U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Airline Transport Pilot Certification Training Program

Date: 7/2/13 **AC No:** 61-138

Initiated by: AFS-200 **Change:**

1. **PURPOSE.** This advisory circular (AC) provides information and courseware 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.

2. **AUDIENCE.** The primary audience for this AC is training personnel involved in the development and delivery of an airline transport pilot (ATP) Certification Training Program (CTP) under 14 CFR part 121, 135, 141, or 142. Pilot applicants for an ATP certificate with an airplane category multiengine class rating or an ATP certificate issued concurrently with a type rating should also be familiar with the contents of this AC.

3. **RELATED CFR REGULATIONS.** Parts 61, 91 subpart K (91K), 121, 135, 141, and 142.

4. **DEFINITIONS.**

a. Flight Training Device (FTD). A replica of airplane instruments, equipment, panels, and controls in an open flight deck area or an enclosed airplane cockpit replica. It includes the equipment and computer programs necessary to represent airplane (or a set of airplane) operations in ground and flight conditions having the full range of capabilities of the systems installed in the device as described in 14 CFR part 60 and the qualification performance standard for a specific FTD qualification level.

b. Full Flight Simulator (FFS). A replica of a specific type, or make, model, and series airplane cockpit. It includes the assemblage of equipment and computer programs necessary to represent airplane operations in ground and flight conditions, a visual system providing an out-of-the-cockpit view, a system that provides cues at least equivalent to those of a three-degrees-of-freedom motion system, and has the full range of capabilities of the systems installed in the device as described in part 60 and the Qualification Performance Standards (QPS) for a specific FFS qualification level.

c. Flight Simulation Training Device (FSTD). A FFS or a FTD, as qualified under part 60.

d. Conceptual Proficiency. The state of performing a given skill with satisfactory and consistent correctness.

5. RELATED GUIDANCE. See Appendix 3.

6. BACKGROUND.

a. Aviation Rulemaking Committee (ARC). The Federal Aviation Administration (FAA) published an Advanced Notice of Proposed Rulemaking (ANPRM), New Pilot Certification Requirements for Air Carrier Operations, on February 8, 2010. In response to the ANPRM, the FAA Administrator chartered the First Officer Qualifications (FOQ) Aviation Rulemaking Committee (ARC) on July 16, 2010.

b. FOQ ARC Background. The ARC was chartered to develop recommendations regarding rulemaking on the flight experience and training requirements of a pilot prior to operating as a first officer in part 121 air carrier operations.

(1) The FOQ ARC was composed of subject matter experts (SME) from nine organizations. The organizations were Regional Airline Association (RAA), Aviation Accreditation Board International (AABI), National Business Aviation Association (NBAA), National Air Disaster Alliance/Foundation (NADA/F), Aircraft Owners and Pilots Association (AOPA), Air Line Pilots Association, International (ALPA), The Coalition of Airline Pilots Associations (CAPA), Pilot Career Initiative (PCI), and Air Transport Association of America, Inc. (ATA).

(2) The ARC members' expertise included significant levels of experience in air carrier operations; development, implementation, and management of pilot training and qualification programs; the establishment of pilot training and qualification standards at the domestic and international level; and public advocacy for aviation safety. The FOQ ARC members determined that there is a knowledge and experience gap when comparing the training a pilot receives for a commercial pilot certificate to the competencies required of a part 121 first officer.

c. Public Law (P.L.) 111-216. On August 1, 2010, President Obama signed into law the Airline Safety and Federal Aviation Administration Extension Act of 2010 (P.L. 111-216). Section 217 of the Act required the FAA to modify the requirements of an ATP certificate, as issued under part 61. Specifically, to be qualified to receive an ATP certificate, the pilot should have received flight training, academic training, or operational experience that will prepare a pilot, at a minimum, to function effectively in a multipilot [multicrew] environment; function effectively in adverse weather conditions; function effectively during high altitude operations; adhere to the highest professional standards; and function effectively in an air carrier environment. This section also required the Administrator to determine an appropriate amount of experience in difficult operational conditions that should be required to be eligible for the issuance of an ATP certificate.

d. Addressing the Knowledge Gap. Though P.L. 111-216 focused primarily on modifications to the certification requirements for an ATP certificate, the knowledge gap identified by the FOQ ARC remained relevant as both initiatives focused on enhancing the qualifications and training for pilots that desire to work in an air carrier environment. The FAA has determined this knowledge gap extends to pilots beyond part 121 air carrier operations to also include pilots that are required by regulation to hold an ATP certificate (§§ 91.1053 and

135.243). This knowledge gap can be best and most effectively bridged through successful completion of a modern flight training program that methodically integrates academic training and aeronautical experience in a FSTD.

e. Notice of Proposed Rulemaking (NPRM). On February 29, 2012, the FAA published the Pilot Certification and Qualification Requirements for Air Carrier Operations NPRM. The proposed rule set forth the proposed training requirements for the ATP certificate. The FAA also published a draft AC titled "Airline Transport Pilot Certification Training Program for Airplane Category Multiengine Class Rating or Type Rating." The draft AC outlined a training program containing both academic and FSTD training. The FAA amended both the final rule and this AC based on public comments submitted to the Federal Register (FR).

f. ATP CTP. The ATP CTP is designed to bridge the knowledge gap between a pilot who holds a commercial pilot certificate and a pilot operating in an air carrier environment. Bridging this gap requires training in essential subject areas as determined by P.L. 111-216, recommended by the FOQ ARC, proposed by the Pilot Certification and Qualification Requirements for Air Carrier Operations NPRM, and required by § 61.156. Successful completion of the ATP CTP will ensure an ATP applicant receives the baseline knowledge and experience to prepare them for the duties, responsibilities, and challenges of an air carrier environment.

7. TRAINING PROGRAM GENERAL.

a. Persons Required by Regulation to Hold an ATP Certificate. The ATP CTP applies to applicants for an ATP certificate with airplane category multiengine class rating or an ATP certificate issued concurrently with an airplane type rating, and is intended to prepare the applicant to operate safely in those operations which require an ATP certificate by rule. In part 121 operations, each pilot in command (PIC) and each second in command (SIC) are required to have an ATP certificate. Part 135 operations requiring the PIC to hold an ATP certificate with an airplane category multiengine class rating are (1) commuter operations using multiengine airplanes with nine or fewer passenger seats (Scheduled 135), (2) on-demand operations using multiengine airplanes with 10 or more passenger seats, or (3) turbojets. Part 91K operations require all PICs of multiengine turbine-powered fixed-wing airplanes to hold an ATP certificate.

b. Training Program Overview. The ATP CTP is a prerequisite for the FAA's highest certificate and includes training in: aerodynamics, automation, adverse weather conditions, air carrier operations, transport airplane performance, professionalism, and leadership and development. This AC is designed to provide guidance to training providers in developing the components of an ATP CTP submitted for FAA approval. The training program will impart conceptual knowledge through academics and consolidate that knowledge through training in an FSTD. The training program will provide an applicant for an ATP certificate with an airplane category multiengine class rating or an ATP certificate issued concurrently with an airplane type rating with the knowledge and competencies required to function effectively as a professional flightcrew member in an air carrier environment.

8. UPDATES/TECHNOLOGY. This AC will be revised as needed to accommodate new academic areas and/or new technologies. Training providers can add material or revise the

ATP CTP as technologies/procedures change, without a corresponding AC change. However, changes to approved training programs and course material must be submitted for review and approval by FAA Headquarters in Washington, D.C., as described in paragraph 9.

