument & Commercial**What is your current total time in flight hours (approximately)? **149** hours

After graduation, which professional sector do you plan to pursue? (Do not include CFI for time building)

66 Regional Airline **7** Part 135/Charter **9** Part 91/Corporate **14** Military
Other: **8 (Cargo, US Forest Service, career change, misc.)****Figure 3. Averaged responses to the first section of the student survey instrument.**

As previously stated, 45 students responded to be either freshman or sophomore class status, and 46 students responded to be either junior or senior class status. This means the survey instrument captured a relatively equal cross-section of experience among students in the department. The average level of progress in the department (certificates/ratings accomplished) was between the “Instrument Rating” and “Commercial Pilot” level, which is consistent with a student approximately half way through the Professional Pilot concentration. The average “total time in flight hours” was 149 hours. For the “professional sector you plan to pursue,” 66 students indicated “regional airline,” 7 students indicated “part 135/charter,” 9 students indicated “part 91/corporate,” 14 students indicated “military,” and 8 students indicated “other” to represent career fields not listed. (Note that some students answered for multiple career paths, and some students did not answer this question at all).

For the second half of the survey, students answered four Likert-scale questions and one free response question. Each question was specifically written to address a key

component of the department’s adopting and integration of the ATP CTP course into the curriculum. In recording the data, the researcher assigned a value of 1 to “Strongly Disagree,” 2 to “Disagree,” 3 to “Neutral,” 4 to “Agree,” and 5 to “Strongly Agree.” Student responses were then compounded and averaged to come up with response values to each Likert-scale question.

ATP CTP Course at Middle Tennessee State University				
<i>Please select one response to the following statement: I would be interested in taking the ATP CTP course through the Aerospace Department at Middle Tennessee State University.</i>				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
			4.21	
				4.14
				4.30
<i>Please select one response to the following statement: I believe the ATP CTP course will be provided to me free of charge by a future employer after I graduate from Middle Tennessee State University.</i>				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
			3.92	
				3.86
				3.98
<i>Please select one response to the following statement: I believe the ATP CTP course would be more beneficial to Professional Pilot students versus the current AERO 4250 High Altitude course.</i>				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
			3.82	
				3.70
				3.93
<i>Please select one response to the following statement: I would be willing to take a 1 or 2 day trip to a nearby flight simulation center to complete the full flight simulator (FFS) training for the ATP CTP.</i>				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
			4.42	
				4.27
				4.57
If the ATP CTP course was offered, what is the (reasonable) maximum amount it should cost? (For reference, the ATP CTP cost at other flight schools is approximately \$5000 for a 6-7 day course)				
			\$ 3,891	
				\$3628
				\$4151

Figure 4. Averaged response to the second section of the student survey instrument. Numbers in “red” represent the entire student population (N=91). Numbers in green represent the lower class student population (N=45). Numbers in blue represent the upper class student population (N=46).

For the first Likert-scale question (Q1), the average response was 4.21, which places the average opinion between “Agree” and “Strongly Agree.”

Interest in Taking ATP CTP

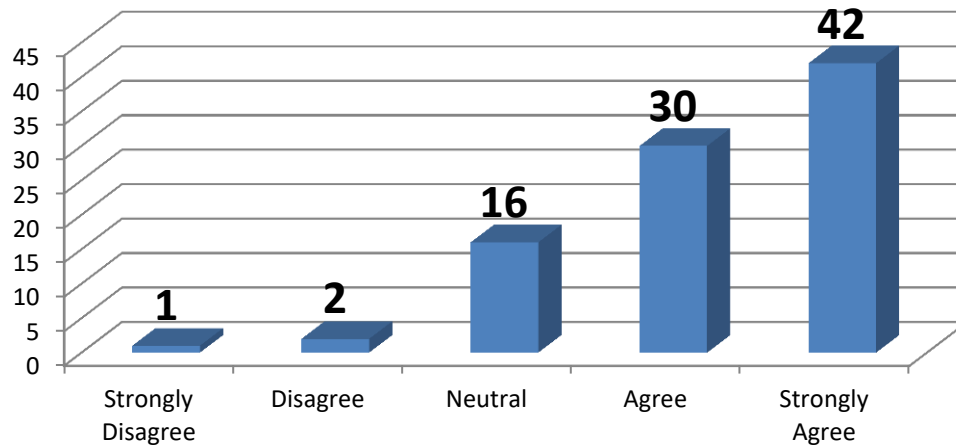


Figure 5. Detailed distribution of student responses to Likert-scale (Q1).

For the second Likert-scale question (Q2), the average response was 3.92, which places the average opinion between “Neutral” and “Agree.”

Believe ATP CTP Will Be Free

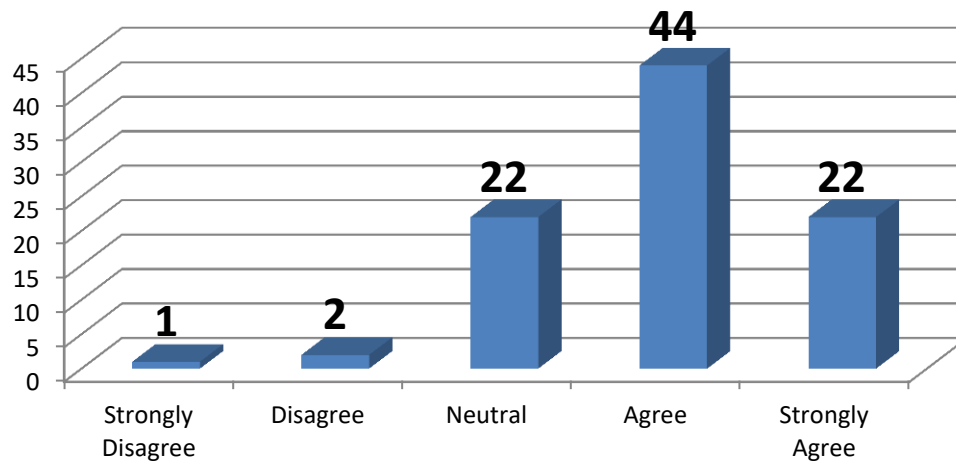


Figure 6. Detailed distribution of student responses to Likert-scale (Q2).

For the third Likert-scale question (Q3), the average response was 3.82, which places the average opinion between “Neutral” and “Agree.”

ATP CTP vs. High Altitude Course

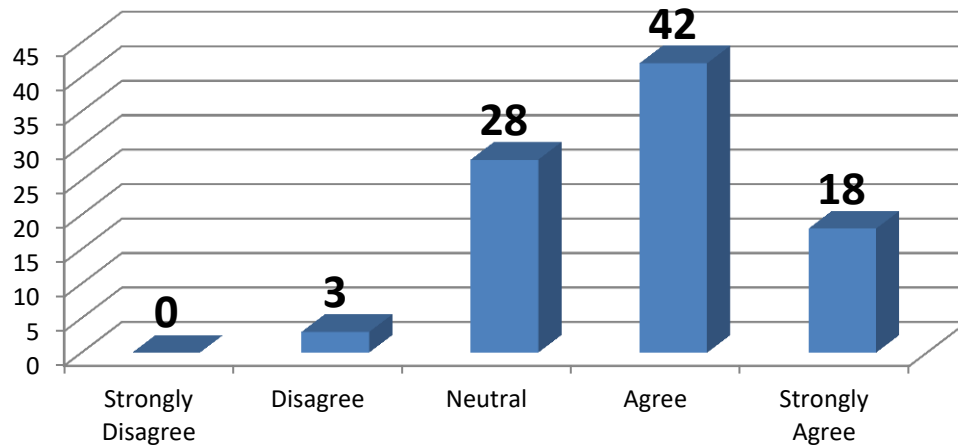


Figure 7. Detailed distribution of student responses to Likert-scale (Q3).

For the fourth Likert-scale question (Q4), the average response was 4.42, which places the average opinion between “Agree” and “Strongly Agree”

Interest in Road Trip for FFS

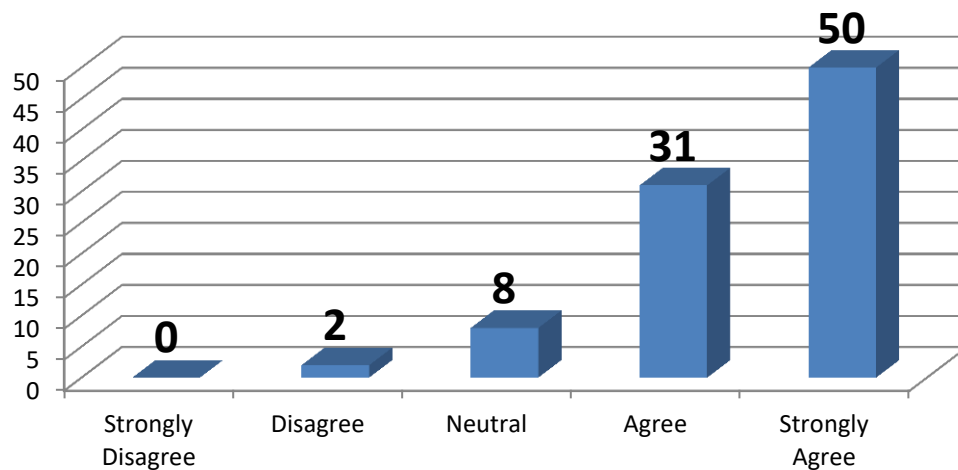


Figure 8. Detailed distribution of student responses to Likert-scale (Q4).

For the open response question, students indicated the average cost they would consider reasonable for the ATP CTP to be \$3,891.

Further analysis of the data was conducted with the responses separated between lower class and upper class students. For Likert-scale question (Q1), the lower class average response was 4.14, and the upper class average response was 4.30. For Likert-scale question (Q2), the lower class average response was 3.86, and the upper class average response was 3.98. For Likert-scale question (Q3), the lower class average response was 3.70, and the upper class average response was 3.93. For Likert-scale question (Q4), the lower class average response was 4.27, and the upper class average response was 4.57. For the open response question, lower class students indicated they would spend an average of \$3,628, while upper class students indicated they would spend an average of \$4,151. These values are further represented on Figure 4 (with red, green, and blue colored numbers). On a whole, the responses seemed to be very similar between lower and upper class students, albeit upper class students tended to have stronger opinions on each topic versus lower class students.

Response to Business Proposal from Flight Safety International

As previously discussed, a letter requesting a business case proposal for the Aerospace Department of Middle Tennessee State University to contract “dry-lease” a CRJ-200 FFS was sent to Flight Safety International, a 14 CFR part 142 flight simulation training center. This letter was responded to by a Flight Safety International sales representative, based in Atlanta, GA. The researcher completed a telephone discussion with this sales representative, who also represented Flight Safety International’s ATP CTP program, and was thus familiar with relevant regulations and FAA guidance.

The researcher provided a further explanation of the department’s wishes to contract for FFS usage, the planned semester schedule of the ATP CTP program, and an

estimate of the number of students that would be enrolled for FFS training each semester. The Flight Safety International sales representative responded by stating that the department's total number of block hours in the simulator would not meet the minimum that Flight Safety International requires for a dry-lease, which is approximately 150-200 hours per year, minimum. Further, the sales representative stated that a majority of the CRJ-200 FFS block hours are "virtually" owned by several large air carriers, who use an arrangement with Flight Safety International for their initial and recurrent training programs. Finally, the sales representative stated that a contract with the department for furtherance of the department's ATP CTP program would represent a conflict of business interests for Flight Safety International, as the simulation center also offers a complete ATP CTP course. Thus, the telephone conversation concluded with the sales representative insinuating that Flight Safety International would not be interested in contracting with the department for FFS use, given the low block hour utilization and the conflict of business interests between Flight Safety International and Middle Tennessee State University.

Summary

Throughout development of the TCO) for the ATP CTP program, much consideration was given to a successful path of implementation and eventual integration of the ATP CTP into the existing Professional Pilot concentration curriculum. A key consideration was developing the TCO to fit the existing curriculum structure of Professional Pilot V, AERO 4250, to allow students the initial choice of enrolling in either the High Altitude Crew Coordination course or the ATP CTP course. Eventually, a successful trial of this parallel structure should lead to the department replacing the High

Altitude Crew Coordination course with the ATP CTP course, for the benefit of all Professional Pilot concentration students.

Each section of the ATP CTP's TCO, based on the existing TCO of the High Altitude Crew Coordination course, was modified and re-written to include compliance with the regulations and FAA guidance. Section 1 – General provides an overview of the course, facilities, training aids, flight simulation training devices, and instructors. Section 2 – Syllabus outlines the entire curriculum for the course; separated into three training states – academic, FTD, and FFS – the syllabus affords a maximum level of flexibility and feasibility for the department in implementing the ATP CTP. Section 3 – Assessment describes how each stage check will be accomplished throughout the syllabus, provides for the expansion of a question-answer bank when the course material is developed further by the department and course-specific professor, and an internal evaluation program (IEP) for tracking student performance and critiques throughout the course. Combined with the student survey instrument results, the successful development of this TCO provides further evidence for the feasibility of the department implementing the ATP CTP course.

