U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Airline Transport Pilot Certification Training Program

Date: 6/21/23 **AC No:** 61-138A
Initiated by: AFS-200 **Change:**

1 **PURPOSE OF THIS ADVISORY CIRCULAR (AC).** This 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. In addition, this AC provides guidance regarding designing and implementing acceptable methods of compliance with the requirements of § 61.156. This AC describes acceptable means, but not the only means, to implement and maintain an airline transport pilot (ATP) Certification Training Program (CTP). The contents of this document do not have the force and effect of law and are not meant to bind the public in any way, and the document is intended only to provide information to the public regarding existing requirements under the law or agency policies.

2 **AUDIENCE.** The primary audience for this AC is training personnel involved in the development and delivery of an ATP 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 **WHERE YOU CAN FIND THIS AC.** You can find this AC on the Federal Aviation Administration's (FAA) website at https://www.faa.gov/regulations_policies/advisory_circulars and the Dynamic Regulatory System (DRS) at https://drs.faa.gov.

4 **WHAT THIS AC CANCELS.** AC 61-138, Airline Transport Pilot Certification Training Program, dated July 2, 2013, is canceled.

5 **RELATED 14 CFR REGULATIONS.** Parts 61, 91 subpart K (part 91K), 121, 135, 141, and 142.

6 **DEFINITIONS.**

6.1 **Flight Training Device (FTD).** A replica of aircraft instruments, equipment, panels, and controls in an open flight deck area or an enclosed aircraft cockpit replica. It includes the equipment and computer programs necessary to represent aircraft (or a set of aircraft) 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 Standards (QPS) for a specific FTD qualification level.

6.2 **Full Flight Simulator (FFS).** A replica of a specific type, or make, model, and series (M/M/S) aircraft cockpit. It includes the assemblage of equipment and computer

programs necessary to represent aircraft 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 QPS for a specific FFS qualification level.

6.3 Flight Simulation Training Device (FSTD). An FFS or an FTD, as qualified under part 60.

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

7 RELATED GUIDANCE. See Appendix C, Related Guidance.

8 BACKGROUND.

8.1 Aviation Rulemaking Committee (ARC). The FAA published an Advanced Notice of Proposed Rulemaking (ANPRM), New Pilot Certification Requirements for Air Carrier Operations, on February 8, 2010 (75 FR 6164). In response to the ANPRM, the FAA Administrator chartered the First Officer Qualifications (FOQ) ARC on July 16, 2010.

8.2 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.

8.2.1 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).

8.2.2 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.

8.3 Public Law (PL) 111-216. On August 1, 2010, President Obama signed into law the Airline Safety and Federal Aviation Administration Extension Act of 2010 (PL 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 must 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 (refer to PL 111-216, section 217(c)(2)).

8.4 Addressing the Knowledge Gap. Though PL 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 (part 91, § 91.1053 and part 135, § 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 an FSTD.

8.5 Notice of Proposed Rulemaking (NPRM). On February 29, 2012, the FAA published the Pilot Certification and Qualification Requirements for Air Carrier Operations NPRM (77 FR 12373). The proposed rule set forth the proposed training requirements for the ATP Certificate that included the ATP CTP. 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).

8.6 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 PL 111-216 and recommended by the FOQ ARC. This was subsequently adopted in the "Pilot Certification and Qualification Requirements for Air Carrier Operations" rulemaking as required by § 61.156. Successful completion of the ATP CTP will ensure that an ATP applicant receives the baseline knowledge and experience to prepare them for the duties, responsibilities, and challenges of an air carrier environment.

9 TRAINING PROGRAM GENERAL.

9.1 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) is required to have an ATP Certificate, pursuant to part 121, § 121.436(a) and (b). Under part 135, commuter operations using multiengine airplanes with nine or fewer passenger seats (Scheduled 135), on-demand operations using multiengine airplanes with 10 or more passenger seats, and turbojet airplane operations require the PIC to hold an ATP Certificate with an airplane category multiengine class rating (and appropriate type rating, if required) pursuant to § 135.243(a). Part 91K

operations require all PICs of multiengine turbine-powered fixed-wing airplanes to hold an ATP Certificate, pursuant to § 91.1053(a)(2).

9.2 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 category aircraft 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. 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.