9. OBTAINING PROGRAM APPROVAL.

a. Working with an Assigned Inspector. Part 121, 135, 141, or 142 certificate holders seeking approval for an ATP CTP should work with their assigned inspector (principal operations inspector (POI)/Training Center Program Manager (TCPM)) using this AC and the job aid titled ATP CTP Course Approval Job Aid located on the FAA Pilot Training Web site http://www.faa.gov/pilots/training/atp. Once the assigned inspector is satisfied the submitted program meets all of the requirements of § 61.156, the assigned inspector should forward the completed job aid and program to the appropriate Regional Office (RO) for review. If the RO concurs with the program, they will then forward a copy of the program and both completed job aids to the FAA Headquarters in Washington, D.C. via the following address: 9-AFS-HQATPCTP@faa.gov.

b. Initial and Final Approval. The Air Transportation Division (AFS-200) and the General Aviation and Commercial Division (AFS-800) (as applicable) will conduct a review of the program. For program approvals submitted by part 121 air carriers, part 135 operators, or part 142 Training Centers, AFS-200 must concur with initial and final approval. For program approvals submitted by part 141 Pilot Schools, AFS-800 must concur with initial and final approval. Initial approvals will be valid for one year (unless extended by AFS-200/800). Within one year, AFS-200 or AFS-800 will conduct a site visit/audit of each approved ATP CTP. If the program and flight training equipment meet all of the requirements of the rule and the objectives of this AC (as revised), the program will receive final approval. Revisions to approved programs must be resubmitted through the certificate holders' POI or TCPM.

10. INSTRUCTOR QUALIFICATIONS. Instructor requirements for the ATP CTP can be found in §§ 121.410, 135.336, 141.33, and 142.54. There are two core principles designed into this training program:

- Each subject taught must be related to its applicability to air carrier operations; and
- Concepts learned in the academic portion of the program will be reinforced in the FSTD portion of the course.

a. Baseline Instructor Requirements. To support these principles, all instructors of the ATP CTP must (1) hold an ATP certificate with an airplane category multiengine class rating and (2) have at least two years of air carrier experience. Air carrier experience for the purpose of establishing eligibility to instruct the ATP CTP is defined as experience as a PIC in operations under § 91.1053(a)(2)(i) or § 135.243(a)(1), or as a PIC or SIC under part 121.

b. Instructor Training Requirements.

(1) Instructors who provide ground and/or flight training must receive initial training on the course material and the following topics:

(a) The fundamental principles of the learning process;

(b) Elements of effective teaching, instruction methods, and techniques;

(c) Instructor duties, privileges, responsibilities, and limitations;

(d) Training policies and procedures; and

(e) Evaluation.

(2) Instructors who provide training in an FSTD must (1) have an appropriate airplane type rating for the airplane which the FSTD represents and (2) must also have received initial and annual recurrent training from the certificate holder on the following topics:

(a) Proper operation of flight simulator and FTD controls and systems;

(b) Proper operation of environmental and fault panels;

(c) Data and motion limitations of simulation;

(d) Minimum equipment requirements for each curriculum; and

(e) The tasks and maneuvers that will be demonstrated in the FSTD.

c. SME Instructors. The FAA recognizes the training course contains academic subjects for which SME might be appropriate. The FAA sees benefit in a SME delivering a specialized subject such as meteorology, human factors, or flight dispatch. However, because the subjects focus on applying knowledge to an air carrier environment, the FAA will allow SMEs to deliver content in the ATP CTP while concurrently requiring the presence of an instructor with the required air carrier operational experience. This will help ensure that the material presented is applied to and given in context to air carrier operations.

d. Previous Experience.

(1) The FAA recognizes due to many factors, including defunct air carriers, employment records to verify air carrier experience may not always be available. The FAA has developed guidance, found in Appendix 2 of this AC, which provides a method for a pilot to attest to previous experience.

(2) The FAA also recognizes that some of the requirements may be duplicative for holders of a flight instructor certificate as well as instructors qualified under certain rule parts. For example, the fundamentals of instruction are trained and evaluated as part of the practical test standards for receiving a flight instructor certificate under part 61 as well as instructors teaching under part 142. The fundamentals of instruction are reemphasized for an active flight instructor or through instructor refresher courses and annual training center evaluator/instructor training. As such, with sufficient documentation the FAA does not believe pilots with current flight instructor certificates or currently qualified part 142 training center personnel need to repeat such training. The FAA has made accommodations for possible duplicative instructor requirements in the regulatory text.

11. ACADEMIC TRAINING PHILOSOPHY.

a. Bridging the Knowledge Gap. 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.

b. Learning Objectives. This AC provides greater detail on the subject material outlined in the regulation and sets forth the learning objectives that should be the goal of each section. Many sections also contain references to additional resources where more detailed information can be found. However, each application must include a syllabus and course material in order to demonstrate how and to what extent each subject will be taught.

(1) The FAA has identified subject areas which can be taught at a high level or by simply an introduction of the topic; these are identified as "Overview".

(2) All other subjects without the "Overview" designation 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 (described in paragraph 13 of this AC) and pass the ATP knowledge test.

12. ACADEMIC TRAINING TOPICS. The ATP CTP must include at least 30 hours of classroom instruction per § 61.156(a). The aeronautical knowledge areas to be trained should include, but are not limited to, the following areas:

a. Aerodynamics (Minimum: 8 Hours).

(1) High Altitude Operations.

(a) Learning Objective. 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.

(b) Training Topic Components.

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 V_{MO}/M_{MO} and stall angle of attack (AOA), including turbulence considerations;

6. High Altitiude/Low Energy Recovery; speed reductions at high altitude; excursions behind the power curve at high altitudes and associated recovery techniques (high altitude slowdowns, emphasize no jeopardy events when needing to vacate altitudes for operational considerations). (Refer to CRJ Airspeed Recovery Video);

7. Maximum Lift over Drag Ratio (L/D Max), best range, best endurance; and

8. Flight characteristics of swept wing airplanes, use of a yaw damper, and phenomena such as Dutch roll.

(2) Stall Prevention and Recovery Training.

(a) Learning Objective. 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 and recovery of stall events. (Refer to AC 120-109, Stall and Stick Pusher Training.)

(b) Training Topic Components.

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:

- AOA versus pitch angle;
- Bank angle and G-loading;
- Weight and center of gravity (CG);
- Autothrottle or AOA protection;
- Overreliance on automation/complacency;
- Lack of situational awareness; and
- Contamination (ice).

3. Differences between transport category airplane certification and general aviation airplane certification regarding use of flight controls at high AOA. For example, transport category airplanes are certified to provide roll authority to the pilot all the way up to full stall identification.

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 (Refer to NTSB Report Number: AAR-10-01, Colgan Air 3407, AC 120-109.

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. (Refer to NTSB Animation of Colgan Air 3407, Dutch Safety Board Animation of Turkish 1951).

(3) Upset Prevention and Recovery Training.

(a) Learning Objective. 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.

(b) Training Topic Components.

1. Factors which contribute to airplane upsets (Refer to Aircraft Upset Recovery Training Aid, Rev 2):

- Environmental: including clear air turbulence, mountain wave, windshear, thunderstorms, microbursts, wake turbulence, and airplane icing.
- System malfunctions or failures: including flight instrument, autoflight, flight control, and other system anomalies which could contribute to upsets. (Refer to BEA (Bureau d'Enquêtes et d'Analyses) Report of Air France 447).
- Pilot-induced: including 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. (Refer to NTSB report of Midwest Airlines 490).
- Avoiding cyclical or oscillatory control inputs to prevent exceeding the structural limits of the airplane; (Refer to NTSB Animation of American Airlines 547).

2. Overview of accidents or incidents involving aircraft upset in transport category airplanes.

3. The FAA recommends the use of the Airplane Upset Recovery Training Aid, Revision 2, section 2.6.3.2 through 2.6.3.5, for expanded guidance in order to train the academic portion of the following recovery techniques:

- Nose High/ Wings level recovery,
- Nose Low/ Wings level recovery,
- High-Bank-Angle Recovery Techniques, and
- Consolidated Summary of Airplane Recovery Techniques.

(c) Recognition and Prevention Techniques and Philosophy.

1. Students should understand that any time the airplane begins to diverge from the intended flightpath or speed; they must identify what, if any, action must be taken.

2. Timely and appropriate intervention: It should be emphasized that recovery to a stabilized flightpath should be initiated as soon as a developing upset condition is recognized. The amount and rate of control input to counter a developing upset must be proportional to the amount and rate of pitch, roll and/or yaw experienced. This action may prevent what might become a more serious event.

3. Examples of instrumentation during developing and developed upset: A key aspect to upset awareness, prevention, and recovery training is for students to recognize and prevent developing upsets and recover from developed upsets.

4. Effective scanning: An effective scan is essential for pilots to identify the precursors and the initial development of the upset and using that recognition make timely and appropriate responses to return the aircraft back to the desired path.