CHAPTER 4: DISCUSSION AND FUTURE RESEARCH

Introduction

In summary, the purpose of this capstone project was to establish a draft of the training course outline (TCO) for the Airline Transport Pilot Certification Training Program (ATP CTP) for consideration in future use by the Aerospace Department of Middle Tennessee State University. Relevant literature on the ATP CTP, including documents relating to its creation such as the FAA's Advanced Notice of Proposed Rulemaking (ANPRM) and Notice of Proposed Rulemaking (NPRM), was reviewed to ensure the department's ATP CTP course would comply as closely as possible with the regulations and FAA guidance. A survey instrument was distributed to students enrolled in the Professional Pilot curriculum to gauge their interest level and opinions concerning the ATP CTP. Finally, a business case proposal was made to a major flight simulation training center for use of an FFS, which is the one component of the ATP CTP that is outside the resources of the department to accomplish "in-house."

Efficacy of Capstone Project

Overall, the development of the ATP CTP course was a positive endeavor. Analyses of the current ATP CTP training offerings throughout the aviation industry lead to the conclusion that an implementation of the program by the department would be a worthwhile step. There exist relatively few institutions that offer the ATP CTP, especially for students seeking to complete the training without the aid or affiliation of an air carrier or similar employer. Further, many air carriers and aviation employers have resorted to providing ATP CTP training through a contractual partnership, opposed to establishing and operating their own course. Lastly, although ATP CTP training is

currently provided free of charge by many aviation employers, such as regional airlines, there is no guarantee for this precedent to continue. For example, Southwest Airlines, a major passenger airline within the United States, has traditionally required its pilot applicants to possess a Boeing B-737 type rating –a specific authorization issued by the FAA to operate large and complex aircraft – prior to consideration for interviewing or employment. Within the recent years, airlines have begun increasing their hiring efforts as more senior pilots reach the age of retirement; thus, there has been a significant shift in the demand for pilots working for the airlines. As a result, Southwest Airlines now accepts pilot applicants for interviewing and employment without any requirement for the Boeing B-737 type rating (Pilot Credentials, 2016), arguably in order to meet the increased need for hiring pilots. In this same manner, as the demand for pilots may decrease in the future, this could result in the cost of the ATP CTP training transferring from being covered by airlines to the responsibility of the individual pilots. Thus, all of these factors contribute to the efficacy of this Capstone project by highlighting a defined need for the ATP CTP program for students in the Professional Pilot concentration, as it is vital to providing students with training to meet industry needs.

Concerning student opinion, this Capstone project and the proposed ATP CTP program it produced appear to meet the desires of students within the department. Through the survey instrument responses, the average student response to Q1 (“Interest in Taking the ATP CTP”) was between “Agree” and “Strongly Agree,” with 79% of total response indicating some level of favorability. The average student response to Q3 (“Benefit of ATP CTP versus High Altitude Crew Coordination”) was also between “Agree” and “Strongly Agree,” with 65% of total responses indicating some level of

favorability. The student response to Q4 (“Willingness to Travel for Full Flight Simulator”) was overwhelmingly positive; 89% of total responses indicated some level of favorability, with 67% of those favorable responses being the most favorable choice on the survey (“strongly agree”). Interestingly, the student response to Q3 (“ATP CTP Provided Free of Charge by Future Employer”) was also between “Agree” and “Strongly Agree,” with 73% of students agreeing at some level. Without more detailed survey data collection and statistical analysis, it is difficult to determine the significance of this response; however, for this project it appeared that most students were aware of the fact that the ATP CTP may be paid by a future employer, yet were also willing to pay for and complete the course while enrolled at Middle Tennessee State University.

The main detriment to the future implementation of the ATP CTP by the department is the required FFS training stipulated through the regulations, which brings the further considerations of business negotiations, excessive cost to students, and the necessity of travel to an off-campus location. Given the estimated cost of \$8 million dollars for the purchase of a Level C FFS, the minimum qualification level needed for the FFS portion of the ATP CTP, it is unrealistic for Middle Tennessee State University to have the capital for such expenditures (AOPA, 2013, p. 4). Thus, the next best choice is for the department to contract with a flight simulation training center or airline for the use of an FFS. The rejection of a partnership by Flight Safety International certainly had an effect on the possible efficacy of this capstone, but it is important to note that many other flight simulation training centers exist with similar capabilities as Flight Safety International. Additionally, a flat out “dry-lease,” as was proposed in the business case request with Flight Safety International, may still prove to be cost prohibitive. For

example, AOPA (2013, p. 4) cites the operating cost of a Level C FFS to be approximately \$1,000 per hour, which would add approximately \$3,000 per student to the cost of the ATP CTP (assuming two students share six hours of FFS block time). Thus, the FFS question will be the most important detriment to overcome in future work with the department's ATP CTP program in order to ensure successful implementation.

Significance of Capstone Project

In terms of significance, this capstone project has demonstrated the feasibility of implementing the ATP CTP as part of the Professional Pilot curriculum. Beyond the benefits to students, as discussed above and in previous sections, the main significance of this program will be the industry recognition and prestige it brings to the department. In much the same way that air carriers compete to hire pilots, colleges and universities continually compete for quality applicants to their programs. By offering the ATP CTP course, Middle Tennessee State University will gain a valuable recruiting benefit in attracting high-caliber aerospace students. Further, these students will enjoy a competitive advantage upon completion of the program and entrance into the workplace, as they will possess a certification that few other college aviation students achieve prior to graduation. Finally, the ATP CTP will supplement the most important trait a pilot can possess – a strong sense of safety culture. By exposing Professional Pilot concentration students to the advanced training topics within the ATP CTP, both academic and practical in nature, they are endowed with valuable lessons and skills that will serve to keep them safer while flying. Thus, even though a student may not for some time (months or years) fly for an air carrier or in the type of aircraft the ATP CTP focuses on, the students will still be able to apply the general safety concepts.

Another significant effect if the ATP CTP is implemented will be the possibility of partnerships with other air carriers. Presently, several air carriers offer programs targeted for students in the Professional Pilot concentration aimed at mentorship, professional development, and eventual recruitment and employment with the said air carrier. Throughout the industry, these types of partnerships are very desirable for both students and educational institutions, as they provide a multitude of benefits to both. In the context of the ATP CTP, a program within the department may inspire air carriers to assist with the completion of the course, including the FFS requirement, as discussed above. In addition, air carriers may offer tuition reimbursement, bonuses, or other types of monetary scholarships or awards to students for successfully completing the ATP CTP course. This attention from industry would greatly benefit students overall, as they will have more competitive and lucrative opportunities for employment with these air carriers; further, this attention will benefit the department by opening channels for future industry attention, resources, and professional relationships.

Recommendations and Future Research

With the progression of this capstone project, it became clear the largest challenge the department would face in implementing the ATP CTP course was the lack of opportunities for convenient use of an FFS. Although it would be extremely unlikely that the FAA would consider an exemption to removing this requirement, strong evidence exists to suggest that a compromise on fewer required hours of FFS training may be realistic. Within 14 CFR part 141, there is a specific regulation that gives pilot schools the ability to develop special training programs and curricula. §141.57 states, “a pilot school certificate or provisional pilot school certificate may apply for approval to conduct

a special course of airman training for which a curriculum is not prescribed in the appendixes of this part, if the applicant shows that the training course contains features that could achieve a level of pilot proficiency equivalent to that achieved by a training course prescribed in the appendixes of this part or the requirements of part 61 of this chapter” (eCFR, 2016). This means that, theoretically, a pilot school could develop a curriculum with even less hours than those required by the normal 14 CFR parts 141 or 61 minimums, which includes the ATP CTP course.

The department has historically been heavily involved in part 141 flight training, and additionally, holds approval for several special training programs and curricula under §141.57. Currently, the department operates three training course based on §141.57: Private Pilot, Instrument Rating, and Commercial Pilot. Each of these courses was developed under the FAA Industry Training Standards (FITS) initiative – a joint collaboration between the FAA, industry partners, and educators. FITS involves “scenario-based, learner-focused training materials that encourage practical application of knowledge and skills” (FAA 7, 2006). Specifically, FITS also was designed to reduce the general aviation accident rate in response to a challenge issued by FAA in 1998 – the *Safer Skies Initiative* – aimed at catalyzing improvements in 16 identified areas (USGAO, 2000, pp. 10-12). The department first developed a FITS Private/Instrument curriculum in 2004, and saw enough favorable results in student success to implement permanently that curriculum in 2007, along with developing a Commercial curriculum by 2008 (Beckman, et al, 2008). In addition to the safety-encouraging mental model of FITS, in each curriculum, “students progress through the course and ultimately complete the course when they meet the flight proficiency standards, regardless of how many or how

few flight hours they accumulate while in the course. This competency-based system is a departure from the traditional flight hour based system” (Craig, et al, n.d., p. 1). In sum, FITS allows for both a more safety-focused curriculum and a reduction in the required flight hours by making total experience incidental to the student achieving acceptable performance throughout the course.

The department has a proven record of success in training students to proficiency under the FITS Private, Instrument, and Commercial curricula. In each case, students complete fewer flight hours than required by 14 CFR parts 61 and 141, yet they still meet high proficiency standards during their practical tests (checkrides). For example, during the initial phase of the Commercial curriculum, practical test pass rates reached 88% (Craig, et al, n.d., p. 1). There exists a large potential for the department to use leverage of their successes with §141.57 – Special Curricula to modify the requirements for the ATP CTP course. Remember, the department must demonstrate, “that the training course contains features that could achieve a level of pilot proficiency equivalent to that achieved by a training course” (eCFR 2, 2016). Thus, with an expanded research effort and collection of data, the potential exists for the department to develop a course that the FAA will consider to provide equivalent proficiency under the ATP CTP rules.

Much of aviation’s early progress was the result of trial-and-error experimentation, yet aviation has also highly profited from the use of science and research in developing, especially in regards to the human factor. Training pilots is not a clearly defined field, and the FAA seems to acknowledge continual improvements to the process. Thus, with the newly created ATP CTP course, there exists a large potential for

improvement. The principal challenge for institutions like Middle Tennessee State University to offer the ATP CTP is the full flight simulator (FFS) requirement. If the department was able to conduct an extensive research study, demonstrating that additional training using a highly-qualified flight training device (FTD) provided an equivalent or greater level of safety and training utility, than a §141.57 – Special Curricula exemption may enable the department to offer the ATP CTP with fewer FFS hours, and even make the further case for elimination of the FFS if it was found to be unnecessary to achieve the equivalent level of proficiency as required by the regulations for the ATP CTP.

Summary

This capstone project and the development of a draft of the ATP CTP program for use by the department was a crucial first step towards actual implementation and use. Further bolstered by positive student opinion and an identified need in the industry, the efficacy and significance of this program to Professional Pilot concentration students is clear. So long as the department addresses the issue with obtaining FFS usage and controls cost expenditures, the ATP CTP program is projected to be a great success. Coupled with the possibility of future research through the ATP CTP in the name of 14 CFR part 141, §141.57 – Special Curricula, the ATP CTP offers great gains for the department, faculty, and students alike. The researcher is hopeful that this TCO will ultimately be used by the department in implementing the ATP CTP course.

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APPENDICES

APPENDIX A: IRB Approval Letter

IRB
 INSTITUTIONAL REVIEW BOARD
 Office of Research Compliance,
 010A Sam Ingram Building,
 2269 Middle Tennessee Blvd
 Murfreesboro, TN 37129



IRBN007 – EXEMPTION DETERMINATION NOTICE

Wednesday, September 28, 2016

Investigator(s): Leland Thomas Waite (PI), and Dr. Wendy Beckman (FA)
 Investigator(s) Email(s): ltw2m@mtmail.mtsu.edu
 Department: Aerospace Department

Study Title: Airline Transport Pilot Certification Training Program (ATP CTP) for the
 Aerospace Department of Middle Tennessee State University
 Protocol ID: 17-1046

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the EXEMPT review mechanism under 45 CFR 46.101(b)(2) within the research category (2) *Educational Tests*. A summary of the IRB action and other particulars in regard to this protocol application is tabulated as shown below:

IRB Action	EXEMPT from further IRB review***	
Date of expiration	NOT APPLICABLE	
Participant Size	150	
Participant Pool	Aerospace students enrolled in Professional Pilot I, II, III, IV, or V course, and enrolled in the Professional Pilot concentration.	
Mandatory Restrictions	Students need to consent to participation.	
Additional Restrictions	Students who are not enrolled in the Professional Pilot Concentration.	
Comments	None	
Amendments	Date N/A	Post-Approval Amendments None

***This exemption determination only allows above defined protocol from further IRB review such as continuing review. However, the following post-approval requirements still apply:

- Addition/removal of subject population should not be implemented without IRB approval
- Change in investigators must be notified and approved
- Modifications to procedures must be clearly articulated in an addendum request and the proposed changes must not be incorporated without an approval
- Be advised that the proposed change must comply within the requirements for exemption
- Changes to the research location must be approved – appropriate permission letter(s) from external institutions must accompany the addendum request form
- Changes to funding source must be notified via email (irb_submissions@mtsu.edu)
- The exemption does not expire as long as the protocol is in good standing

- Project completion must be reported via email (irb_submissions@mtsu.edu)
- Research-related injuries to the participants and other events must be reported within 48 hours of such events to compliance@mtsu.edu

The current MTSU IRB policies allow the investigators to make the following types of changes to this protocol without the need to report to the Office of Compliance, as long as the proposed changes do not result in the cancellation of the protocols eligibility for exemption:

- Editorial and minor administrative revisions to the consent form or other study documents
- Increasing/decreasing the participant size

The investigator(s) indicated in this notification should read and abide by all applicable post-approval conditions imposed with this approval. [Refer to the post-approval guidelines posted in the MTSU IRB's website](#). Any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918 within 48 hours of the incident.