10 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 the Office of Safety Standards (OSS), as described in paragraph 11, because the ATP CTP would deviate from the original ATP CTP as approved by the Administrator, pursuant to § 61.156.

11 OBTAINING PROGRAM APPROVAL.

11.1 Working with an Assigned Inspector. Part 121, 135, 141, or 142 certificate holders (CH) 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 ATP CTP Course Approval Job Aid located on the FAA Pilot Training website at https://www.faa.gov/pilots/training/atp. Once the assigned inspector has determined that 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 division within the OSS, as discussed in paragraph 11.2, for review.

11.2 Initial and Final Approval. An ATP CTP must be approved by the Administrator, pursuant to § 61.156. The Air Transportation Division and the General Aviation and Commercial Division (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 providers, the Air Transportation Division must concur with initial and final approval. For program approvals submitted by part 141 pilot schools, the General Aviation and Commercial Division must concur with initial and final approval. Initial approvals will be valid for 1 year (unless extended by the Air Transportation Division or the General

Aviation and Commercial Division). Within 1 year, the Air Transportation Division or the General Aviation and Commercial Division will conduct an evaluation of each approved ATP CTP. If the program and flight training equipment meet the requirements of § 61.156 and the regulations as set forth in part 121, 135, 141, or 142, as applicable, the program will receive final approval. Revisions to approved programs must be resubmitted through the CHs' POI or TCPM.

12 INSTRUCTOR QUALIFICATIONS. Instructor requirements for the ATP CTP can be found in the 14 CFR part under which the course is offered. In addition to the general instructor requirements set forth by each part, the specific requirements to instruct an ATP CTP are found in § 121.410; § 135.336; part 141, § 141.33; and part 142, § 142.54. The instructor qualifications discussed in this AC are set forth by these regulations.

12.1 Baseline Instructor Requirements. To support these principles, the regulations in each 14 CFR part under which an ATP CTP may be offered require all instructors of the ATP CTP to hold an ATP Certificate with an airplane category multiengine class rating, and have at least 2 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. In addition, instructors must also be qualified to instruct under the regulatory part for which the ATP CTP is delivered, which includes the training requirements as subsequently set forth.

12.2 Instructor Training Requirements.

12.2.1 Instructors who provide ground and/or flight training must receive initial training on the course material and the following topics (refer to §§ 121.410(b)(3), 135.336(b)(3), and 142.53(a)(2); part 141 instructors are required to hold a flight instructor certificate under § 141.33(a)(3) and (4), and training for the certificate would have included the following topics):

1. The fundamental principles of the learning process;
2. Elements of effective teaching, instruction methods, and techniques;
3. Instructor duties, privileges, responsibilities, and limitations;
4. Training policies and procedures; and
5. Evaluation.

12.2.2 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 have received training within the preceding 12 months from the CH on the following topics (refer to §§ 121.410(b)(4), 135.336(b)(4), 141.33(a)(4)(iii), and 142.53(a)(4)):

1. Proper operation of flight simulator and FTD controls and systems;
2. Proper operation of environmental and fault panels;
3. Data and motion limitations of simulation;

4. Minimum equipment requirements for each curriculum; and
5. The tasks and maneuvers that will be demonstrated in the FSTD.

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

12.4 Previous Experience.

12.4.1 The FAA recognizes that, due to many factors (e.g., defunct air carriers), employment records to verify the minimum 2 years of air carrier experience may not always be available. The FAA has developed guidance in Appendix B, Documenting Previous Experience Guidance, which provides a method for a pilot to attest to previous experience that is acceptable to the FAA.

12.4.2 The FAA also recognizes that some of the requirements may be duplicative for holders of a flight instructor certificate and instructors qualified under certain rule parts. For example, the fundamentals of instruction are trained and evaluated as part of the practical test for receiving a flight instructor certificate under part 61 as well as for instructors teaching under part 142. The fundamentals of instruction are reemphasized for an active flight instructor through instructor refresher courses and annual training provider 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 provider personnel need to repeat such training. The FAA has made accommodations for possible duplicative instructor requirements by providing relief for those instructors who already possess a flight instructor certificate (refer to §§ 121.410(b)(3), 135.336(b)(3), and 142.54(c); instructors under part 141 are required under § 141.33 to hold a flight instructor certificate, therefore, these training elements are not listed in part 141).