5. Pitch/Power/Roll/Yaw: Students should understand how to recognize developing and developed upset conditions so they can make control inputs based on desired aircraft reaction. Control deflections at one point in the flight envelope might not be appropriate in another part of the flight envelope. Pilots should have a fundamental understanding of instrumentation and flight dynamics in Pitch/Power/Roll/Yaw in order to recognize the current state of the airplane and make the correct control inputs to arrest the divergence or recovery from the upset. The Air Data Instrument (ADI) is the primary control instrument for recovery from an upset. Due to varying visibility conditions, one cannot depend on having adequate outside visual references.

6. Recovery: An overview of actions to take to recover from an upset encompasses three basic activities, which should be part of every upset recovery:

- Manage the energy;
- Arrest the flightpath divergence; and
- Recover to a stabilized flightpath.

b. Meteorology (Minimum: 2 Hours).

(1) Learning Objective. 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 decisionmaking in air carrier operations.

(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 (Refer to AC 120-58, Pilot Guide Large Aircraft Ground Deicing).

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, including low-visibility surface movement, and category (CAT) II and CAT III approaches (Overview).

c. Air Carrier Operations (Minimum: 14 Hours).

(1) Physiology/Fitness for Duty (Overview).

(a) Learning Objective. Students should have an understanding of the effects of altitude on human physiology and crewmember responsibilities to remain fit for duty.

(b) Training Topic Components.

1. Hypoxia: signs, symptoms, and effects; times of useful consciousness.

2. Aircraft Decompression—Causes and recognition of cabin pressure loss.

3. Altitudes/conditions which require the use of oxygen masks.

4. Effects of fatigue on performance, including mitigation strategies (Refer to AC 120-100, Basics of Aviation Fatigue).

(2) Communications.

(a) Learning Objective. 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.

(b) Training Topic Components.

1. Sterile flight deck rules.

2. Briefings: Discuss advantages of proper briefings and how to properly accomplish professional briefings for all phases of ground and flight operations.

- Briefings between flightcrew and cabin crew.
- Passenger briefings (Overview).

3. Clearance delivery including pre-departure clearance (PDC), and Controller-Pilot Data Link Communications (CPDLC) (Overview).

(3) Checklist Philosophy.

(a) Learning Objective. Students should understand the different types of commonly used checklists and checklist philosophies and how to apply them in a multicrew environment.

(b) Training Topic Components.

1. Checklist philosophies (read/do, do/verify, memory items, and flows) manufacturer vs. operator developed checklist.

2. Use of normal checklists.

3. Use of quick reference handbook/emergency checklists.

(4) Operational Control (Overview).

(a) Learning Objective. 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.

(b) Training Topic Components.

1. Air carrier operational control concept (Refer to AC 120-101, Part 121 Air Carrier Operational Control).

2. Dispatch and flight following differences and responsibilities.

3. Emergencies and decisionmaking with joint pilot/dispatcher responsibilities.

(5) Minimum Equipment List (MEL) and Configuration Deviation List (CDL).

(a) Learning Objective. Students should understand the operation and use of an MEL and CDL in relation to inoperative equipment.

(b) Training Topic Components.

1. Introduction to MEL and CDL as dispatch documents (Refer to FAA Order 8900.1, MEL/CDL for Operators).

2. Repair intervals of deferred equipment—Categories A, B, C, D.

3. Maintenance and operations procedures, responsibilities, and cautions.

4. 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) Learning Objective. Students should gain an understanding of elements associated with operating at complex and high density airports with emphasis on runway incursion prevention techniques.

(b) Training Topic Components.

1. Runway incursion prevention (Refer to FAA Runway Safety Resources).

- Professionalism during taxi operations, including sterile flight deck and standard operating procedures (SOP) (refer to the current edition of AC 120-74, Parts 91, 121, 125, and 135 Flightcrew Procedures During Taxi Operations).
- Airport situational awareness.
- Taxi route planning and briefings including hot spot identification and runway crossings.
- Technology (electronic flight bag, moving maps).

2. Practical knowledge of airport surface operations, including:

- Airport movement areas.
- Ramp procedures and communications.
- Coded taxi routes and complex taxi procedures.

(7) Turbine Engines (Overview).

(a) Learning Objective. Students should gain an understanding of turbine engine operation and common malfunctions.

(b) Training Topic Components.

1. Turbine engine theory.

2. Differences in thrust application of a turbine engine vs. a reciprocating engine.

3. Turbine engine malfunctions (start malfunctions, surge, compressor stalls, roll-back).

4. Engine re-start considerations, internal damage, starting altitude, and speed envelopes.

5. Knowledge of turbine-powered engine monitoring systems, including:

- Engine indication; and
- Crew alerting system (engine indicating and crew alerting system (EICAS) or electronic centralized aircraft monitor (ECAM)).

6. EPR, N1, N2, exhaust gas temperature (EGT) indications.

(8) Transport Airplane Performance.

(a) Learning Objective. The student 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.

(b) Training Topic Components.

1. Weight, altitude, and V-speed relationship.

2. Flight operations performance considerations of minimum control speed with the critical engine inoperative during takeoff roll (V_{MCG}),
minimum control speed with the critical engine inoperative out of ground effect-red radial line (V_{MCA}), V_1 and V_2.

3. Proper use of rudder in a transport category airplane and discuss the limitations associated with its use to include airplane certification standards.

4. Weight and Balance (W&B). Introduction to air carrier W&B systems (average weight program; indexing) (Refer to the current edition of AC 120-27, Aircraft Weight and Balance Control). (Overview)

5. Performance calculations.

- Air carrier performance requirements including: balanced field length, accelerate-go, accelerate-stop, V_{MCG}, and second segment climb performance.
- 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 (Refer to AC 120-91, Airport Obstacle Analysis).
- Air carrier en route performance requirements and calculations (maximum altitude, step climb, crossing restrictions).
- Performance calculations required for landing.
- Contaminated runway considerations for takeoff and landing.

(9) Automation (Overview).

(a) Learning Objective. 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.

(b) Training Topic Components.

1. Introduction to computer-assisted piloting (pilot/system interface).

2. Automation philosophies/architecture and envelope protections.

3. Flight director/autopilot (FD/AP): modes of operation, properly interpreting mode annunciation, and recovery techniques from automation input errors.

4. 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 (Overview).

(a) Learning Objective. Students should have an understanding of equipment and principles used in advanced navigation and how to apply these concepts to air carrier operations.

(b) Training Topic Components.

1. Airspace speed restrictions and altitude constraints (crossing altitudes).

2. Basic principles of flight management systems (FMS).

3. Introduction to the concepts of area navigation, Global Positioning System/Area Navigation (GPS/RNAV) capabilities, lateral navigation (LNAV), vertical navigation (VNAV), Required Navigation Performance (RNP), and required authorizations (operations specifications OpSpecs)) and training.

4. Automatic Dependant Surveillance- Broadcast (ADS-B).

5. Traffic Alert and Collision Avoidance System (TCAS).

6. Terrain Awareness and Warning System (TAWS).

d. Leadership/Professional Development, Crew Resource Management, and Safety Culture (Minimum: 6 Hours).

(1) Leadership/Professional Development.

(a) Learning Objective. 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.

(b) Leadership Philosophy. "Leadership is not simply having responsibility for the outcome of the flight, but for taking the authority to make the difficult and final decisions, and when the situation requires, making a command decision."[1]

1. Authority. The Captain is the final authority as to the operation of the airplane. Use that authority wisely and appropriately considering the situation.

2. Responsibility. The Captain is responsible for the tone, pace, and the outcome of decisions made and will be held accountable for all outcomes. Decisions produce actions and actions have consequences. The Captain is responsible for enforcing organizational, procedural, and FAA standards.

3. Sound Decisions. The Captain is not operating in a vacuum and should consider all available input, but is ultimately required and expected to make sound, safe decisions.

4. Awareness. The Captain is expected to be operating the airplane with the "Big Picture" in mind. Situational awareness is paramount when making decisions.

5. Mentoring. The Captain should always be preparing first officers for upgrade. Explaining operational considerations, decision making factors, and lessons learned is an essential function of a captain.

(c) Professional Development. Learning never stops: a responsible pilot will always seek more training, instruction or professional development. Be honest with yourself and be ready to critique your performance. Know your strengths and weaknesses. First officers should always be preparing to upgrade.