All of the research-related records, which include signed consent forms, current & past investigator information, training certificates, survey instruments and other documents related to the study, must be retained by the PI or the faculty advisor (if the PI is a student) at the secure location mentioned in the protocol application. The data storage must be maintained for at least three (3) years after study completion. Subsequently, the researcher may destroy the data in a manner that maintains confidentiality and anonymity. IRB reserves the right to modify, change or cancel the terms of this letter without prior notice. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board
Middle Tennessee State University

Quick Links:

[Click here](#) for a detailed list of the post-approval responsibilities.
More information on exempt procedures can be found [here](#).

APPENDIX B: Professional Pilot Student Survey

Student Information

What is your current class status at Middle Tennessee State University?

Freshman Sophomore Junior Senior Graduate Student

Are you currently enrolled in a Flight Lab at Middle Tennessee State University? (If yes, which one?)

Yes No Current Flight Lab: _____

Which of the following certificates/ratings have you completed? (Check Ride with FAA is complete)

Private Pilot Instrument Rating Commercial Pilot Multiengine Rating
 CFI CFII MEI

What is your current total time in flight hours (approximately)? _____ hours

After graduation, which professional sector do you plan to pursue? (Do not include CFI for time building)

Regional Airline Part 135/Charter Part 91/Corporate Military

Other: _____

ATP CTP Course at Middle Tennessee State University

Please select one response to the following statement: I would be interested in taking the ATP CTP course through the Aerospace Department at Middle Tennessee State University.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please select one response to the following statement: I believe the ATP CTP course will be provided to me free of charge by a future employer after I graduate from Middle Tennessee State University.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please select one response to the following statement: I believe the ATP CTP course would be more beneficial to Professional Pilot students versus the current AERO 4250 High Altitude course.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please select one response to the following statement: I would be willing to take a 1 or 2 day trip to a nearby flight simulation center to complete the full flight simulator (FFS) training for the ATP CTP.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

If the ATP CTP course was offered, what is the (reasonable) maximum amount it should cost?

(For reference, the ATP CTP cost at other flight schools is approximately \$5000 for a 6-7 day course)

\$ _____

Airline Transport Pilot Certification Training Program (ATP CTP) for the Aerospace Department of Middle Tennessee State University

Student Survey Information Form (1/2)
Principal Investigator: Leland Thomas Waite
Faculty Advisor: Dr. Wendy Beckman

Background Information

As of July 31, 2014, the Federal Aviation Administration (FAA) has changed the requirements for an airman to obtain an Airline Transport Pilot (ATP) certificate with airplane category and multiengine class ratings. Additionally, any pilot flying for a Part 121 air carrier as a First Officer is now required to have an ATP certificate. This change to the regulations affects professional pilot students seeking employment as a First Officer with the airlines, along with any students seeking an ATP certificate in general.

Previously, an airman was required to complete a written exam and a practical exam (oral and flight checkride) in order to obtain their ATP certificate. Now, an airman is required to complete the FAA's Airline Transport Pilot Certification Training Program (ATP CTP) as part of the process. This ATP CTP program must be completed before the student is eligible to take the written exam. The FAA must approve the ATP CTP program, and it must be offered by a FAA certified airline, flight school, or flight simulation center.

The ATP CTP course requires 30 hours of classroom training over a number of topics the FAA considers to be important for airline and multiengine jet operations. Further, the course requires 10 total hours of flight simulation training device (FSTD) instruction time – 6 of those hours may be accomplished in a FSTD (such as Middle Tennessee State University's CRJ-200 FTD), but 4 of those hours must be completed in a full flight simulator (FFS), which Middle Tennessee State University does not possess. At the completion of the course, the students complete an academic test and receive a graduation certificate that may be used to take the ATP written exam.

Currently, Middle Tennessee State University offers classroom and simulator training in the CRJ-200 FTD for Professional Pilot V, AERO 4250. Students in this course complete 19 hours of classroom training and 32 hours of flight simulation training device (FSTD) instruction time. Additionally, the students receive a High Altitude endorsement at the completion course. Unfortunately, as currently certified the Professional Pilot V, AERO 4250 course does not provide any credit towards the ATP CTP.

At this time, many regional airlines and other operators are offering to pay for ATP CTP training once a new-hire joins their company. However, this trend is not universally occurring within the industry, and in the future, these airlines may discontinue providing "free" ATP CTP training. Thus, it may be beneficial for students to complete the ATP CTP course while at Middle Tennessee State University.

Survey Use

The data collected from this survey will be aggregated and analyzed for use in the PI's Capstone Project, which seeks to establish a draft of a training program for Middle Tennessee State University to use in creating and implementing an Airline Transport Pilot Certification Training Program (ATP CTP) course using the department's CRJ-200 FSTD and a contracted FFS with another training provider.

APPENDIX C: Flight Safety Business Proposal Letter

Aerospace Department
MTSU P.O. Box 67
Middle Tennessee State University
Murfreesboro, Tennessee 37132
Office: (615) 898-2788



October 7, 2016

Greg Ruggles
Regional Sales Manager
1010 Toffie Terrace
Atlanta, GA 30354

Dear Mr. Ruggles:

My name is Leland Waite, and I am graduate student in the Aerospace Department of Middle Tennessee State University. Located in Murfreesboro, Tennessee, our program is home to over 700 undergraduate students studying across seven disciplines and concentrations: professional piloting, dispatch, maintenance management, technology, unmanned aircraft systems, and air traffic control. We also offer graduate programs in three areas: safety and security management, education, and administration. Our program also holds a Part 141 pilot school certificate and provides flight training to our students across a number of certificates and ratings

I am writing to you today as part of a research project for the completion of my degree. My project involves a proposal for our program to offer the Airline Transport Pilot Certification Training Program (ATP CTP) as part of our professional pilot curriculum. As you know, a pilot wishing to earn an ATP multiengine certificate must now complete this training course – one of the new changes implemented by the FAA under the “1500 Hour Rule.”

Currently, our program is approved by the FAA as an institution of higher education, which allows our students to earn the Restricted ATP (R-ATP) with a minimum of 1,000 flight hours if they complete the necessary coursework and flight training. We believe that offering our students the chance to complete the ATP CTP training while enrolled in our program would give them a greater advantage in the industry upon graduation. Unfortunately, our program does not have the resources to complete the full training requirements of the ATP CTP.

The training requirements for the ATP CTP, under §61.156, specify that a student must complete 30 hours of classroom instruction and 10 hours of flight simulation training device (FSTD) instruction. Of the 10 hours of FSTD training, at least 6 hours must be in a full flight simulator (FFS), and the remaining 4 hours may be accomplished in a flight training device (FTD). Our program is capable of providing the 30 hours of classroom instruction, and we currently own and operate a Level 5 FTD representing the CRJ-200, which would allow us to complete the 4 hours of FTD training. However, the university would need to contract with an outside training provider for the completion of the 6 hours of FFS training.

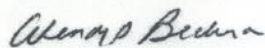
Thus, through this letter I am hoping to obtain a preliminary proposal from Flight Safety to contract with Middle Tennessee State University for the use of an FFS to complete the training required for the ATP CTP. I understand there is a much more lengthy process to complete the contract, but for my research project, a simple estimate of the costs and feasibility of Flight Safety providing for the use of an FFS would be most appreciated.

Since our program currently owns a Level 5 FTD representing the CRJ-200, an FFS also representing the CRJ-200 would be the most desirable. Additionally, our program employs several instructors who hold CL-65 type ratings and meet the air carrier experience requirements for the ATP CTP, so we would most likely provide our own personnel, and thus would need only dry-lease use of the FFS. However, an estimate of the costs and feasibility of using Flight Safety personnel for the FFS training would also be appreciated. The university operates on a semester system, so the program would need to contract for the simulator twice a year, near the conclusion of the fall and spring semesters.

Thank you for taking the time to read and consider this proposal. Any preliminary information you are able to provide will be most useful toward the completion of my research project, and to our program in further study of developing our ATP CTP. I look forward to the prospect of the Aerospace Department and Middle Tennessee State University forging an agreement with Flight Safety to provide the highest quality of training to our students and future graduates.

Please feel free to contact me by email at ltw2m@mtmail.mtsu.edu, or by telephone at (208) 921-3434. Additionally, you may reach my Faculty Advisor and Chair of the Aerospace Department, Dr. Wendy Beckman, by email at wendy.beckman@mtsu.edu or by telephone at (615) 898-2788.

Sincerely,



Dr. Wendy S. Beckman
Chair, Aerospace Department
Middle Tennessee State University



Leland T. Waite
Graduate Student
Middle Tennessee State University

APPENDIX D: Training Course Outline – General

MIDDLE TENNESSEE STATE UNIVERSITY
AEROSPACE DEPARTMENT

APPROVED PILOT SCHOOL
CERTIFICATE #CA8S053Q

AIRLINE TRANSPORT PILOT
CERTIFICATION TRAINING PROGRAM (ATP CTP)
TRAINING COURSE OUTLINE

GENERAL

OCTOBER 2016



*Flight Training Office
Jean A. Jack Flight Education Center
1940 Memorial Blvd
Murfreesboro, TN 37130
615-890-5755*

October 31, 2016

Mr. John Q. Public
Principal Operations Inspector
Federal Aviation Administration
Nashville Flight Standards District Office
2 International Plaza, Suite 700
Nashville, TN 37217

Dear Mr. Public:

We are submitting the Airline Transport Pilot Certification Training Program (ATP CTP) training course outline for initial approval. This course fulfills the training requirements set forth under the applicable sections of 14 CFR part 61, part 141, and Advisory Circular AC 61-138. Additionally, this course also fulfills the training requirements for the High Altitude Endorsement set forth under the applicable sections of 14 CFR part 61, part 141, and Advisory Circular AC 61-107. Upon completion, students will receive a graduation certificate reflecting their completion of the ATP CTP and a High Altitude Endorsement.

Sincerely,

Leland T. Waite
Graduate Teaching Assistant

For

Aerospace Department
Middle Tennessee State University

REVISIONS CONTROL RECORD

Revision Number	Date	Revision and Pages	Entered By
0	10-31-16	New – Training Course Outline (TCO): Section 1 – General, formatting and page numbering, entire new program document created.	L. Waite

FLIGHT TRAINING COURSE OUTLINE
LIST OF EFFECTIVE PAGES

GENERAL – SECTION 1	SECTION-PAGE	EFFECTIVE DATE	REVISION #
Title Page	1-1	10-31-16	0
Letter of Submission to the FAA	1-2	10-31-16	0
Revisions Control Record	1-3	10-31-16	0
List of Effective Pages	1-4 – 1-5	10-31-16	0
Facilities	1-6	10-31-16	0
Training Aids	1-6	10-31-16	0
FSTD (FTD)	1-6	10-31-16	0
FSTD (FFS)	1-6	10-31-16	0
Instructors	1-7	10-31-16	0
SYLLABUS – SECTION 2			
Title Page	2-1	10-31-16	0
Revision Control Record	2-2	10-31-16	0
Prerequisites for Enrollment	2-3	10-31-16	0
Course Objectives and Completion Standards	2-3	10-31-16	0
Academic Training Objectives and Completion Standards	2-3	10-31-16	0
FSTD (FTD) Training Objectives and Completion Standards	2-4	10-31-16	0
Stage 3 Objectives and Completion Standards	2-4	10-31-16	0
End of Course Objectives and Completion Standards	2-4	10-31-16	0
Planned Training Time	2-4	10-31-16	0
Classroom Lesson 1	2-5 – 2-7	10-31-16	0
Classroom Lesson 2	2-8	10-31-16	0
Classroom Lesson 3	2-9 – 2-12	10-31-16	0
Classroom Lesson 4	2-13 – 2-14	10-31-16	0
Cockpit Procedures Lesson 1	2-15	10-31-16	0
Cockpit Procedures Lesson 2	2-16	10-31-16	0
Classroom Training Assessment	2-17	10-31-16	0
FSTD (FTD) Lesson 1	2-18 – 2-20	10-31-16	0
FSTD (FTD) Lesson 2	2-21 – 2-23	10-31-16	0
FSTD (FTD) Lesson 3	2-24 – 2-26	10-31-16	0
FSTD (FTD) Lesson 4	2-27 – 2-28	10-31-16	0
FSTD (FTD) Lesson 5	2-29 – 2-31	10-31-16	0
Line Oriented Flight Training (LOFT) Assessment	2-32 – 2-34	10-31-16	0
FSTD (FFS) Lesson 1	2-35 – 2-36	10-31-16	0
FSTD (FFS) Lesson 2	2-37 – 2-38	10-31-16	0
End of Course Assessment	2-39	10-31-16	0
Chronological Training Log	2-41 – 2-42	10-31-16	0

ASSESSMENT – SECTION 3

Title Page	3-1	10-31-16	0
Revision Control Record	3-2	10-31-16	0
Academic Assessment	3-3	10-31-16	0
Cumulative Assessment	3-3	10-31-16	0
Internal Evaluation Program	3-4	10-31-16	0
Deficiency Amendments	3-4	10-31-16	0

APPENDIX

Title Page	A1-1	10-31-16	0
Revisions Control Record	A1-2	10-31-16	0
Enrollment Certificate	A1-3	10-31-16	0
Graduation Certificate	A1-4	10-31-16	0

FACILITIES: Training for this course is conducted at Middle Tennessee State University's Airport Campus, located at the Murfreesboro Municipal Airport (MBT) in Murfreesboro, Tennessee. There are two classrooms available for instructional use: the first measuring 17' by 23', with a maximum capacity of 20 students; the second measuring 23' by 25', with a maximum capacity of 32 students. The simulator room, measuring 36' by 60', houses the FSTD (FTD) and debriefing stations that will be used in this course. Teaching materials and training records are stored within a lockable filing cabinet located in the simulator room. The simulator room also contains three other FTDs and two desks, which have been designated as pre/post-briefing areas.