13 ACADEMIC TRAINING PHILOSOPHY.

13.1 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 expected of an ATP Certificate holder. This knowledge is the academic foundation for applicants to begin understanding the complexities they will face in the next phase of their professional development.

13.2 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 additional information can be found. Each application to establish and implement an ATP CTP

should include a syllabus and course material to demonstrate how and to what extent each subject will be taught.

13.2.1 In the suggested academic training topic curriculum in paragraph 14, the FAA has identified subject areas that can be taught at a high level or by simply an introduction of the topic; these are identified as "Overview." These topics are intended to be introductory, as the students will receive aircraft, operation, and carrier-specific details later in their training.

13.2.2 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 both correctly answer questions in the academic evaluation of the course (described in paragraph 16) and pass the ATP knowledge test.

13.3 Methods of Classroom Instruction. Section 61.156(a) requires an applicant to receive at least 30 hours of classroom instruction ("classroom instruction" means that the instruction is provided in a fully interactive environment). Classroom instruction may be accomplished in a physical classroom or by virtual classroom instruction methods as long as the training objectives are satisfied. Regardless of whether the training provider chooses to accomplish the academic training in a physical classroom or through the utilization of a virtual classroom instruction methodology, the training provider's method for classroom instruction must be interactive. In other words, classroom instruction must allow the instructor and students to interact (including visually) in a real-time environment that facilitates conversation among and between all the students and the instructor concurrently. Additionally, classroom instruction allows the instructor to monitor and measure student engagement in real time. Therefore, asynchronous methods of instruction (e.g., prerecorded video lessons, computer-based training, correspondence learning, etc.) are not considered acceptable methods of meeting the requirements of classroom instruction required by § 61.156(a). Any virtual classroom instruction should be synchronous (i.e., all students participating simultaneously) and instructor-led. This instructional method is commonly termed "virtual instructor-led training (VILT)."

13.3.1 The FAA specifically encourages classroom instruction through facilitated discussion modules. The instructor requirements for the ATP CTP are designed in a way that allows experienced instructors to associate training elements with real-world applications and scenarios. The academic training is not intended to be strictly lecture-type instruction but, rather, instruction in which students are asked to participate in a discussion regarding the training elements. The training provider's design and implementation of the ATP CTP should ensure that the knowledge gained in the academic portion of the course will meet the training objectives and be directly applicable to air carrier operations and the operation of sophisticated, high performance, large, turbine aircraft.

13.3.2 Student engagement is a critical aspect of classroom instruction, regardless of whether it is administered in person or through a virtual classroom. The ATP CTP should contain

adequate policies and procedures that will ensure that students remain engaged in the learning process during the ATP CTP. Examples include, but are not limited to:

- Restrictions on cell phone use and mitigations of other distractors.
- Adequate breaks throughout classroom day.
- Student attendance policies.
- Instructor monitoring of student engagement.

13.3.3 While an ATP CTP may employ a virtual classroom instruction methodology to deliver the academic portion of the ATP CTP, training providers should consider the nuances and potential challenges of such a methodology. For an ATP CTP that utilizes, or plans to utilize, a virtual classroom instruction methodology, the ATP CTP application should describe in detail how the training provider will ensure training effectiveness comparable to that found in the physical classroom. The following list includes areas which the training provider should consider when developing a virtual classroom instruction methodology for the ATP CTP and may be useful in ensuring that the objectives of the training can be achieved. Policies, procedures, and controls that should be considered include, but are not limited to:

1. A description of the extent to which student cameras will be utilized during virtual classroom instruction;
2. Student equipment requirements for the virtual classroom instruction (e.g., minimum screen size required, microphone, camera, software, operating system, etc.);
3. How the training provider will support students with virtual classroom instruction, including access procedures, IT support processes, and procedures for the student to notify the instructor of lost communications;
4. A process to address an issue where the student or instructor connectivity issue cannot be resolved promptly, which should include that the student will be rescheduled for that training module and that an instructor will repeat the module with the student to receive module credit;
5. A method for the training provider to validate that student facilities and equipment are adequate for enrollment of virtual classroom instruction;
6. Methods/tools to be utilized to ensure student engagement;
7. How training will be accomplished when students and instructors are in different time zones;
8. Description of the training platform the training provider intends to utilize, including the methods used to validate the effectiveness and usability of the platform to deliver the training;
9. Training for instructors on how to facilitate and teach in a virtual classroom;