1. It is important to be technically proficient. It is critical that each pilot be thoroughly knowledgeable about his/her responsibilities and the aircraft.

2. The pilots must have regard for the welfare of the crew and passengers. The passengers' lives and well-being are in the hands of the crew.

3. It is critical that the crew's actions communicate trust and professionalism. Each action a crewmember takes is a reflection of yourself, your company, and the pilot profession.

(2) Crew Resource Management (CRM).

(a) Learning Objective. Students should demonstrate knowledge of the 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).

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[1] *Crew Resource Management*, B. Kanki, R. Helmreich, J. Anca, 2010, p. 404

(b) CRM Philosophy and PM Intervention Strategies.

1. CRM Philosophy. "The true definition of *teamwork*, or CRM, is its focus on the proper response to threats to safety and the proper management of crew error."[2]

- Review the applicable Accident/Incident Reports and Animation.
- Review the elements of effective CRM. (Refer to AC 120-51, Crew Resource Management Training).

2. PM Intervention Strategies.

- Discuss the methods that can be used to enhance the monitoring and challenging functions of both captains and first officers. Appropriate questioning among pilots is a desirable CRM behavior and part of a healthy safety culture.
- The PM must establish a positive attitude toward monitoring and challenging errors made by the Pilot Flying (PF).

(3) Safety Culture/Voluntary Safety Programs (Overview).

(a) Learning Objective. 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.

(b) Voluntary Safety Programs. Airlines with positive safety cultures encourage all employees to communicate safety concerns to management in an atmosphere of mutual trust, focus on solving problems rather than punishing people, and effectively manage risk across their organization. The FAA voluntary safety programs represent major components of most air carrier safety programs. Voluntary Safety Programs include:

1. Aviation Safety Reporting System (ASRS) (refer to ASRS Program Briefing).

2. Aviation Safety Action Program (ASAP) (refer to the current edition of AC 120-66, Aviation Safety Action Program ASAP)).

3. Flight Operational Quality Assurance (FOQA) (refer to AC 120-82, Flight Operational Quality Assurance).

4. Line Operations Safety Audits (LOSA) (refer to AC 120-90, Line Operations Safety Audits).

[2] *Crew Resource Management*, B. Kanki, R. Helmreich, J. Anca, 2010, p.

5. Safety Management Systems (SMS) (refer to the current edition of AC 120-92, Safety Management Systems for Aviation Service Providers).

13. ACADEMIC EVALUATIONS. Training providers are required by §§ 121.410, 135.336, 142.54 and part 141 appendix K, to conduct evaluations to ensure that the training techniques, procedures, and standards for the course are acceptable to the Administrator. A pilot should demonstrate through an academic evaluation an understanding of the academic areas covered in the ATP CTP. The following paragraphs contain direction and guidance for those academic evaluations, which should take place after each section of the academic portion of the course.

a. Evaluation Procedures. The training provider should provide a description of the evaluation procedure used to measure the attendee's proficiency. This discussion should identify and describe the form of test (i.e., individual paper tests handed out, tests presented on a screen, etc.). For example, "The attendee will answer a series of multiple choice questions related to this topic at the end of the day in which the topic was presented, and again in the final test at the end of the program. The test will be in printed form and handed to the applicant for completion."

b. Written Test Questions. The training provider should provide a comprehensive written test or test question pool with an answer key in the submitted application for the course.

(1) The training provider should provide source materials (references) from which the answers to the questions were derived. References should be sufficiently detailed to enable FAA personnel to easily locate those references if FAA personnel feel it is necessary to verify or confirm specific information presented in the test. Inadequate references may result in denial of the approval. Test questions should be appropriate to the lesson plans and subject areas the sponsor will teach. It is also recommended the sponsor administer closed book exams.

(2) The sponsor should have each student answer at least 30 test questions. All 30 test questions do not have to be given at the same time; however, at least 15 of the questions should be given at the end of the ATP CTP covering the entire academic course material. A student's successful completion of the ATP CTP is dependent upon a minimum score of 70 percent on each written test administered. Individual sponsors may set higher standards. Students who fail to achieve the minimum score should receive training and retake the exam on the topics failed.

14. FSTD TRAINING PHILOSOPHY. 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.

a. Briefings Before and After Each Session. In order to consolidate the academic and FSTD portions of the course, FSTD instructors are expected to conduct pre-briefings before each session. The pre-briefing should review the training topics to be covered in that session. A

briefing after each FSTD session should review those concepts presented and allow the students an opportunity for further questions.

b. FSTD Training Categories. ATP CTP FSTD training is divided into two categories: demonstration-based training and experience-based training. In the FSTD Training Topics listed below, demonstration-based training items are identified by **(D)** and experience-based training items are identified by **(E)**. Many training items fall into both categories.

(1) Demonstration-Based Training. The purpose of demonstration-based training is to develop the knowledge necessary to complete the desired outcome during the experience phase. The demonstration phase should include an instructor-led demonstration of the entry/application of skills and desired outcome of a specific maneuver including an explanation on the limitations of the airframe and the simulator.

(2) Experience-Based Training. The purpose of experience-based training is to allow the student to reinforce the basic airplane characteristics witnessed in the demonstration phase. Experience-based training allows the pilot to obtain repetitive handling experience and motion sensations when operating the airplane in both dynamic and difficult operating conditions. Experience-based training maneuvers should be practiced to the point of conceptual proficiency. For example, repetitive practice during the entire approach-to-stall regime in various airplane configurations and bank angles should be accomplished until the ATP applicant successfully achieves the conceptual knowledge or demonstrates competency in the maneuver.

15. FSTD TRAINING TOPICS. As stated in § 61.156(b), the ATP CTP must include at least ten hours of training in an FSTD, qualified under 14 CFR part 60. Of the ten required hours, at least six hours of training must be completed in a full flight simulator (FFS), Level C or higher. Up to four hours of training may be accomplished in a Level 4 or higher FTD.

a. FTD Training (4 hours). All training must be accomplished in a Level 4 or higher FTD. A FFS (Level A, B, C, or D, motion on or off) may be used for the FTD training portion of the program provided it meets the minimum equipment requirements for the FTD defined in paragraph 19 of this AC. Use of an FTD for the automation/navigation section should be limited to operations on autoflight. The learning objectives for this section of the course can more effectively be met without students attempting to hand fly an FTD.

b. Training Topic Components. The aeronautical experience areas to be trained should include, but are not limited to, the following areas:

(1) Navigation.

(a) Learning Objective. 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.

(b) Training Topic Components.

- Interpret navigation displays (ND), a primary flight display (PFD), and/or a multi-function display **(D, E)**;
- Perform FMS route input and modifications **(D, E)**;
- Receive and understand air traffic control (ATC) instructions **(D, E)**; and
- Use of area navigation systems in flight **(D, E)**.

(2) Automation.

(a) Learning Objective. 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.

(b) Training Topic Components.

- Interact with the mode control panel; verify mode control panel inputs; interpret flight mode annunciations **(D, E)**;
- Use various levels of autopilot/auto-throttle automation applicable to pilot flying duties and pilot monitoring duties with and without the autopilot engaged **(D, E)**;
- Use of FD/flight guidance systems **(D, E)**;
- Knowledge of an FMS for each phase of flight **(D)**;
- Use of automation in climb, cruise, descent and approach modes **(D, E)**; and
- Use of TCAS and TAWS **(D, E)**.

c. FFS Training (6 hours). All training must be accomplished in a Level C or higher FFS. The aeronautical experience areas to be trained should include, but are not limited to, the following areas:

(1) Runway safety and adverse weather (3 hours).

(a) Learning Objective. 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.

(b) Training Topic Components.

1. Taxi.

- Adherence to SOPs and best practices used to maintain situational awareness with complex taxi instructions **(D, E)**; and
- Recognition of hot spots, line up and wait terminology, runway incursion prevention techniques, procedures for ensuring correct departure runway **(D, E)**.