The secondary location for this course is conducted at TBD, located in TBD; a training center certified 14 CFR part 142, utilizing an FSTD (FFS) Level D simulator.

TRAINING AIDS: Below is a partial listing of training aids that may be utilized in the course pursuant to 14 CFR §141.41 (c).

- A. MTSU CRJ-200 flight crew operating manual
 - a. Manufacturer's normal and abnormal procedures
 - b. Manufacturer's performance charts/diagrams
- B. MTSU CRJ-200 systems manual
- C. MTSU CRJ-200 cockpit diagrams and posters
- D. MTSU CRJ-200 checklist
- E. MTSU CRJ-200 full flight simulator (FFS) training packet
- F. Aerosim JetPac CRJ-200 & CRJ-200 VFD training software
- G. Apple iPad equipped with the ForeFlight or JeppView applications
- H. Dry erase board and makers
- I. Computer, projector, and screen

FLIGHT SIMULATION TRAINING DEVICE (FSTD – FTD): A Frasca CRJ-200 FSTD (FTD) with a 220° wrap-around visual display will be utilized in the course pursuant to 14 CFR §141.41 (b). It has been qualified as a Level 5 FSTD (FTD) under FAA #1240 with the following features: Collins Pro Line 4 avionics suite (which includes the Collins FMS-4000, weather radar, and TCAS) and the TruVision Global visual image generator. Adjacent to the instructor console is a debriefing station that can record and playback each simulation session.

FLIGHT SIMULATION TRAINING DEVICE (FSTD – FFS): A To-Be-Determined (TBD) FSTD (FFS) will be utilized in this course pursuant to 14 CFR §141.41 (a). It has been qualified as a Level C or higher FFS under FAA #TBD with the following features: TBD. This FFS will be contracted through TBD, a training center certified under 14 CFR part 142.

INSTRUCTORS

- A. **Chief Instructor**: The Chief Instructor for this course is **John Q. Doe**. The Chief Instructor for this course meets the requirements of 14 CFR §141.35 (e).
- B. **Assistant Chief Instructor(s)**: The Assistant Chief Instructor for this course is **Jane Q. Doe**. The Assistant Chief Instructor for this course meets the requirements of 14 CFR §141.36 (e).
- C. **Check Instructors**: The appointed Check Instructors for this course meet the requirements of 14 CFR §141.37. A Letter of Authorization appointing the Check Instructors will be submitted to the FSDO, for their approval. A stamped copy of this letter will be kept in the instructor's folder.
- D. **Instructors**: Each instructor assigned to this course must hold an FAA airline transport pilot certificate with an airplane category multiengine class rating and have at least 2 years of air carrier experience, to meet the requirements of 14 CFR §141.33. Additionally, each instructor providing FSTD training must hold a type rating in the represented aircraft, which for this course is designated to be a CRJ-200. Each instructor providing ground or flight training will also receive initial and annual recurrent training that meets the requirements specified in 14 CFR §141.33.
- E. **Subject Matter Experts**: Other persons with subject matter expert qualifications may be used for instruction in this course provided they are continually supervised by a qualified instructor with at least 2 years of air carrier experience.

APPENDIX E: Training Course Outline – Syllabus

MIDDLE TENNESSEE STATE UNIVERSITY
AEROSPACE DEPARTMENT

APPROVED PILOT SCHOOL
CERTIFICATE #CA8S053Q

AIRLINE TRANSPORT PILOT
CERTIFICATION TRAINING PROGRAM (ATP CTP)
TRAINING COURSE OUTLINE

SYLLABUS

OCTOBER 2016

REVISIONS CONTROL RECORD

Revision Number	Date	Effectuated Pages	Entered By
0	10-31-16	New – Training Course Outline (TCO): Section 2 – Syllabus, formatting and page numbering, entire new program document created.	L. Waite

PREREQUISITES FOR ENROLLMENT

To enroll in the ATP CTP, the student must hold a commercial pilot certificate with airplane single and multiengine land category and class ratings; additionally, the student must also possess an instrument airplane rating.

COURSE OBJECTIVES AND COMPLETION STANDARDS

OBJECTIVES: During this course, students will complete the academic and FSTD training components of the ATP CTP in accordance with 14 CFR §61.156 and 14 CFR §141 Appendix K (13). Students will also receive the necessary academic and FTSD training components required for the High Altitude Endorsement in accordance with 14 CFR §61.31(g).

In addition, students will gain aeronautical knowledge and experience with respect to crew coordination, to be a successful crewmember in a simulated air carrier operation, through the use of classroom instruction and scenario training in the CRJ-200 FSTD.

COMPLETION STANDARDS: At the completion of this course, students shall have completed the necessary training and passed the necessary assessments in accordance with the requirements of 14 CFR §61.156 and 14 CFR §141 Appendix K (13), to include all required academic and FSTD training. Students will have received and logged ground and flight training from an authorized instructor. Students will receive a graduation certificate reflecting completion of the ATP CTP, and a High Altitude Endorsement.

In addition, students shall possess the knowledge and experience, with respect to crew coordination, to be a successful crewmember in a simulated air carrier operation. This will be demonstrated through the satisfactory completion of an Line Oriented Flight Training (LOFT) assessment.

ACADEMIC TRAINING - OBJECTIVES AND COMPLETION STANDARDS

OBJECTIVES: During this stage, students will complete the academic training necessary to obtain the aeronautical knowledge specified through the ATP CTP in accordance with 14 CFR §61.156 and 14 CFR §141 Appendix K (13), and for the High Altitude Endorsement in accordance with 14 CFR §61.31(g).

Students will also be exposed to such concepts as crew coordination, flight crew normal operations, flows and checklists, and CRJ-200 aircraft systems.

COMPLETION STANDARDS: At the completion of this stage, students shall have completed the academic training as required by 14 CFR §61.156, 14 CFR §141 Appendix K (13), and 14 CFR §61.31(g).

Additionally, students shall have a working knowledge of crew coordination, flight crew normal operations, flows and checklists, and be able to describe CRJ-200 systems.

FSTD (FTD) TRAINING - OBJECTIVES AND COMPLETION STANDARDS

OBJECTIVES: During this stage, students will complete FSTD – FTD (Level 5) training as required for the ATP CTP by 14 CFR §61.156 and 14 CFR §141 Appendix K (13), and the necessary maneuvers for the High Altitude Endorsement as required by 14 CFR §61.31(g).

In addition, students will gain crew coordination and flight crew operations experience by executing various scenario-based FSTD training events.

COMPLETION STANDARDS: At the completion of this stage, students shall have completed the FSTD – FTD training as required by 14 CFR §61.156 and 14 CFR §141 Appendix K (13), and the necessary maneuvers as required by 14 CFR §61.31(g).

Additionally, students shall demonstrate his or her ability to implement crew coordination and flight crew operations by completing a Line Oriented Flight Training (LOFT) Assessment scenario.

FSTD (FFS) TRAINING - OBJECTIVES AND COMPLETION STANDARDS

OBJECTIVES: During this stage, students will complete FSTD – FFS (Level C or higher) training as required for the ATP CTP by 14 CFR §61.156 and 14 CFR §141 Appendix K (13).

COMPLETION STANDARDS: At the completion of this stage, the student shall have completed the FSTD – FFS (Level C or higher) training as required by 14 CFR §61.156 and 14 CFR §141 Appendix K (13).

END OF COURSE - OBJECTIVES AND COMPLETION STANDARDS

OBJECTIVES: During the End of Course assessment, students will demonstrate their mastery of the information presented during both the academic and FSTD training stages.

COMPLETION STANDARDS: At the completion of the End of Course assessment, students will receive a graduation certificate demonstrating satisfactory completion of the ATP CTP, as described in Advisory Circular 61-138. Additionally, students will also receive a High Altitude Endorsement, as described in Advisory Circular 61-65.

PLANNED TRAINING TIME

Planned academic training time is 30 hours. Planned FTSD training time is 26 hours; 20 of which utilize an FTD, and 6 of which utilize a Level C or higher FFS. The academic assessment is planned for 3 hours, the Line Oriented Flight Training (LOFT) assessment is planned for 3 hours, and the end of course assessment is planned for 3 hours.

CLASSROOM LESSON 1

PLANNED TIME:

Total:	8.0 Hours
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LESSON OVERVIEW: This lesson fulfills the classroom instruction requirement for the aeronautical knowledge area of *Aerodynamics*, as required for the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. Additionally, this lesson partially fulfills the classroom instruction requirement for the aeronautical knowledge areas of the High Altitude Endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

LEARNING OBJECTIVES:

1. High Altitude Operations: students will have an understanding of aerodynamics, especially at altitudes near the maximum operating altitudes and at high operational weights. Students will also understand the narrow operating margins in these conditions and how to safely conduct flight operations in large transport category airplanes with varying operating conditions.
2. Stall Prevention and Recovery Training: students will understand the factors leading to a stall, indications of an impending stall, full stall identification, and proper stall recovery techniques. The student will know how and when to use these principles in flight operations of large transport aircraft for the prevention of stall events.
3. Upset Prevention and Recovery Training: students should understand the factors that may lead to airplane upset, learn proper airplane upset prevention and recovery techniques, and apply these principles while operating transport aircraft.

LESSON ELEMENTS:

1. Aerodynamics
 - a. High altitude operations
 - (1) Basic principles of energy management (kinetic and potential)
 - (2) Relationship between mach number, indicated airspeed, true airspeed, and change over altitudes
 - (3) Bank angles at high altitude and its effect on high and low speed operating margins
 - (4) Relationship between altitude capability, weight, and temperature
 - (5) Convergence of VMO/MMO and stall angle of attack (AOA), including turbulence considerations
 - (6) High Altitude/Low Energy Recovery; speed reductions at high altitude; excursions behind the power curve at high altitudes and associated recovery techniques (high altitude slowdowns)
 - (7) Maximum Lift over Drag Ratio (L/D Max), best range, best endurance
 - (8) Flight characteristics of swept wing airplanes, use of a yaw damper, and phenomena such as Dutch roll
 - b. Stall Prevention and Recovery Training

- (1) Understanding that a reduction of AOA is required to initiate recovery of all stall events (approach-to-stall and aerodynamic stall)
 - (2) Awareness of the factors that may lead to a stall event during automated and manual flight operations including:
 - a. AOA versus pitch angle
 - b. Bank angle and G-loading
 - c. Weight and center of gravity (CG)
 - d. Autothrottle or AOA protection
 - e. Overreliance on automation/complacency
 - f. Lack of situational awareness
 - g. Contamination (ice)
 - (3) Differences between transport category airplane certification and general aviation airplane certification regarding the use of flight controls at high AOA
 - (4) The necessity for smooth, deliberate, and positive control inputs to avoid unacceptable load factors and secondary stalls
 - (5) For airplanes equipped with a stick pusher, recommended recovery actions which include allowing stick pusher activation as a stall recovery
 - (6) Differences in airplane performance (thrust available) during high versus low altitude operations, the effects of those differences on stall recovery, and the anticipated altitude loss during a recovery
 - (7) Overview of stall-related accidents and incidents in transport category airplanes
- c. Upset Prevention and Recovery Training
- (1) Factors which contribute to airplane upsets
 - a. Environmental: clear air turbulence, mountain wave, windshear, thunderstorms, microbursts, wake turbulence, and airplane icing
 - b. Systems malfunctions or failures: flight instrument, autoflight, flight control, and other system anomalies which could contribute to upsets
 - c. Pilot induced: misinterpretation or slow instrument cross check, improper adjustment of attitude and power, improper pilot input, inattention, distractions, spatial disorientation, pilot incapacitation, and improper use of airplane automation
 - d. Avoiding cyclical or oscillatory control inputs to prevent exceeding the structural limits of the airplane
 - (2) Overview of accidents or incidents involving aircraft upset in transport category airplanes
 - (3) Airplane Upset Recovery Training Aid (Rev 2)
 - a. Nose High/Wings level recovery
 - b. Nose Low/Wings level recovery
 - c. High-Bank-Angle Recovery Techniques
 - d. Consolidated Summary of Airplane Recovery Techniques
 - (4) Recognition and prevention techniques and philosophy
 - a. Divergence from the intended flight path or speed; identify what, if any, action must be taken
 - b. Timely and appropriate intervention

- c. Examples of instrumentation during developing and developed upset
- d. Effective scanning
- e. Pitch/Power/Roll/Yaw
- f. Recovery

COMPLETION STANDARDS: Students shall demonstrate a satisfactory understanding of the academic areas covered in this lesson concerning the ATP CTP and High Altitude Endorsement. This will be accomplished through the completion of a written quiz at the conclusion of each topic area. Students shall achieve a minimum score of 70% on each written test, and will accomplish retraining and retesting over any deficient academic areas, as required.

CLASSROOM LESSON 2

PLANNED TIME:

Total:	2.0 Hours
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LESSON OVERVIEW: This lesson fulfills the classroom instruction requirement for the aeronautical knowledge area of *Meteorology*, as required for the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. Additionally, this lesson partially fulfills the classroom instruction requirement for the aeronautical knowledge areas of the High Altitude Endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

LEARNING OBJECTIVES:

1. Meteorology: students should gain an understanding of adverse weather conditions, weather conditions encountered at high altitude, available weather resources, and understand how to apply these principles in their decision-making in air carrier operations.

LESSON ELEMENTS:

1. Meteorology
 - a. Airplane Weather Detection Systems
 - (1) Equipment limitations
 - (2) Use of weather detection systems to navigate around hazardous weather
 - (3) Windshear detection systems (predictive and reactive) and avoidance strategies
 - (4) Turbulence avoidance, considerations, and mitigation strategies
 - (5) In flight icing detection, avoidance, considerations, and mitigation strategies
 - (6) Ground de-icing/anti-icing: airplane de-ice/anti-ice procedures, use of hold-over tables, calculating hold-over times, and pre-takeoff contamination checks
 - (7) Mountain wave activity and its potential effect on safe operating margins
 - (8) Crosswind operating techniques and cautions and limitations
 - (9) Air carrier meteorology products which assist in the avoidance of adverse weather
 - (10) Braking action/friction reports, limitations, and best practices
 - b. Air Carrier Low-Visibility Operations (Overview)
 - (1) Low-visibility surface movement
 - (2) CAT II and CAT III approaches

COMPLETION STANDARDS: Students shall demonstrate a satisfactory understanding of the academic areas covered in this lesson concerning the ATP CTP and High Altitude Endorsement. This will be accomplished through the completion of a written quiz at the conclusion of each topic area. Students shall achieve a minimum score of 70% on each written test, and will accomplish retraining and retesting over any deficient academic areas, as required.

CLASSROOM LESSON 3

PLANNED TIME:

Total:	14.0 Hours
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LESSON OVERVIEW: This lesson fulfills the classroom instruction requirement for the aeronautical knowledge area of *Air Carrier Operations*, as required for the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138.

Additionally, this lesson partially fulfills the classroom instruction requirement for the aeronautical knowledge areas of the High Altitude endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

LEARNING OBJECTIVES:

1. Physiology/Fitness for Duty: students should have an understanding of the effects of altitude on human physiology and crewmember responsibilities to remain fit for duty.
2. Communications: students should gain an understanding of advanced aircraft communication systems, regulations pertaining to communications in air carrier operations, and understand how to communicate and apply these principles in a high-workload environment.
3. Checklist Philosophy: students should understand the different types of commonly used checklists and checklist philosophies and how to apply them in a multicrew environment.
4. Operational Control: students should learn the concept and components of air carrier operational control, including the authority/responsibility and functional differences between a flight release and a dispatch release.
5. Minimum Equipment List (MEL) and Configuration Deviation List (CDL): students should understand the operation and use of an MEL and CDL in relation to inoperative equipment.
6. Ground Operations: students should gain an understanding of the elements associated with operating at complex and high density airports with emphasis on runway incursion prevention techniques.
7. Turbine Engines: students should gain an understanding of turbine engine operation and common malfunctions.
8. Transport Airplane Performance: students should have an understanding of the many considerations and requirements for transport airplane performance and how these elements are applied to air carrier flight operations.
9. Automation: (Overview) students should gain an understanding of airplane automation components, the relationship of these components to each other, and how

to manage airplane automation. Students should also understand how to apply these principles to the various phases of flight in air carrier operations.

10. Navigation and Flightpath Warning Systems: (Overview) students should have an understanding of equipment and principles used in advanced navigation and how to apply these concepts to air carrier operations.

LESSON ELEMENTS:

1. Physiology/Fitness for Duty
 - a. Hypoxia: signs, symptoms, and effects; times of useful consciousness
 - b. Aircraft decompression – causes and recognition of cabin pressure loss
 - c. Altitudes/conditions which require the use of oxygen masks
 - d. Effects of fatigue on performance, including mitigation strategies
2. Communications
 - a. Sterile flight deck rules
 - b. Briefings: discuss advantages of proper briefings and how to properly accomplish professional briefings for all phases of ground and flight operations
 - (1) Briefings between flight crew and cabin crew
 - (2) Passenger briefings (Overview)
 - c. Clearance delivery including pre-departure clearance (PDC), and Controller-Pilot Data Link Communications (CPDLC) (Overview)
3. Checklist Philosophy
 - a. Checklist philosophies (read/do, do/verify, memory items, and flows) manufacturer vs. operator checklist
 - b. Use of normal checklists
 - c. Use of quick reference handbook/emergency checklists
4. Operational Control (Overview)
 - a. Air carrier operational control concept
 - b. Dispatch and flight following differences and responsibilities
 - c. Emergencies and decision-making with joint pilot/dispatcher responsibilities
5. Minimum Equipment List (MEL) and Configuration Deviation List (CDL)
 - a. Introduction to MEL and CDL as dispatch documents
 - b. Repair intervals of deferred equipment – Categories A, B, C, D
 - c. Maintenance and operations procedures, responsibilities, and cautions
 - d. Additional air carrier maintenance procedures, operational procedures, and operational limitations (i.e., speed restrictions) required in order to dispatch with components or items of equipment deferred or removed in accordance with the MEL or CDL
6. Ground Operations
 - a. Runway incursion prevention
 - (1) Professionalism during taxi operations, including sterile flight deck and standard operating procedures (SOP)
 - (2) Airport situational awareness
 - (3) Taxi route planning and briefings including hot spot identification and runway crossings

- (4) Technology (electronic flight bag, moving maps)
- b. Practical knowledge of airport surface operations, including
 - (1) Airport movement areas
 - (2) Ramp procedures and communications
 - (3) Coded taxi routes and complex taxi procedures
- 7. Turbine Engines
 - a. Turbine engine theory
 - b. Differences in thrust application of a turbine engine vs. a reciprocating engine
 - c. Turbine engine malfunctions (start malfunctions, surge, compressor stalls, roll-back)
 - d. Engine re-start considerations, internal damage, starting altitude, and speed envelopes
 - e. Knowledge of turbine-powered engine monitoring systems, including
 - (1) Engine indication
 - (2) Crew alerting system (EICAS)
 - f. EPR, N1, N2, exhaust gas temperature (EGT) indications
- 8. Transport Airplane Performance
 - a. Weight, altitude, and V-speed relationship
 - b. Flight operations performance considerations of minimum control speed with the critical engine inoperative during takeoff roll (VMCG), minimum control speed with the critical engine inoperative out of ground effect-red radial line (VMCA, V1, and V2)
 - c. Proper use of rudder in a transport category airplane and discuss the limitations associated with its use to include airplane certification standards
 - d. Weight and balance, introduction to air carrier weight and balance systems (average weight program; indexing)
 - e. Performance calculations
 - (1) Air carrier performance requirements including: balanced field length, accelerate-go, accelerate-stop, VMCG, and second segment climb performance
 - (2) Performance calculations required for takeoff: effect of variable flap settings on runway distance used and second segment climb performance, packs on/off, engine anti-ice on/off
 - (3) Air carrier en route performance requirements and calculations (maximum altitude, step climb, crossing restrictions)
 - (4) Performance calculations required for landing
 - (5) Contaminated runway considerations for takeoff and landing
- 9. Automation
 - a. Introduction to computer-assisted piloting (pilot/system interface)
 - b. Automation philosophies/architecture and envelope protections
 - c. Flight director/autopilot (FD/AP): modes of operation, properly interpreting mode annunciation, and recovery techniques from automation input errors
 - d. Managing automation anomalies: mitigation strategies, including control inputs, (e.g., managing the airplane with pitch and power with the loss of airspeed indications)

10. Navigation and Flightpath Warning Systems

- a. Airspace speed restrictions and altitude constraints (crossing altitudes)
- b. Basic principles of flight management systems (FMS)
- c. Introduction to the concepts of area navigation, Global Positioning System/Area Navigation (GPS/RNAV) capabilities, lateral navigation (LNAV), vertical navigation (VNAV), Required Navigational Performance (RNP), and required authorizations (operations specifications – OpSpecs) and training
- d. Automatic Dependent Surveillance – Broadcast (ADS-B)
- e. Traffic Alert and Collision Avoidance Systems (TCAS)
- f. Terrain Awareness and Warning Systems (TAWS)

COMPLETION STANDARDS: Students shall demonstrate a satisfactory understanding of the academic areas covered in this lesson concerning the ATP CTP and High Altitude Endorsement. This will be accomplished through the completion of a written quiz at the conclusion of each topic area. Students shall achieve a minimum score of 70% on each written test, and will accomplish retraining and retesting over any deficient academic areas, as required.

CLASSROOM LESSON 4

PLANNED TIME:

Total:	6.0 Hours
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LESSON OVERVIEW: This lesson fulfills the classroom instruction requirement for the aeronautical knowledge area of *Leadership & Professional Development, Crew Resource Management, and Safety Culture*, as required for the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. Additionally, this lesson partially fulfills the classroom instruction requirement for the aeronautical knowledge areas of the High Altitude Endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

LEARNING OBJECTIVES:

1. Leadership & Professional Development: students should demonstrate an understanding of the professional responsibilities associated with being an airline transport pilot and describe how to apply leadership skills in the position of PIC.
2. Crew Resource Management (CRM): students should demonstrate knowledge of basic principles of CRM and describe how to apply these principles to air carrier operations in a multicrew environment. Emphasis should be placed on effective intervention strategies for the pilot monitoring (PM).
3. Safety Culture & Voluntary Safety Programs: (Overview) students should demonstrate knowledge of the basic principles of air carrier voluntary safety programs and how the information collected from these programs is used to enhance an air carrier's safety culture.

LESSON ELEMENTS:

1. Leadership/Professional Development
 - a. Leadership Philosophy
 - (1) Authority
 - (2) Responsibility
 - (3) Sound Decisions
 - (4) Awareness
 - (5) Mentoring
 - b. Professional Development
 - (1) Technically proficient
 - (2) Regard for welfare of crew and passengers
 - (3) Communicate trust and professionalism
2. Crew Resource Management (CRM)
 - a. CRM philosophy: "The true definition teamwork, or CRM, is its focus on the proper response to threats to safety and the proper management of crew error
 - (1) Accident/incident reports and animations
 - (2) Elements of effective CRM
 - b. PM Intervention Strategies

- (1) Enhance monitoring and challenging functions of both captains and first officers
 - (2) PM must establish a positive attitude toward monitoring and challenging errors made by the PF
3. Safety Culture/Voluntary Safety Programs
 - a. Voluntary Safety Programs
 - (1) Aviation Safety Reporting System (ASRS)
 - (2) Aviation Safety Action Program (ASAP)
 - (3) Flight Operational Quality Assurance (FOQA)
 - (4) Line Operations Safety Audits (LOSA)
 - (5) Safety Management Systems (SMS)

COMPLETION STANDARDS: Students shall demonstrate a satisfactory understanding of the academic areas covered in this lesson concerning the ATP CTP and High Altitude Endorsement. This will be accomplished through the completion of a written quiz at the conclusion of each topic area. Students shall achieve a minimum score of 70% on each written test, and will accomplish retraining and retesting over any deficient academic areas, as required.

COCKPIT PROCEDURES LESSON 1

PLANNED TIME:	Pre-Brief:	0.25 Hours
	Post-Brief:	0.25 Hours
	Total:	0.5 Hours
	FTD:	1.5 Hours
	Total:	1.5 Hours

LESSON OVERVIEW: The lesson consists of a scenario in which students will become familiar with the cockpit layout of the FTD through the physical manipulation of switches, controls, and aircraft systems. Additionally, the usage of flows, checklists, and normal procedures will be introduced. This lesson is used as an introduction to the FTD, the concept of a dual-crew environment, and crew resource management (CRM).

CRM OBJECTIVES: With the use of the aircraft checklists and FTD, students will practice and demonstrate the following:

1. Physical manipulation of FTD switches, controls, and aircraft systems
2. Use of checklists
3. Communications

TECHNICAL OBJECTIVES: With the use of the aircraft checklists and FTD, students will practice and demonstrate the following:

1. Become familiar with FTD cockpit layout
2. Accomplish the *Flight Deck Safety Check*
3. Accomplish the *Before Start Check*
4. Accomplish the *Cleared to Start Check*
5. Accomplish the *After Start Check*
6. Accomplish the *Taxi Check*

COMPLETION STANDARDS: Students shall demonstrate a working knowledge of the FTD cockpit layout. At the conclusion of the lesson, students should be able to complete the checklists and flows with instructor assistance.

COCKPIT PROCEDURES LESSON 2

PLANNED TIME:	Pre-Brief:	0.25 Hours
	Post-Brief:	0.25 Hours
	Total:	0.5 Hours
	FTD:	1.5 Hours
	Total:	1.5 Hours

LESSON OVERVIEW: The lesson consists of a scenario in which students will continue to practice the usage of flows, checklists, and normal procedures. Additionally, effective crew briefings, FMS programming, and autopilot usage will be introduced. This lesson is used to reinforce an introduction to the FTD, the concept of a dual-crew environment, and crew resource management. Lastly, students will be introduced to the problems associated with an over-reliance on automation. This lesson will prepare students for FTD flight training.