2. Takeoff.

- Normal takeoff, PF (outside scan) and PM (engine monitoring) duties and responsibilities **(D, E)**;
- V_{MCG} demonstration to show the effects of differential power with limited rudder aerodynamic authority **(D)**;
- V_1 : Application of V_1 decision speed concepts and how they relate to accelerate-go and accelerate stop distances with and without the effects of a contaminated runway **(D,E)**;
- Rejected takeoffs with aircraft weight, runway length, and contamination considerations **(D, E)**; and
- Ability to apply appropriate precautions for adverse weather during takeoff to include: windshear, contaminated runway surfaces, and crosswinds with gusts **(D, E)**.

3. V_2 climb performance.

- Climb at V_2 **(D, E)**;
- Effects of speeds less than V_2 and greater than V_2 **(D)**; and
- Automation during departure **(D, E)**.

4. Approach/Landing.

- Icing conditions in flight and its effects on performance and decisionmaking **(D, E)**;
- Achieve a stabilized approach using energy management concepts **(D)**;
- Landing in crosswinds with and without gusts with emphasis on airplane performance limitations in crosswinds **(D, E)**;
- Landing technique and stopping distances on contaminated runways **(D, E)**; and
- Operations in low visibility conditions: taxi, takeoff, and landing **(D)**.

(2) High Altitude Operations, Stall and Upset Prevention and Recovery (3 hours).

(a) Learning Objective. Students should reinforce their understanding of low energy states, stalls, upset and high altitude aerodynamics through demonstration and experience based training.

1. High Altitude Operations.

- Speed/mach changeover **(D)**;
- Effects of weight on maximum altitude (high and low speed convergence) **(D)**;
- Effects of high altitude turbulence with limited performance margins **(D);** and
- Relationship between weight, thrust, and altitude **(D, E)**.

2. Low Energy States/Stall Prevention Training.

- High altitude/low energy recovery demonstrating limited thrust capability and necessity to exchange altitude for airspeed **(D)**;
- Acceleration performance from second regime (back side of power curve) at low altitude and high altitude **(D)**;
- Demonstration of stall recovery without application of thrust **(D)**; and
- Stall prevention training **(E)**. Emphasis on reduction of AOA for recovery (Refer to AC 120-109 Stall and Stick Pusher Training).

    - Takeoff or Maneuvering configuration approach-to-stalls,
    - Clean configuration approach-to-stalls (high altitude), and
    - Landing configuration approach-to-stalls.

NOTE: For each student one of the three tasks above should be experienced using a realistic scenario and autoflight (samples of the training scenarios can be found in Appendix 2 of AC 120-109).

3. Stick Pusher, if installed, reference AC 120-109 for proper recovery from stick pusher activation **(D, E)**.

(b) Upset Prevention and Recovery Training (UPRT).

1. Considerations for UPRT.

(i) 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.

(ii) Availability of Visual References. A Commercial Aviation Safety Team (CAST) study of 18 accidents and incidents resulting from a pilot loss of airplane state awareness determined that many accidents and incidents occurred when pilots did not have visual references available (i.e., instrument meteorological conditions (IMC) or night). In the past, unusual attitude training was commonly conducted in visual meteorological conditions (VMC), giving the pilot considerable advantage in determining the appropriate recovery. UPRT should include scenarios where visual references are not available.

(iii) PM. Evidence shows in many loss of control incidents and accidents, the PM may have been more aware of the aircraft state than the pilot flying. Training should emphasize crew interaction to vocalize the divergence conditions, use CRM to stop the divergence, and return the aircraft to stabilized flight.

(iv) Startle. Startle has been a factor in upset incidents and accidents. Although it may be difficult to create the physiological response of startle in the training environment, 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.

2. UPRT Elements.

(i) Manual Handling. Flying the aircraft, with sole reference to pitch and power emphasizing core handling skills in the event of system failure (e.g., loss of airspeed or unreliable airspeed indications) **(D, E)**.

(ii) 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. (Refer to Airplane Upset Recovery Training Aid, version 2, 2008) **(D, E)**.

3. Refer to Appendix 1 of this AC for sample training scenarios and an original equipment manufacturer (OEM) approved upset recovery template on:

(i) Nose-High/Wings-level recovery.

(ii) Nose-Low/Wings-level recovery.

NOTE: All instructors must be knowledgeable of the limitations of both the simulator motion and approved flight envelope. Particular care should be used when conducting these maneuvers to stay within both envelopes. Excursions outside of either must include an instructor debrief emphasizing that the flight handling characteristics in that region may not be representative of the actual aircraft.

16. ATP CTP GRADUATION CERTIFICATE.

a. Academic Evaluation. Applicants who successfully pass the academic evaluations and complete the ATP CTP must be issued a graduation certificate by the training provider. The applicant must present an ATP CTP graduation certificate when he or she applies to take the ATP knowledge test. Applicants who do not pass the academic evaluation will be required to obtain remedial training from the training provider on those subject areas until the academic evaluation is successfully completed.

b. Graduation Certificate. A graduation certificate must contain the following information in order to be considered valid:

(1) The full name, address, and FAA certificate number of the training provider authorized to conduct the course;

(2) The full name, FAA pilot certificate number, and address of the graduate;

(3) The following statement: “The applicant named above has successfully completed the Airline Transport Pilot Certification Training Program as required by § 61.156, and therefore has met the prerequisite required by § 61.35(a)(2) for the Airline Transport Pilot Airplane Knowledge Test.”;

(4) The date of issuance;

(5) The signature of the authorized instructor who completed the academic portion of the course; and

(6) A sequential number on the certificate starting with the first four identifiers of the training provider's certificate number.

17. FAILURE OF KNOWLEDGE TEST.

a. Failure to Pass. Applicants who do not pass the ATP Airplane Knowledge Test must follow the provisions provided in § 61.49.

b. Authorized Instructor. For the purposes of the required retraining, "an authorized instructor" is an instructor that:

(1) Meets the instructor qualifications described in paragraph 10(a) of this AC;

(2) Has completed the ground instructor training requirements in paragraph 10(b) of this AC; and

(3) Is employed by a training provider authorized to provide the ATP CTP.

NOTE: Applicants may seek retraining from any authorized training provider.

18. INTERNAL EVALUATION PROGRAM (IEP).

a. Identify and Eliminate Deficiencies. An effective IEP would identify and attempt to eliminate deficiencies identified within the training program. At minimum the proposed IEP must measure, track, and analyze:

(1) Student performance on both quiz and test scores;

(2) Student graduation rates; and

(3) Student feedback forms.

b. Amend Deficiencies. Based on the analysis of the data captured from the measurements above, the training provider should then identify course deficiencies and then amend as appropriate:

(1) Instructor performance; and/or

(2) Course material.

NOTE: Further guidance on developing IEPs can be found in the current edition of AC 120-59, Air Carrier Internal Evaluation Programs.

19. FSTD MINIMUM EQUIPMENT REQUIREMENTS. The following describes the minimum equipment the FSTD must have for use in the ATP CTP.

a. FTD. A Level 4 or higher FTD qualified under part 60 is required. The equipment used in the FTD portion of the program should also be equipped with:

(1) FMS;

(2) EFIS (PFD and ND);

(3) TCAS; and

(4) TAWS.

NOTE: For alternative training devices which the training provider believes can meet the learning objectives defined in this AC, training providers may submit a detailed request in its application for course approval or course revision.

b. FFS. A Level C or higher FFS qualified under part 60 is required. As part of the evaluation of the FFS training topics and learning objectives, the FAA reviewed all of the approved FFSs under part 60 including the associated weights of the aircraft they represent. Based on that review, the FAA has determined an FFS representing an aircraft with a maximum takeoff weight (MTOW) of at least 40,000 pounds is necessary to meet the objectives of the ATP CTP.

(1) Minimum Weight of the Aircraft that the FFS Represents. The weight of the aircraft the simulator represents is an important factor in ensuring handling characteristics of a typical transport aircraft. The 40,000 pound minimum requirement will ensure the device can replicate the lower performance margins and handling qualities inherent in transport category aircraft when being operated near their maximum operating weight at altitudes near their service ceiling.

(2) Apply for a Deviation. If a training provider seeks to use a device that does not meet the weight criteria set forth in § 61.156 but believes it can adequately demonstrate the learning objectives, it must apply for a deviation.

(a) Deviation requests must be submitted to the certificate holder's assigned principal operations inspector or TCPM. Once the assigned inspector is satisfied the submitted device meets the learning objectives of the course as defined by the guidance contained in this AC, the assigned inspector should forward to the appropriate FAA RO for review.