CRM OBJECTIVES: With the use of the aircraft checklists and FTD, students will practice and demonstrate the following:

1. Physical manipulation of FTD switches, controls, and aircraft systems
2. Use of checklists
3. Communications
4. Use of an effective crew briefing
5. Reliance on automation

TECHNICAL OBJECTIVES: With the use of the aircraft checklists and FTD, students will practice and demonstrate the following:

1. Accomplish the *Before Takeoff Check*
2. Accomplish the *Climb Check*
3. Accomplish the *Descent Check*
4. Accomplish the *Approach Check*
5. Accomplish the *Before Landing Check*
6. Accomplish the *After Landing Check*
7. Accomplish the *Shutdown Check / Exit Check / Terminating Check*

COMPLETION STANDARDS: Students shall demonstrate a working knowledge of briefings, FMS programming, and the use of the autopilot and FCP. At the conclusion of the lesson, the student should be able to complete the checklists and flows with minimal instructor assistance and demonstrate the necessary proficiency for FTD flight training.

CLASSROOM TRAINING ASSESSMENT (STAGE CHECK)**PLANNED TIME:**

Total:	3.0 Hours
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STAGE CHECK OVERVIEW: This assessment is designed to evaluate the knowledge of the aeronautical knowledge areas, as required for the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138, and for the high altitude endorsement as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

STAGE CHECK OBJECTIVES: During this assessment students will demonstrate their mastery of the subjects covered in the previous ground lessons through written and practical tests.

STAGE CHECK ELEMENTS:

- (1) Written test
 - a. Aerodynamics
 - b. Meteorology
 - c. Air Carrier Operations
 - d. Leadership & Professional Development, Crew Resource Management, and Safety Culture
 - e. High Altitude endorsement requirements
- (2) Practical test
 - a. Cockpit flows and checklists
 - b. Flight Management System (FMS)

COMPLETION STANDARDS: Students shall achieve a minimum score of 70% on each written and practical test, and will accomplish retraining and retesting over any deficient academic areas, as necessary.

FSTD (FTD) LESSON 1

PLANNED TIME:	Pre-Brief: 0.5 Hours	
	Post-Brief: 0.5 Hours	
	Total: 1.0 Hours	
	FTD: 3.0 Hours	
	Total: 3.0 Hours	

LESSON OVERVIEW: This lesson partially fulfills the FSTD (Level 5 FTD) requirement for the simulation training requirement the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. Additionally, this lesson partially fulfills the simulation training requirement for the High Altitude endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

LEARNING OBJECTIVES:

1. Navigation: students should reinforce their understanding of the components of typical air carrier navigation equipment, and experience the navigation equipment's interface with automation. Students should also understand and experience how to apply these principles to the various phases of flight in air carrier operations.
2. Automation: students should reinforce their understanding of the use of airplane automation, the relationship of these components with navigation and learn how to manage both to achieve the desired Flightpath.
3. Crew Resource Management: students should become familiar with the concept of crew resource management (CRM) and its application to a multi-crew environment. Additionally, students will practice realistic applications of crew coordination and communication, flows, checklists, briefings, and adherence to standard procedures.

TRAINING TOPIC COMPONENTS:

1. Navigation
 - a. Interpret navigation displays (ND), a primary flight display (PFD), and/or a multi-function display (MFD)
 - b. Perform FMS route input and modifications
 - c. Receive and understand air traffic control (ATC) instructions
 - d. Use of area navigation systems in flight
2. Automation
 - a. Interact with the mode control panel; verify mode control panel inputs; interpret flight mode annunciations
 - b. Use various levels of autopilot/auto-throttle automation applicable to pilot flying duties and pilot monitoring duties with and without the autopilot engaged
 - c. Use of FD/flight guidance systems
 - d. Knowledge of an FMS for each phase of flight
 - e. Use of automation in climb, cruise, descent, and approach modes

- f. Use of TCAS and TAWS
- 3. CRJ-200 Procedures
 - a. Normal operating procedures, checklists, briefings, and FMS programming
 - b. Perform the following takeoffs: normal
 - c. Perform the following climbs: normal, with FMS and autopilot operation
 - d. Perform the following en-route: steep turns; high speed handling and maneuvers
 - e. Perform the following descents: normal, with FMS and Autopilot operation; STAR procedures
 - f. Perform the following approaches: ILS approach in visual conditions
 - g. Perform the following landings: normal

LESSON ELEMENTS:

- 1. Operating procedures
 - a. Preparation
 - (1) Flight Management System (FMS) initialization and programming
 - (2) Preflight / pre-taxi procedures
 - (3) APU start
 - b. Surface operations
 - (1) Engine starting (normal)
 - (2) Taxi
 - (3) Pre-takeoff checks
 - c. Takeoff
 - (1) Normal takeoff
 - d. Area departure / climb
 - (1) Vectored Departure
 - (2) Autopilot procedures
 - (3) Normal climb
 - e. En-route
 - (1) Handling maneuvers
 - a. Constant speed climbs, turns, and descents
 - (2) Steep turns
 - (3) High Altitude Operations
 - f. Descent / area arrival
 - (1) Normal descent
 - (2) Autopilot procedures
 - g. Approaches
 - (1) ILS approach
 - h. Landings
 - (1) Normal landing from an ILS approach in visual conditions
 - i. After Landing
 - (1) shutdown
- 2. System procedures
 - a. Communications equipment
 - b. Navigation equipment
 - c. Avionics

COMPLETION STANDARDS: Students shall complete all lesson elements using the normal procedures, checklists, and flows of the CRJ-200. All lesson elements shall be completed to both the demonstration (D) and experience (E) based standards, as described in Advisory Circular 61-138. Students will be expected to maintain aircraft control and perform instrument approach procedures to the applicable tolerances as required by the *FAA Instrument Rating and FAA Commercial Pilot AMEL Practical Test Standards*, with deviations corrected through instructor assistance, as required.

FSTD (FTD) LESSON 2

PLANNED TIME:	Pre-Brief:	0.5 Hours
	Post-Brief:	0.5 Hours
	Total:	1.0 Hours
	FTD:	3.0 Hours
	Total:	3.0 Hours

LESSON OVERVIEW: This lesson partially fulfills the FSTD (Level 5 FTD) requirement for the simulation training requirement the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. Additionally, this lesson partially fulfills the simulation training requirement for the High Altitude endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

LEARNING OBJECTIVES:

1. Navigation: students should reinforce their understanding of the components of typical air carrier navigation equipment, and experience the navigation equipment's interface with automation. Students should also understand and experience how to apply these principles to the various phases of flight in air carrier operations.
2. Automation: students should reinforce their understanding of the use of airplane automation, the relationship of these components with navigation and learn how to manage both to achieve the desired flightpath.
3. Crew Resource Management: students should become familiar with the concept of crew resource management (CRM) and its application to a multi-crew environment. Additionally, students will practice realistic applications of crew coordination and communication, flows, checklists, briefings, and adherence to standard procedures.

TRAINING TOPIC COMPONENTS:

1. Navigation
 - a. Interpret navigation displays (ND), a primary flight display (PFD), and/or a multi-function display (MFD)
 - b. Perform FMS route input and modifications
 - c. Receive and understand air traffic control (ATC) instructions
 - d. Use of area navigation systems in flight
2. Automation
 - a. Interact with the mode control panel; verify mode control panel inputs; interpret flight mode annunciations
 - b. Use various levels of autopilot/auto-throttle automation applicable to pilot flying duties and pilot monitoring duties with and without the autopilot engaged
 - c. Use of FD/flight guidance systems
 - d. Knowledge of an FMS for each phase of flight
 - e. Use of automation in climb, cruise, descent, and approach modes

- f. Use of TCAS and TAWS
- 3. CRJ-200 Procedures
 - a. Accomplish normal operating procedures, checklists, and briefings
 - b. Accomplish abnormal engine start procedures
 - c. Perform the following takeoffs: normal
 - d. Perform the following climbs: instrument departure, with FMS operation to transition altitude
 - e. Perform the following en-route: approach to stalls; autopilot operations en-route
 - f. Perform the following approach: non-precision approach using autopilot
 - g. Perform the following landings: crosswind landings; landing from a non-precision approach

LESSON ELEMENTS:

- 1. Operating procedures
 - a. Preparation
 - (1) Prestart procedures
 - (2) Performance limitations
 - (3) FMS operations
 - b. Surface operations
 - (1) Engine starting (abnormal)
 - (2) Taxi
 - (3) Pre-takeoff checks
 - c. Takeoff
 - (1) Crosswind takeoff
 - d. Area departure / climb
 - (1) FMS operations
 - (2) High altitude considerations
 - (3) Transition altitude
 - e. En-route
 - (1) Stall awareness
 - (2) FMS (intercept radial)
 - (3) Autopilot usage
 - (4) High Altitude Operations
 - f. Descent / area arrival
 - (1) Instrument arrival
 - (2) FMS holding
 - g. Approaches
 - (1) Non-Precision approach using autopilot
 - h. Landings
 - (1) Landing from non-precision approach
 - i. After Landing
 - (1) Shutdown

COMPLETION STANDARDS: Students shall complete all lesson elements using the normal procedures, checklists, and flows of the CRJ-200. All lesson elements shall be completed to both the demonstration (D) and experience (E) based standards, as described in Advisory Circular 61-138. Students will be expected to maintain aircraft control and perform instrument approach procedures to the applicable tolerances as required by the *FAA Instrument Rating and FAA Commercial Pilot AMEL Practical Test Standards*, with deviations corrected through instructor assistance, as required.

FSTD (FTD) LESSON 3

PLANNED TIME:	Pre-Brief:	0.5 Hours
	Post-Brief:	0.5 Hours
	Total:	1.0 Hours
	FTD:	3.0 Hours
	Total:	3.0 Hours

LESSON OVERVIEW: This lesson partially fulfills the FSTD (Level 5 FTD) requirement for the simulation training requirement the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. Additionally, this lesson partially fulfills the simulation training requirement for the High Altitude endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107. This lesson also introduces abnormal and emergency procedures and the philosophy of using the Quick Reference Handbook (QRH) checklists while experiencing system failures.

LEARNING OBJECTIVES:

1. Navigation: students should reinforce their understanding of the components of typical air carrier navigation equipment, and experience the navigation equipment's interface with automation. Students should also understand and experience how to apply these principles to the various phases of flight in air carrier operations.
2. Automation: students should reinforce their understanding of the use of airplane automation, the relationship of these components with navigation and learn how to manage both to achieve the desired Flightpath.
3. Crew Resource Management: students should become familiar with the concept of crew resource management (CRM) and its application to a multicrew environment. Additionally, students will practice realistic applications of crew coordination and communication, flows, checklists, briefings, and adherence to standard procedures.

TRAINING TOPIC COMPONENTS:

1. Navigation
 - a. Interpret navigation displays (ND), a primary flight display (PFD), and/or a multi-function display (MFD)
 - b. Perform FMS route input and modifications
 - c. Receive and understand air traffic control (ATC) instructions
 - d. Use of area navigation systems in flight
2. Automation
 - a. Interact with the mode control panel; verify mode control panel inputs; interpret flight mode annunciations
 - b. Use various levels of autopilot/auto-throttle automation applicable to pilot flying duties and pilot monitoring duties with and without the autopilot engaged
 - c. Use of FD/flight guidance systems

- d. Knowledge of an FMS for each phase of flight
- e. Use of automation in climb, cruise, descent, and approach modes
- f. Use of TCAS and TAWS
- 3. CRJ-200 Procedures
 - a. Accomplish normal operating procedures, checklists, and briefings
 - b. Perform the flowing surface operations: FMS setup, engine starts, pre-takeoff checks
 - c. Perform the following takeoffs: lower than standard takeoff minimums; crosswind; rejected takeoff
 - d. Perform the following en-route: engine shutdown in flight with air restart
 - e. Perform the following approaches: precision approach; non-precision approach; missed approach from instrument procedure
 - f. Perform the following landings: landing form a precision approach
 - g. Recognize the following emergency and abnormal situations and perform the appropriate checklists: powerplant malfunction; powerplant relight

LESSON ELEMENTS:

- 1. Operating procedures
 - a. Preparation (quick start procedure can be utilized at instructor discretion)
 - (1) Prestart procedures
 - b. Surface operations
 - (1) Checklist exercise
 - (2) Taxi
 - c. Takeoff
 - (1) Low visibility takeoff (600 RVR)
 - d. Area departure / climb
 - (1) RNAV departure (if available)
 - (2) FMS operation
 - e. En-route
 - (1) Engine flameout in flight
 - (2) Engine relight procedures
 - (3) High Altitude Operations
 - f. Descent / area arrival
 - (1) Instrument arrival
 - g. Approaches
 - (1) Non-precision approach
 - (2) Precision approach
 - (3) Missed approach
 - h. Landings
 - (1) Crosswind landing from a precision approach
 - i. After Landing
 - (1) Emergency evacuation (discussion)
 - (2) Shutdown
- 2. System procedures (normal, abnormal, alternate)
 - a. Power plant malfunction

COMPLETION STANDARDS: Students shall complete all lesson elements using the normal procedures, checklists, and flows of the CRJ-200. All lesson elements shall be completed to both the demonstration (D) and experience (E) based standards, as described in Advisory Circular 61-138. Students will be expected to maintain aircraft control and perform instrument approach procedures to the applicable tolerances as required by the *FAA Instrument Rating and FAA Commercial Pilot AMEL Practical Test Standards*, with deviations corrected through instructor assistance, as required.

FSTD (FTD) LESSON 4

PLANNED TIME:	Pre-Brief:	0.5 Hours
	Post-Brief:	0.5 Hours
	Total:	1.0 Hours
	FTD:	3.0 Hours
	Total:	3.0 Hours

LESSON OVERVIEW: This lesson partially fulfills the FSTD (Level 5 FTD) requirement for the simulation training requirement the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. Additionally, this lesson fulfills the simulation training requirement for the High Altitude endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107. This lesson also reinforces abnormal and emergency procedures and the philosophy of using the Quick Reference Handbook (QRH) checklists while experiencing cabin pressurization failures.

LEARNING OBJECTIVES:

1. Navigation: students should reinforce their understanding of the components of typical air carrier navigation equipment, and experience the navigation equipment's interface with automation. Students should also understand and experience how to apply these principles to the various phases of flight in air carrier operations.
2. Automation: students should reinforce their understanding of the use of airplane automation, the relationship of these components with navigation and learn how to manage both to achieve the desired Flightpath.
3. Crew Resource Management: students should become familiar with the concept of crew resource management (CRM) and its application to a multicrew environment. Additionally, students will practice realistic applications of crew coordination and communication, flows, checklists, briefings, and adherence to standard procedures.
4. High Altitude Operations: students will become familiar with and perform the necessary steps in dealing with cabin pressurization failures, rapid decompression, and emergency descent procedures.

TRAINING TOPIC COMPONENTS:

1. Navigation
 - a. Interpret navigation displays (ND), a primary flight display (PFD), and/or a multi-function display (MFD)
 - b. Perform FMS route input and modifications
 - c. Receive and understand air traffic control (ATC) instructions
 - d. Use of area navigation systems in flight
2. Automation

- a. Interact with the mode control panel; verify mode control panel inputs; interpret flight mode annunciations
 - b. Use various levels of autopilot/auto-throttle automation applicable to pilot flying duties and pilot monitoring duties with and without the autopilot engaged
 - c. Use of FD/flight guidance systems
 - d. Knowledge of an FMS for each phase of flight
 - e. Use of automation in climb, cruise, descent, and approach modes
 - f. Use of TCAS and TAWS
3. CRJ-200 Procedures:
- a. Accomplish normal operating procedures, checklists, and briefings
 - b. Perform the following takeoff: aborted takeoff; normal takeoff in icing conditions
 - c. Perform the following departure: SID, with FMS and autopilot usage
 - d. Perform the following en-route: hydraulic system failure
 - e. Perform the following arrival: STAR, with FMS and autopilot usage
 - f. Perform the following approaches: precision approach, including missed approach due to lower than standard landing minimums;
 - g. Perform rapid decompression and emergency descent procedures as required by 14 CFR §61.31(g).

LESSON ELEMENTS:

- 1. Operating procedures
 - a. Preparation (quick start procedure: on runway)
 - b. Takeoff
 - (1) Rejected takeoff
 - (2) Takeoff in icing conditions
 - c. Area departure / climb
 - (1) SID
 - d. En-route
 - (1) Hydraulic issue
 - (2) High Altitude Operations
 - e. Descent / area arrival
 - (1) Instrument arrival
 - f. Approaches
 - (1) Missed approach from instrument approach procedure
 - g. Rapid decompression and emergency descent

COMPLETION STANDARDS: Students shall complete all lesson elements using the normal procedures, checklists, and flows of the CRJ-200. All lesson elements shall be completed to both the demonstration (D) and experience (E) based standards, as described in Advisory Circular 61-138. Students will be expected to maintain aircraft control and perform instrument approach procedures to the applicable tolerances as required by the *FAA Instrument Rating and FAA Commercial Pilot AMEL Practical Test Standards*, with deviations corrected through instructor assistance, as required. This lesson fulfills the simulation training requirements for the High Altitude endorsement, as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

FSTD (FTD) LESSON 5

PLANNED TIME:	Pre-Brief:	0.5 Hours
	Post-Brief:	0.5 Hours
	Total:	1.0 Hours
	FTD:	3.0 Hours
	Total:	3.0 Hours

LESSON OVERVIEW: This lesson fulfills the FSTD (Level 5 FTD) requirement for the simulation training requirement the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. This lesson also reinforces abnormal and emergency procedures and the philosophy of using the Quick Reference Handbook (QRH) checklists while experiencing various system failures.

LEARNING OBJECTIVES:

1. Navigation: students should reinforce their understanding of the components of typical air carrier navigation equipment, and experience the navigation equipment's interface with automation. Students should also understand and experience how to apply these principles to the various phases of flight in air carrier operations.
2. Automation: students should reinforce their understanding of the use of airplane automation, the relationship of these components with navigation and learn how to manage both to achieve the desired Flightpath.
3. Crew Resource Management: students should become familiar with the concept of crew resource management (CRM) and its application to a multicrew environment. Additionally, students will practice realistic applications of crew coordination and communication, flows, checklists, briefings, and adherence to standard procedures.

TRAINING TOPIC COMPONENTS:

1. Navigation
 - a. Interpret navigation displays (ND), a primary flight display (PFD), and/or a multi-function display (MFD)
 - b. Perform FMS route input and modifications
 - c. Receive and understand air traffic control (ATC) instructions
 - d. Use of area navigation systems in flight
2. Automation
 - a. Interact with the mode control panel; verify mode control panel inputs; interpret flight mode annunciations
 - b. Use various levels of autopilot/auto-throttle automation applicable to pilot flying duties and pilot monitoring duties with and without the autopilot engaged
 - c. Use of FD/flight guidance systems
 - d. Knowledge of an FMS for each phase of flight
 - e. Use of automation in climb, cruise, descent, and approach modes

- f. Use of TCAS and TAWS
- 3. CRJ-200 Procedures
 - a. Accomplish normal, abnormal, and emergency operating procedures, checklists, and briefings
 - b. Demonstrate understanding of FMS and autopilot operation
 - c. Demonstrate all procedures and maneuvers during takeoff, climb, en-route, descent, approach, and landing
 - d. Recognize emergency and abnormal situations and perform the appropriate checklists

LESSON ELEMENTS:

- 1. Operating procedures
 - a. Preparation
 - (1) Pre-start procedures
 - (2) Performance limitations
 - (3) APU start
 - (4) FMS operations
 - b. Surface operations
 - (1) Starting
 - (2) Taxi
 - (3) Pre-takeoff checks
 - c. Takeoff
 - (1) Instrument takeoff
 - (2) Rejected takeoff
 - d. Area departure / climb
 - (1) Instrument departure
 - (2) FMS operation
 - (3) Engine failure / fire in flight
 - e. Descent / area arrival
 - (1) Instrument arrival
 - (2) Holding
 - (3) FMS operation
 - f. Approaches
 - (1) Precision approach
 - (2) Missed approach
 - (3) Non-precision approach
 - g. Landings
 - (1) Crosswind landing
 - (2) Rejected landing
 - (3) Landing from a non-precision approach
- 2. System procedures (abnormal, emergency)
 - a. Review, as required

COMPLETION STANDARDS: Students shall complete all lesson elements using the normal procedures, checklists, and flows of the CRJ-200. All lesson elements shall be completed to both the demonstration (D) and experience (E) based standards, as described in Advisory Circular 61-138. Students will be expected to maintain aircraft control and perform instrument approach procedures to the applicable tolerances as required by the *FAA Instrument Rating and FAA Commercial Pilot AMEL Practical Test Standards*, with deviations corrected through instructor assistance, as required.

**LINE ORIENTED FLIGHT TRAINING (LOFT)
ASSESSMENT (STAGE CHECK)**

PLANNED TIME:	Pre-Brief:	0.5 Hours		
	Post-Brief:	0.5 Hours		
	<table border="1"><tr><td>Total:</td><td>1.0 Hours</td></tr></table>	Total:	1.0 Hours	
Total:	1.0 Hours			
	FTD:	3.0 Hours		
	<table border="1"><tr><td>Total:</td><td>3.0 Hours</td></tr></table>	Total:	3.0 Hours	
Total:	3.0 Hours			

STAGE CHECK OVERVIEW: This assessment reviews the elements of the FSTD (Level 5 FTD) requirement for the simulation training requirement the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138. Students will be expected to show satisfactory understanding and application of all previous lesson elements, as appropriate. Students shall demonstrate an ability to perform as a crewmember in a simulated air carrier environment before progressing to the FSTD (FFS) simulation training lessons.

STAGE CHECK OBJECTIVES: Students shall demonstrate an acceptable understanding of the previously presented Learning Objectives:

1. Navigation
2. Automation
3. Crew Resource Management (CRM)

STAGE CHECK COMPONENTS:

1. Navigation
 - a. Interpret navigation displays (ND), a primary flight display (PFD), and/or a multi-function display (MFD)
 - b. Perform FMS route input and modifications
 - c. Receive and understand air traffic control (ATC) instructions
 - d. Use of area navigation systems in flight
2. Automation
 - a. Interact with the mode control panel; verify mode control panel inputs; interpret flight mode annunciations
 - b. Use various levels of autopilot/auto-throttle automation applicable to pilot flying duties and pilot monitoring duties with and without the autopilot engaged
 - c. Use of FD/flight guidance systems
 - d. Knowledge of an FMS for each phase of flight
 - e. Use of automation in climb, cruise, descent, and approach modes
 - f. Use of TCAS and TAWS
3. CRJ-200 Procedures
 - a. Accomplish normal, abnormal, and emergency operating procedures, checklists, and briefings
 - b. Demonstrate understanding of FMS and autopilot operation

- c. Demonstrate all procedures and maneuvers during takeoff, climb, en-route, descent, approach, and landing
- d. Recognize emergency and abnormal situations and perform the appropriate checklists

STAGE CHECK ELEMENTS: The Chief Instructor or Check Instructor may choose which lesson elements to incorporate into the flight training scenario at his or her discretion. Not all lesson elements are required to be accomplished during this lesson.

- 1. Operating procedures
 - a. Preparation
 - (1) Performance limitations
 - (2) Preflight / pre-taxi procedures
 - (3) APU start
 - (4) Pre-start procedures
 - (5) FMS operations
 - b. Surface operations
 - (1) Engine starting (normal / abnormal)
 - (2) Taxi
 - (3) Pre-takeoff checks
 - c. Takeoff
 - (1) Crosswind takeoff
 - (2) Low visibility takeoff (600 RVR)
 - (3) Rejected takeoff
 - d. Area departure / climb
 - (1) FMS operations
 - (2) Autopilot procedures
 - (3) Instrument departure (RNAV / vector)
 - (4) High altitude considerations
 - (5) Transition altitude
 - (6) Engine failure / fire in flight
 - e. En-route
 - (1) FMS operations
 - (2) Autopilot usage
 - (3) Stall awareness
 - (4) Hydraulic issues
 - (5) Engine flameout in flight
 - (6) Engine relight procedures
 - (7) High Altitude Operations
 - f. Descent / area arrival
 - (1) FMS operations
 - (2) Autopilot usage
 - (3) Instrument arrival
 - (4) Holding
 - g. Approaches
 - (1) Autopilot usage

- (2) Precision approach
- (3) Non-precision approach
- (4) Missed approach
- h. Landings
 - (1) Rejected landing
 - (2) Crosswind landing from a precision approach
 - (3) Landing from a non-precision approach
- i. After Landing
 - (1) Shutdown
- 2. System procedures (normal, abnormal, emergency)
 - a. Communications equipment
 - b. Navigation equipment
 - c. Avionics
 - d. Powerplant malfunction
 - e. Hydraulic malfunction
 - f. Perform rapid decompression and emergency descent procedures as required by 14 CFR §61.31(g).

COMPLETION STANDARDS: Students must successfully complete the entire LOFT using the normal procedures, checklists, and flows of the CRJ-200. All lesson elements shall be completed to both the demonstration (D) and experience (E) based standards, as described in Advisory Circular 61-138. Additionally, students must recognize the abnormal and emergency conditions presented and perform the appropriate checklists, and complete the rapid decompression and emergency descent procedures as required by 14 CFR §61.31(g). Students will be expected to maintain aircraft control and perform instrument approach procedures to the applicable tolerances as required by the *FAA Instrument Rating and FAA Commercial Pilot AMEL Practical Test Standards*.

FSTD (FFS) LESSON 1

PLANNED TIME:	Pre-Brief: 0.5 Hours	
	Post-Brief: 0.5 Hours	
	Total: 1.0 Hours	
	FFS: 3.0 Hours	
	Total: 3.0 Hours	

LESSON OVERVIEW: This lesson partially fulfills the FSTD (Level C or greater FFS) requirement for the simulation training requirement the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138.

LEARNING OBJECTIVES:

1. Runway Safety and Adverse Weather: students should reinforce and apply their understanding of air carrier operations during the taxi, takeoff, and landing phases of flight including the effects of adverse weather on these operations.