(b) If the RO concurs with the deviation request they will then forward to the Air Transportation Division (AFS-200) in Washington, D.C. If AFS-200 feels the deviation request is creditable, the National Simulator Program (NSP) office (AFS-205) will be assigned to review the device to determine if the device meets the learning objectives of the course. If the NSP has a favorable review, AFS-200 will issue the deviation request for a period not to exceed two years.

/s/  for

John M. Allen
Director, Flight Standards Service

APPENDIX 1. UPSET PREVENTION AND RECOVERY TRAINING (UPRT) RECOVERY TEMPLATE AND SCENARIOS

1. Upset Recovery Template.

The following Upset Prevention and Recovery template was created by Airbus, ATR, Boeing, Bombardier and Embraer. The Original Equipment Manufacturer (OEM) recovery techniques will be updated in their respective manuals and remain consistent with the information contained in the Airplane Upset Recovery Training Aid (AURTA), Revision 2. It is important to note that correct interpretation and application of techniques and recommendations can only be determined when the supporting information is well understood.

The following techniques represent a logical progression for recovering the aircraft. They are not necessarily procedural. The sequence of actions is for guidance only and represents a series of options for the pilot to consider and to use depending on the situation. Not all actions may, or should, be necessary once recovery is underway. If needed, use pitch trim sparingly. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These techniques assume the aircraft is not stalled. A stalled condition can exist at any attitude and may be recognized by continuous stall warning activation accompanied by one of the following:

- Buffeting, which could be heavy at times.
- Lack of pitch authority and/or roll control.
- Inability to arrest descent rate.

If the aircraft is stalled, recovery from the stall must be accomplished first by applying and maintaining nose-down elevator until stall recovery is complete and stick shaker activation ceases.

NOTE: Operators should work with their airplane manufacturer(s) to ensure they have the manufacturer-approved, airplane-specific upset prevention and recovery guidance and techniques in their operating manual.

NOTE: The manufacturer's procedures take precedence over the following recommendations:

Nose-High Recommendation	
[1]**Recognize and confirm the developing situation. Announce: "Nose High"**	
PF	PM
[2]AP - DISCONNECT	Monitor Airspeed and Attitude throughout the recovery and announce any continued divergence.
A/THR – OFF	
APPLY as much nose down control input as required to obtain a nose-down pitch rate.	
Thrust - Adjust (if required)	
Roll - Adjust (if required) not to exceed 60 degrees	
When Airspeed is sufficiently increasing: [3]RECOVER to level flight	

Recovery to level flight may require use of pitch trim.

[1] If the AP and/or A/THR are responding correctly, it may not be appropriate to decrease the level of automation while assessing if the divergence is being stopped.

[2] A large out of trim condition could be encountered when the A/P is disconnected.

[3] Avoid stall because of premature recovery or excessive g loading.

Warning: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.

Nose-Low Recommendation	
[1]Recognize and confirm the developing situation. Announce: "Nose Low "	
PF	PM
[2]AP - DISCONNECT	Monitor Airspeed and Attitude throughout the recovery and announce any continued divergence.
A/THR – OFF	
RECOVER from stall if required	
[3]ROLL in the shortest direction to wings level.	
Thrust and Drag Adjust (if required)	
[4]Recover to level flight	

Recovery to level flight may require use of pitch trim.

[1]If the AP and/or A/THR are responding correctly, it may not be appropriate to decrease the level of automation while assessing if the divergence is being stopped.

[2]A large out of trim condition could be encountered when the A/P is disconnected.

[3]It may be necessray to reduce the g loading by applying forward control pressure to improve roll effectiveness.

[4]Avoid stall because of premature recovery or excessive g loading.

Warning: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads

2. Upset Recovery Scenarios. Two scenarios were constructed using the philosophies and concepts described in this advisory circular (AC). The examples should be easily tailored to any transport category airplane. The examples given are not intended to be limiting in any way, they are provided as a framework for developing a training curriculum.

NOTE: The manufacturer's procedures take precedence over the recommendations in this AC.

SCENARIO 1: NOSE HIGH	
INSTRUCTOR ROLE	Initiate a condition which will result in an unexpected nose high attitude (40° or greater) with full power.
OBJECTIVE	The pilot will recognize the nose high attitude and immediately perform the upset recovery procedure.
EMPHASIS AREAS	• Recognition and recovery. • Crew coordination. • Angle of attack (AOA) management. • Aural and visual warnings (environment and airplane cuing). • Surprise and startle. • Situational awareness (SA) while returning to desired flightpath after the upset recovery, including such items as heading, altitude, other aircraft, and flight deck automation.
FSTD SETUP CONSIDERATIONS	Use of simulator capabilities to induce a nose high attitude may include: • Automated simulator presets • Airspeed slewing. • Attitude changes. • Airplane weight and center of gravity (CG) changes. • Environmental changes.
SCENARIO ELEMENTS	• Upon recognizing the first indication of an upset, perform the upset recovery procedure. • The necessity for smooth, deliberate, and positive control inputs to avoid increasing load factors. • If the airplane is equipped with underwing mounted engines, the pilot should demonstrate recovery by reducing thrust to approximately midrange until a detectable nose-down pitch rate is achieved.

COMPLETION STANDARDS	• Recognizes and confirms the situation. • Verifies the autopilot and autothrottle/autothrust are disconnected. • Proper recovery consists of up to full nose-down elevator and, if required, by using stabilizer trim to relieve elevator control pressure. A steady nose-down pitch rate should be achieved and it should be noted that the airplane would be near zero g and the associated characteristics of such. • When approaching the horizon the student checks airspeed, adjusts thrust, and establishes the appropriate pitch attitude and stabilizer trim setting for level flight.
COMMON STUDENT ERRORS	• Fails to disengage the autopilot and autothrottle. • Hesitates to use up to full control input. • Overtrims nose-down stabilizer. • Fails to use nose-up stablilizer trim.

SCENARIO 2: NOSE LOW	
INSTRUCTOR ROLE	Initiate a condition which will result in an unexpected nose low attitude (approximately 20 degrees).
OBJECTIVE	The pilot will recognize the nose low attitude and immediately perform the upset recovery procedure.
EMPHASIS AREAS	• Recognition and recovery. • Crew coordination. • AOA management. • Aural and visual warnings (environment and airplane cuing). • Surprise and startle. • Situational awareness (SA) while returning to desired flightpath after the upset recovery, including such items as heading, altitude, other aircraft, and flight deck automation.
FSTD SETUP CONSIDERATIONS	Use of simulator capabilities to induce a nose low attitude may include: • Automated simulator presets. • Airspeed slewing. • Attitude changes. • Airplane weight and center of gravity (CG) changes. • Environmental changes.

SCENARIO ELEMENTS	• Upon recognizing the first indication of an upset, perform the upset recovery procedure. • The necessity for smooth, deliberate, and positive control inputs to avoid increasing load factors.
COMPLETION STANDARDS	• Recognizes and confirms the situation. • Verifies the autopilot and autothrottle/autothrust are disconnected. • Proper recovery consists of rolling to approaching wings level, then applying nose-up elevator; applying stabilizer trim, if necessary; and adjusting thrust and drag as necessary. • For a satisfactory nose-low recovery, the student must avoid ground impact and accelerated stall and respect g-force and airspeed limitations. • Recovers to stabilized flight with a pitch, thrust, and airplane configuration that corresponds to the desired airspeed.
COMMON STUDENT ERRORS	• Forgets to disengage the autopilot and or autothrottle. • Fails to use full control inputs. • Initiates pull-up before approaching wings level. • Attempts to precisely obtain wings level and delays pull-up. • Enters secondary stall. • Exceeds positive g force during pull-up. • Fails to reduce thrust to idle for high speed. • Fails to use speedbrakes, if required. • Achieves inadequate pull-up to avoid ground impact.

APPENDIX 2. DOCUMENTING PREVIOUS EXPERIENCE GUIDANCE

To be eligible to teach the airline transport pilot (ATP) Certification Training Program (CTP), an instructor must have at least two years of air carrier experience as defined in Title 14 of the Code of Federal Regulations (14 CFR) part 121, § 121.410, part 135, § 135.336, part 141, § 141.33, or part 142, § 142.54. The following guidance may be used to assist in documenting previous air carrier experience.