TRAINING TOPIC COMPONENTS:

1. Runway Safety and Adverse Weather
 - a. Taxi
 - (1) Adherence to SOPs and best practices used to maintain situational awareness with complex taxi instructions
 - (2) Recognition of hot spots, line up and wait terminology, runway incursion prevention techniques, procedures for ensuring correct departure runway
 - b. Takeoff
 - (1) Normal takeoff, PF (outside scan) and PM (engine monitoring) duties and responsibilities
 - (2) VMCG demonstration to show the effects of differential power with limited rudder aerodynamic authority
 - (3) V1: Application of V1 decision speed concepts and how they relate to accelerate-go and accelerate stop distances with and without the effects of a contaminated runway
 - (4) Rejected takeoffs with aircraft weight, runway length, and contamination considerations
 - (5) Ability to apply appropriate precautions for adverse weather during takeoff to include: windshear, contaminated runway surfaces, and crosswinds with gusts
 - c. V2 Climb Performance
 - (1) Climb at V2
 - (2) Effects of speeds less than V2 and greater than V2
 - (3) Automation during departure
 - d. Approach/Landing
 - (1) Icing conditions in flight and its effects on performance and decision-making
 - (2) Achieve a stabilized approach using energy management concepts

- (3) Landing in crosswinds with and without gusts with emphasis on airplane performance limitations in crosswinds
- (4) Landing technique and stopping distances on contaminated runways
- (5) Operations in low visibility conditions: taxi, takeoff, and landing

LESSON ELEMENTS:

1. Operating procedures
 - a. Preparation
 - (1) Preflight / pre-taxi procedures
 - (2) Briefings / taxi
 - (3) Situational awareness / runway incursions, hotspots
 - b. Surface operations
 - (1) Taxi
 - (2) Pre-takeoff checks
 - (3) Runway verification
 - (4) Low visibility (RVR)
 - c. Takeoff
 - (1) Normal takeoff
 - (2) VMCG considerations
 - (3) V1 considerations
 - (4) Rejected takeoff
 - (5) Threats / windshear, contaminated runway, gusts
 - (6) Low visibility (RVR)
 - d. Area departure / climb
 - (1) FMS operations
 - (2) Autopilot procedures
 - (3) V2 considerations
 - e. Descent / area arrival
 - (1) FMS operations
 - (2) Autopilot usage
 - (3) Instrument arrival
 - (4) Holding
 - f. Approaches
 - (1) Autopilot usage
 - (2) Icing conditions
 - (3) Stabilized approach concept
 - g. Landings
 - (1) Crosswind landing /with and without gusts
 - (2) Aircraft performance limitations
 - (3) Contaminated runway
 - (4) Low visibility (RVR)
 - (5) Crosswind landing from a precision approach
 - (6) Landing from a non-precision approach

COMPLETION STANDARDS: Students shall complete all lesson elements using the normal procedures, checklists, and flows of the CRJ-200. All lesson elements shall be completed to both the demonstration (D) and experience (E) based standards, as described in Advisory Circular 61-138

FSTD (FFS) LESSON 2

PLANNED TIME:	Pre-Brief:	0.5 Hours
	Post-Brief:	0.5 Hours
	Total:	1.0 Hours
	FFS:	3.0 Hours
	Total:	3.0 Hours

LESSON OVERVIEW: This lesson fulfills the FSTD (Level C or greater FFS) requirement for the simulation training requirement the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138.

LEARNING OBJECTIVES:

1. High Altitude Operations, Stall and Upset Prevention and Recovery: students should reinforce their understanding of low energy states, stalls, upset and high altitude aerodynamics through demonstration and experience based training.
2. Upset Prevention and Recovery Training (UPRT)
 - a. CRM: techniques for working as a crew to return the aircraft to normal flight and communicating airplane state between pilots, including CRM callouts to improve situational awareness should be integrated into FSTD training.
 - b. Availability of Visual References: many accidents and incidents occurred when pilots did not have visual references available. UPRT should include scenarios where visual references are not available.
 - c. PM: the pilot monitoring (PM) may have been more aware of the aircraft state than the pilot flying (PF). Training should emphasize crew interaction to vocalize the divergence conditions, use CRM to stop the divergence, and return the aircraft to stabilized flight.
 - d. Startle: state has been a factor in upset incidents and accidents. If achieved, startle events may provide a powerful lesson for the crew. The goal of using startle in training is to provide the crew with a startle experience which allows for the effective recovery of the airplane. Considerable care should be used in startle training to avoid negative learning.

TRAINING TOPIC COMPONENTS:

1. High Altitude Operations
 - a. Speed/mach changeover
 - b. Effects of weight on maximum altitude (high and low speed convergence)
 - c. Effects of high altitude turbulence with limited performance margins
 - d. Relationship between weight, thrust, and altitude
2. Low Energy States/Stall Prevention Training
 - a. High altitude/low energy recovery demonstrating limited thrust capability and necessity to exchange altitude for airspeed

- b. Acceleration performance from second regime (back side of power curve) at low altitude and high altitude
- c. Demonstration of stall recovery without application of thrust
- d. Stall prevention training, emphasis on reduction of AOA for recovery
 - (1) Takeoff or Maneuvering configuration approach-to-stalls
 - (2) Clean configuration approach-to-stalls (high altitude)
 - (3) Landing configuration approach-to-stalls
- 3. Stick pusher
 - a. Proper recovery from stick pusher activation
- 4. Upset Prevention and Recovery Training (UPRT)
 - a. Manual handling: flying the aircraft, with sole reference to pitch and power emphasizing core handling skills in the event of system failure
 - b. Upset recovery techniques: to mitigate loss of control in flight, each of these maneuvers has the following objective: manage the energy, arrest the flightpath divergence, and recover to a stabilized flightpath
 - (1) Nose-High/Wings-level recovery
 - (2) Nose-Low/Wings-level recovery

LESSON ELEMENTS:

- 1. Operating procedures
 - a. En-route – Performance
 - (1) Indicated airspeed / mach changeover
 - (2) Weight / maximum operating altitude
 - (3) Turbulence at high altitudes
 - (4) Weight / thrust / altitude relationship
 - (5) Stall awareness
 - b. En-route – Stalls
 - (1) High altitude / low energy stall recovery
 - (2) Limited thrust stall recovery
 - (3) Power curve recovery
 - (4) Stall recovery
 - a. AOA reduction
 - b. With and without power application
 - (5) Configuration stalls
 - a. Takeoff/maneuvering
 - b. Clean configuration
 - c. Landing configuration
 - (6) Stick shaker / stick pusher
 - c. Upset Prevention and Recovery (UPRT)
 - (1) Manual handling / pitch & power
 - (2) Upset recovery
 - a. Nose-high/wings-level
 - b. Nose-low/wings-level

COMPLETION STANDARDS: Students shall complete all lesson elements using the normal procedures, checklists, and flows of the CRJ-200. All lesson elements shall be completed to both the demonstration (D) and experience (E) based standards, as described in Advisory Circular 61-138.

END OF COURSE ASSESSMENT

PLANNED TIME:

Total:	3.0 Hours
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STAGE CHECK OVERVIEW: This lesson is designed to evaluate the student's knowledge of the aeronautical knowledge areas, as required for the ATP CTP under 14 CFR §61.156 and the applicable parts of Advisory Circular 61-138, and for the High Altitude endorsement as required under 14 CFR §61.31(g) and applicable parts of Advisory Circular 61-107.

STAGE CHECK OBJECTIVES: During this stage check, the student will demonstrate his or her mastery of the subjects covered in the previous ground lessons through written and practical tests.

STAGE CHECK ELEMENTS:

- (1) Written test (Classroom lessons)
 - a. Aerodynamics
 - b. Meteorology
 - c. Air Carrier Operations
 - d. Leadership & Professional Development, Crew Resource Management, and Safety Culture
 - e. High Altitude Endorsement topics
- (2) Written test (FSTD lessons)
 - a. Navigation
 - b. Automation
 - c. Runway Safety & Adverse Weather
 - d. High Altitude Operations, Stall and Upset Prevention and Recovery
 - e. Upset Prevention and Recovery Training (UPRT)
 - f. High Altitude Endorsement topics

COMPLETION STANDARDS: Students shall achieve a minimum score of 70% on each written test and will accomplish retraining and retesting over any deficient academic areas, as necessary.

NOTE: At the completion of the End of Course Assessment, students will receive a graduation certificate demonstrating satisfactory completion of the ATP CTP, as described in Advisory Circular 61-138.. Additionally, students will also receive a High Altitude Endorsement, as described in Advisory Circular 61-65.

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CHRONOLOGICAL TRAINING LOG – PAGE 1

Student Name: _____

Instructor Signature												
Grade (Pass / Fail)												
FTD Time												
Class Time												
Subject(s) Covered or												
Lesson #												
Lesson Date												

CHRONOLOGICAL TRAINING LOG – PAGE 2

Student Name: _____

Instructor Signature												
Grade (Pass / Fail)												
FTD Time												
Class Time												
Subject(s) Covered or												
Lesson #												
Lesson Date												

APPENDIX F: Training Course Outline – Assessment

MIDDLE TENNESSEE STATE UNIVERSITY
AEROSPACE DEPARTMENT

APPROVED PILOT SCHOOL
CERTIFICATE #CA8S053Q

AIRLINE TRANSPORT PILOT
CERTIFICATION TRAINING PROGRAM (ATP CTP)
TRAINING COURSE OUTLINE

ASSESSMENT – QUESTION BANK AND
INTERNAL EVALUATION PROGRAM (IEP)

OCTOBER 2016

REVISIONS CONTROL RECORD

Revision Number	Date	Revision and Pages	Entered By
0	10-31-16	New – Training Course Outline (TCO): Section 3 – Assessment, formatting and page numbering, entire new program document created.	L. Waite

ACADEMIC ASSESSMENT: Students will complete academic assessments throughout the Airline Transport Pilot Certification Training Program (ATP CTP), in accordance with FAA guidance as found in Advisory Circular 61-138. These assessments will be administered as multiple choice questions, with students each submitting an answer sheet for grading. Students shall achieve a minimum score of 70% on each written test, and will accomplish retraining and retesting over any deficient academic areas, as required.

The following aeronautical knowledge topic areas will be tested at their conclusion:

- High Altitude Operations
- Stall Prevention and Recovery Training
- Meteorology
- Air Carrier Low-Visibility Operations (Overview)
- Physiology/Fitness for Duty
- Communications
- Checklist Philosophy
- Operational Control (Overview)
- Minimum Equipment List (MEL) & Configuration Deviation List (CDL)
- Ground Operations
- Turbine Engines
- Transport Airplane Performance
- Automation
- Navigation and Flightpath Warning Systems
- Leadership/Professional Development
- Crew Resource Management
- Safety Culture/Voluntary Safety Programs

CUMULATIVE ASSESSMENT: Students will complete a final, cumulative academic assessment at the conclusion of the Airline Transport Pilot Certification Training Program (ATP CTP), in accordance with FAA guidance as found in Advisory Circular 61-138. This assessments will be administered as multiple choice questions, with students each submitting an answer sheet for grading. Students shall achieve a minimum score of 70% on each written test, and will accomplish retraining and retesting over any deficient academic areas, as required.

The following aeronautical knowledge topic areas will be tested:

- Meteorology
- Air Carrier Operations
- Leadership/Professional Development, Crew Resource Management (CRM), and Safety Culture
- FTD – Navigation
- FTD – Automation
- FFS – Runway Safety and Adverse Weather
- FFS – High Altitude Operations, Stall and Upset Prevention and Recovery

INTERNAL EVALUATION PROGRAM: MTSU recognizes the need to continually improve the ATP CTP program by collecting and analyzing student data. To this end, the Chief Flight Instructor, or designee, for the ATP CTP program will compile the following student data using Microsoft Excel:

- Student test scores for each academic section assessment
- Student test scores for the cumulative academic assessment
- Student performance measures for the FSTD – FTD lessons
- Student performance measures for the FSTD – FFS lessons
- Student graduation rates for ATP CTP
- Student performance below “70%” FAA threshold

Additionally, MTSU recognizes that student feedback provides a unique perspective into the effectiveness of the ATP CTP; thus, MTSU will actively solicit student feedback using anonymous paper and pencil surveys, compiled in Microsoft Excel:

- Student opinions on academic training
- Student opinions on FSTD – FTD lessons
- Student opinions on FSTD – FFS lessons
- Student opinions on section and cumulative academic assessments
- Student opinions on instructor performance
- Student opinions on entire ATP CTP

DEFICIENCY AMENDMENTS: MTSU will analyze all data collected by the Internal Evaluation Program, and conduct an internal review of any deficiencies. An immediate recognition of faults may not be apparent, so trend data will be tracked on a compounding basis. Any identified trends of poor performance will be immediately corrected by MTSU through coordination with the FAA and amendment of the TCO.

APPENDIX G: Training Course Outline – Appendix

MIDDLE TENNESSEE STATE UNIVERSITY
AEROSPACE DEPARTMENT

APPROVED PILOT SCHOOL
CERTIFICATE #CA8S053Q

AIRLINE TRANSPORT PILOT
CERTIFICATION TRAINING PROGRAM (ATP CTP)
TRAINING COURSE OUTLINE

APPENDIX 1

OCTOBER 2016

REVISIONS CONTROL RECORD

Revision Number	Date	Revision and Pages	Entered By
0	10-31-16	New – Training Course Outline (TCO): Appendix 1 – Certificates, formatting and page numbering, entire new program document created.	L. Waite

§ 141.93 Enrollment Certificate

[FirstName MI LastName]

is enrolled in the

Federal Aviation Administration

approved

Airline Transport Pilot Certification Training Program

and was furnished a copy of both the training syllabus and safety practices and procedures at

Middle Tennessee State University

In accordance with 14 CFR §141 Appendix K, 14 CFR §61.156, and 14 CFR §61.31(g) under
Air Agency Certificate CA88053Q



[DDMonthYYYY]

Date of Enrollment

Chief Instructor Signature

§ 141.93 Graduation Certificate

[FirstName MI LastName]

has satisfactorily completed all stages, tests, and other requirements, and has graduated from the

Federal Aviation Administration

approved

Airline Transport Pilot Certification Training Program

at

Middle Tennessee State University

In accordance with 14 CFR §141 Appendix K, 14 CFR §61.156, and 14 CFR §61.31(g) under
Air Agency Certificate CA88053Q



[DDMonthYYYY]

Date of Graduation



Chief Instructor Signature