Lost or Unattainable Records. A principal operations inspector (POI) may accept an affidavit as a method to document previous experience if an instructor is unable to produce suitable employment records because:

1. The records are lost;

2. The air carrier or program manager (PM) is defunct; or

3. The air carrier or PM remains in existence but no longer has the records.

Supporting Documentation. The instructor must submit a signed and notarized statement (affidavit) attesting to the previous experience. The statement should be substantiated by all available evidence, such as completed check ride forms, available training records, logbook entries, and other records attesting to flight operation participation, associated pay stubs, W-2 forms (financially confidential information redacted), tax returns, a statement from a current, or former employee of the air carrier or program manager, and other proofs of employment. Both the pilot and training provider must read, sign, and submit a notarized statement containing the information found in this appendix and provide both affidavits with supporting documentation to the POI or Training Center Program Manager (TCPM). If the affidavits and documentation reasonably support the claimed experience, the POI or TCPM may accept the information as meeting the previous experience requirement. An affidavit without any supporting documentation should not be accepted.

a. False Statements. A pilot who has lost or is unable to obtain suitable records should be reminded that any fraudulent or intentionally false statements concerning these records are a basis for enforcement action in accordance with Title 18 of the United States Code (18 U.S.C.), § 1001.1, and 14 CFR part 61 that could result in a fine, imprisonment, and action against any certificate or rating held.

b. Supporting Documentation Review. The POI or TCPM should consider the following when determining the acceptability of the documentation provided:

1. Review Records. Review and determine the validity of the records.

2. Ensure Clarity. Ensure that records clearly identify the air carrier and associated employment.

3. Review Federal Aviation Administration (FAA) Database. Review FAA database(s) to determine if the air carrier or program manager has records to verify its existence

4. Review Program Tracking and Reporting Subsystem (PTRS) Records. Review PTRS records that may support the nominee's activities with the air carrier or program manager. (This is not required but could be used for confirmation in some cases.)

5. Review Evidence. Review evidence the nominee has provided that confirms the air carrier or program manager no longer retains the records or has not responded to a record request for an air carrier or program manager that currently remains in existence.

6. Review Participation and Qualification. Review records or supporting documents (e.g., logbooks, dispatch releases, evidence of employment, or a statement from a current or former employee of the air carrier or program manager) that attest to or confirm flight program participation and qualification as a pilot for the air carrier or program manager

APPENDIX 2-1. INSTRUCTOR PREVIOUS EXPERIENCE AFFIDAVIT

STATE OF _____

COUNTY OF _____

_____[Name of applicant]_____, being duly sworn, says:

1. On [today's date], I, [Name of applicant], certify that I have been unable to find or obtain the records documenting my employment with [air carrier/operator/program manager] from [date] to [date].

2. I acknowledge that any fraudulent or intentionally false statements concerning aeronautical experience are a basis for suspension or revocation of any certificate or rating I hold.

Considering the above, I offer the following statement in lieu of the actual records:

____ I, [Name of applicant], hereby attest that I was employed as a [pilot in command or second in command] for [Name of part 121 air carrier], a part 121 air carrier based in [city, state, country], from [date] to [date].

____ I, [Name of applicant], hereby attest that I was employed as a pilot in command, as required by § 135.243(a)(1), for [Name of part 135 air carrier/operator], a part 135 [air carrier or operator] based in [city, state, country], from [date] to [date].

____ I, [Name of applicant], hereby attest that I was employed as a pilot in command, as required by § 91.1053(a)(2)(i), for [Name of part 91K operator], a part 91K program manager based in [city, state, country], from [date] to [date].

_____
Airman's Signature

_____
Airman's Name (Printed) and Pilot Certificate Number

SUBSCRIBED AND SWORN TO before me this _____ day of _____, _____

[Seal]

Notary Public in and for

County_____

State of _____

My Commission expires on _____

APPENDIX 2-2. TRAINING PROVIDER AFFIDAVIT FOR LOST/UNOBTAINABLE PREVIOUS EXPERIENCE DOCUMENTATION

STATE OF _____

COUNTY OF _____

_____[Name of Company Representative]_____, being duly sworn, says:

1. On [today's date], I, [Company Representative], [Company Name], certify that I have been unable to find or obtain the records documenting that [instructor's name] was employed by [Company Name] from [date] to [date].

2. I have made a good faith effort to obtain such records. Notwithstanding this effort, I have been unable to find such records. I do not know where such records presently are, or where they may be found. I believe them to be lost or destroyed.

3. I acknowledge that any fraudulent or intentionally false statements concerning aeronautical experience are a basis for suspension or revocation of any certificate or rating I hold, as well as revocation or suspension of this [air carrier certificate or management specifications].

For the above reason, I offer the below statement in lieu of the actual records:

I, [Company Representative], on behalf of [company name], attest the information above is accurate and therefore [Name of instructor] meets the baseline requirements of an instructor as set forth in §§ 121.410 (b)(2), 135.336(b)(2), 141.33(4)(ii), or 142.54(b).

Company Representative's Signature_____

Company Representative's Pilot Certificate Number (if applicable)_____

Company Representative's Name (Print)_____

Company Name and Certificate Number_____

SUBSCRIBED AND SWORN TO before me this _____ day of _____, _____

[*Seal*]

Notary Public in and for

County_____

State of _____

My Commission expires on _____

APPENDIX 3. RELATED GUIDANCE

a. Related Reading Material (current editions).

(1) Advisory Circular (AC) 120-35, Line Operational Simulations: Line Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/22758.

(2) AC 120-51, Crew Resource Management Training. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/22879.

(3) AC 120-62, Takeoff Safety Training Aid. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23202.

(4) AC 120-64, Operational Use and Modification of Electronic Checklists. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23204.

(5) AC 120-66, Aviation Safety Action Program (ASAP). Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23207.

(6) AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23216.

(7) AC 120-74, Parts 91, 121, 125, and 135 Flight crew Procedures during Taxi Operations. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm /go/ document.information/documentID/23220.

(8) AC 120-82, Flight Operational Quality Assurance. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23227.

(9) AC 120-109, Stall and Stick Pusher Training, Retrieved from http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC%20120-109.pdf.

(10) AC 121.195-1, Operational Landing Distances for Wet Runways; Transport Category Airplanes. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/ go/document.information/documentID/22523.

(11) InFO 07009, Runway Lights Required for Night Takeoffs in Part 121. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2007/inFO07009.pdf.

(12) InFO 07018, Taxi Clearances: Know the Rules, Understand Your Clearance. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2007/inFO07018.pdf.

(13) InFO 08029, Approach and Landing Accident Reduction (ALAR): Recommended Flightcrew Training. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2008/inFO08029.pdf.

(14) InFO 08034, Design and Content of Checklists for In-Flight Smoke, Fire and Fumes (SFF). Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2008/inFO08034.pdf.

(15) InFO 08041, Checklist Review. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2008/inFO08041.pdf

(16) InFO 08049, Preventing Wrong Runway Takeoffs. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2008/inFO08049.pdf.

(17) InFO 10010, Enhanced Upset Recovery Training. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2010/InFO10010.pdf.

(18) InFO 10024, Airline Transport Pilot (ATP) Certificate Requirement for Pilots in Part 121 Operations. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2010/InFO10024.pdf.

(19) SAFO 07003, Confirming the Takeoff Runway. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo/all_safos/media/2007/safo07003.pdf.

(20) SAFO 10006, In-Flight Icing Operations and Training Recommendations. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo/all_safos/media/2010/SAFO10006.pdf.

(21) SAFO 10012, Possible Misinterpretation of the Practical Test Standards (PTS) Language “Minimum Loss of Altitude”. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo/all_safos/media/2010/SAFO10012.pdf.

(22) Order 8900.1 Vol. 4, Ch. 2, Sect. 5. All-Weather Terminal Area Approach and Landing Operations. Retrieved from http://fsims.faa.gov/WDocs/8900.1/V04%20AC%20Equip%20&%20Auth/Chapter%2002/04_002_005.pdf.

(23) Order 8900.1 Vol. 3, Ch. 32, Sect. 12. Aircraft Checklists for 14 CFR Parts 121/135. Retrieved from http://fsims.faa.gov/WDocs\8900.1\V03 Tech Admin\Chapter 32\03_032_012.pdf.

(24) Aerodynamics for Naval Aviators, http://www.faa.gov/library/manuals/aviation/media/00-80T-80.pdf).

(25) Degani, A., & Wiener, E.L. (1994). On the design of flight deck procedures. (NASA Contractor Report 177642). Washington, DC: National Aeronautics and Space Administration. Retrieved from http://ti.arc.nasa.gov/m/profile/adegani/Flight-Deck_Procedures.pdf.

(26) FAA, Air Traffic Organization, Office of Safety. (n.d.). Pilot 'Best Practices' for AIRFIELD SAFETY. Retrieved from https://employees.faa.gov/org/linebusiness/ato/safety/rs/pilot_info/.

(27) FAA-H-8083-3A. Airplane Flying Handbook. Retrieved from http://www.faa.gov/library/manuals/aircraft/airplane_handbook/.

(28) FAA, Office of Integrated Safety Analysis, Human Factors Analysis Division. (1995). Human Performance Considerations in the Use and Design of Aircraft Checklists. Retrieved from http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs200/branches/afs210/training_aids/media/checklist.doc.

(29) International Civil Aviation Organization. (1991). Human Factors Digest Number 3: Training of Operational Personnel in Human Factors. (ICAO Circular 227-AN/136).

(30) McDonnell, L.K., Jobe, K.K., & Dismukes, R.K. (1997). Facilitating LOS Debriefings: A Training Manual. (NASA Technical Memorandum 112192). Retrieved from http://ntl.bts.gov/lib/000/900/962/Final_Training_TM.pdf.

(31) Pilot's Handbook of Aeronautical Knowledge , http://www.faa.gov/training_testing/testing/airmen/test_standards/pilot/media/FAA-S-8081-5F.pdf.

(32) Prince, C. (n.d.). Guidelines for Situation Awareness Training. NAWCTSD/UCF/FAA Partnership for Aviation Training. Retrieved from http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs200/branches/afs210/training_aids/media/saguides.doc.

(33) Svatek, N. (1990). Techniques in CRM Training. ICAO Journal, 45(10), 12-13. Retrieved from http://www.icao.int/anb/humanfactors/techniques_in_CRM_1990.pdf.

(34) Tarnowski, E. (1999). Understanding design philosophy can help pilots benefit from modern automated flight systems. ICAO Journal, November/December 1999, 22-24, 29-30. Retrieved from http://www.icao.int/anb/humanfactors/Understanding_design_philosophy_1999.pdf.

(35) Turner, J.W. & Huntley, M.S. (1991). Use and Design of Flight Crew Checklists and Manuals (Report No. FAA-AM-91-07). Retrieved from http://ntl.bts.gov/lib/33000/33400/33421/33421.pdf.

(36) U.S. Air Force, Air Education and Training Command. (2005). Cockpit/Crew Resource Management Training Program. (Air Force Instruction 11-290). Retrieved from http://www.e-publishing.af.mil/shared/media/epubs/AFI11-290.pdf.

b. Decision Making, CRM, Human Factors.

(1) AC 60-22, Aeronautical Decision Making. Retrieved from http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/22624.

(2) Adams, R.J. (1993). How Expert Pilots Think. (Report No. DOT/FAA/RD-93/9). Retrieved from http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA265356&Location=U2&doc=GetTRDoc.pdf.

(3) Civil Aviation Authority (United Kingdom). (2002). Flight Crew Training: Cockpit Resource Management (CRM) and Line-Oriented Flight Training (LOFT). (Previously ICAO Digest No. 2). Retrieved from http://www.caa.co.uk/docs/33/CAP720.PDF.

(4) Driskell, J.E., & Adams, R.J. (1992). Crew Resource Management: An Introductory Handbook. (FAA Report No. DOT-VNTSC-FAA-92-8). Retrieved from http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA257441&Location=U2&doc=GetTRDoc.pdf.

(5) FAA Report No. DOT-VNTSC-FAA-00-22. (2000). Human Factors Considerations in the Design and Evaluation of Electronic Flight Bags (EFBs). Retrieved from http://www.hf.faa.gov/docs/volpe/volpe0022.pdf.

(6) Helmreich, R.L. (1998). Error Management as Organizational Strategy. In Proceedings of the IATA Human Factors Seminar (pp. 1-7). Bangkok, Thailand, April 20-22, 1998. Retrieved from http://homepage.psy.utexas.edu/homepage/group/HelmreichLAB/Publications/pubfiles/Pub225.pdf.

(7) Helmreich, R.L., Butler, R.A., Taggart, W. R., & Wilhelm, J.A. (1995). Behavioral Markers in Accidents and Incidents: Reference List (Technical Report 95-1). Retrieved from http://homepage.psy.utexas.edu/HomePage/Group/HelmreichLAB/Publications/564.doc.

(8) Helmreich, R.L., Merritt, A.C., & Wilhelm, J.A. (1999). The Evolution of Crew Resource Management Training in Commercial Aviation. (University of Texas at Austin Human Factors Research Project: 235). International Journal of Aviation Psychology, 9(1), 19-32. Retrieved from http://www.paediatricchairs.ca/safety_curriculum/domain4_docs/HelmreichCRM.pdf.

(9) InFO 07015. Flight Risk Assessment Tool. Retrieved from http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2007/inFO07015.pdf.

(10) Jensen, R.S. (1989). Aeronautical Decision Making – Cockpit Resource Management (Report No. DOT/FAA/PM-86/46). Retrieved from http://handle.dtic.mil/100.2/ADA205115.

(11) Johnston, A.N., & Maurino, D.E. (1990). Human Factors training for aviation personnel. ICAO Journal, May 1990, pp. 16-19. Retrieved from http://www.icao.int/anb/HumanFactors/Human_factors_training_1990.pdf.

(12) Kochan, J.A., Jensen, R.S., & Chubb, G.P. (1997). A New Approach to Aeronautical Decision-Making: The Expertise Method (Report No. DOT/FAA/AM-97/6). Retrieved from http://handle.dtic.mil/100.2/ADA323793.

(13) Merritt, A.C., & Helmreich, R.L. (1996). Creating and sustaining a safety culture: Some practical strategies. In B. Hayward & A. Lowe (Eds.), Applied Aviation Psychology: Achievement, Change and Challenge (pp. 20-26). Sydney: Avebury Aviation. Retrieved from http://homepage.psy.utexas.edu/homepage/group/helmreichlab/publications/pub%20project/303.doc.

(14) Reason, J. (1990). Human error. New York: Cambridge University Press.

(15) Seamster, T.L., Boehm-Davis, D.A., Holt, R.W., & Schultz, K. (1998). Developing Advanced Crew Resource Management (ACRM) Training: A Training Manual. FAA, Office of the Chief Scientific and Technical Advisory for Human Factors, AAR-100. Retrieved from http://www.hf.faa.gov/docs/dacrmt.pdf.

(16) Sumwalt, R.L., Thomas, R.J., & Dismukes, K. (2002). Enhancing Flight-crew Monitoring Skills Can Increase Flight Safety. Paper presented at the 55th International Air Safety Seminar, Flight Safety Foundation. Dublin, Ireland, November 4-7, 2002. Retrieved from http://human-factors.arc.nasa.gov/flightcognition/Publications/Holbrookcopy.pdf.

c. Related References.

(1) Airplane Upset Recovery Training Aid http://www.faa.gov/other_visit/aviation_industry/airline_operators/training/media/AP_UpsetRecovery_Book.pdf.

(2) Culture, Threat, and Error: Assessing System Safety,Robert L. Helmreich1

(3) Defensive Flying for Pilots: An Introduction to Threat and Error Management Ashleigh Merritt, Ph.D. & James Klinect, Ph.D. The University of Texas Human Factors Research Project1 The LOSA Collaborative http://homepage.psy.utexas.edu/homepage/group/helmreichlab/publications/pubfiles/TEM.Paper.12.6.06.pdf.

(4) University of Texas Human Factors Research Project The University of Texas at Austin http://homepage.psy.utexas.edu/homepage/group/helmreichlab/publications/pub%20project/252.pdf.