10. A method to determine the effectiveness of training, to include validation of student knowledge throughout virtual classroom instruction and upon arrival at the training provider for completion of the training curriculum;
11. Instructor qualifications and ability to instruct through virtual mechanisms, including the determination of instructor eligibility, virtual classroom instruction designation, and the determination of the effectiveness of the instructors conducting virtual classroom instruction (e.g., effective communication over virtual platforms, or the ability to troubleshoot the software platform);
12. A method to identify and document the training the instructor has successfully completed to qualify for virtual classroom instruction;
13. A means (included in student records as applicable) to identify students that have received virtual classroom instruction;
14. A method of ensuring that the management, staffing, instructors, training curricula, and courseware utilized for virtual classroom instruction remain under the control of the training provider;
15. A method of ensuring that all of the training provider's employees with virtual classroom instruction duties and responsibilities are adequately trained in their duties and responsibilities;
16. A description of how the training provider will notify and provide access to the Administrator for all virtual classroom instruction training delivered;
17. A policy that requires students to complete the end-of-course academic evaluation(s) at the training provider's physical location where it can be proctored by a qualified instructor, or a method that will ensure the integrity of the evaluation when conducted virtually;
18. A description and demonstration of the maximum class size that will allow for adequate interaction and student engagement monitoring for virtual classroom instruction;
19. The methods by which the training provider will validate student identity (e.g., instructors will validate the student's personal information by comparing the documents supplied by the student during the enrollment process to the materials and facial recognition presented on the video system); and
20. A policy identifying that the courseware and content utilized in virtual classroom instruction is identical to that which is delivered in a physical classroom.

14 ACADEMIC TRAINING TOPICS. The ATP CTP must include at least 30 hours of classroom instruction per § 61.156(a), broken down into minimum hour requirements for specific academic training areas (e.g., 8 hours of instruction on aerodynamics). This paragraph sets forth the required overarching training areas and provides a recommended structure of training for each area, similar to the format of a curriculum or syllabus.

14.1 Aerodynamics, Including High-Altitude Operations (Minimum: 8 Hours).

14.1.1 High-Altitude Operations.

14.1.1.1 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.

14.1.1.2 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 maximum operating limit speed (V_{MO}/M_{MO}) 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, emphasize no jeopardy events when needing to vacate altitudes for operational considerations);
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.

14.1.2 Stall Prevention and Recovery Training.

14.1.2.1 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 the current edition of AC 120-109, Stall Prevention and Recovery Training.)

14.1.2.2 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 (SA); 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 National Transportation Safety Board (NTSB) Report Number AAR-10-01 of Colgan Air 3407; and 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.)

14.1.3 Upset Prevention and Recovery Training.

14.1.3.1 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.

14.1.3.2 Training Topic Components.

1. Factors which contribute to airplane upsets (refer to Airplane Upset Recovery Training Aid Revision 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 587.)

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, sections 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.

14.1.3.3 Recognition and Prevention Techniques and Philosophy. 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.

14.1.3.3.1 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.

14.1.3.3.2 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.

14.1.3.3.3 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.

14.1.3.3.4 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.

14.1.3.3.5 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.

14.2 Meteorology (Minimum: 2 Hours).

14.2.1 Airplane Weather Detection Systems.

14.2.1.1 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 decision-making in air carrier operations.

14.2.1.2 Training Topic Components.

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 deicing/anti-icing: airplane deice/anti-ice procedures, use of hold-over tables, calculating hold-over times, and pretakeoff contamination checks. (Refer to the current edition of 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.
11. Air carrier low-visibility operations, including low-visibility surface movement and category (CAT) II and CAT III approaches (Overview).

14.3 Air Carrier Operations (Minimum: 14 Hours).

14.3.1 Physiology/Fitness for Duty (Overview).

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

14.3.1.2 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 the current edition of AC 120-100, Basics of Aviation Fatigue.)

14.3.2 Communications.

14.3.2.1 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.

14.3.2.2 Training Topic Components.

1. Sterile flight deck rules.
   - 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).
2. Clearance delivery including Pre-Departure Clearance (PDC), and Controller-Pilot Data Link Communications (CPDLC) (Overview).

14.3.3 Checklist Philosophy.

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

14.3.3.2 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 (QRH)/emergency checklists.

14.3.4 Operational Control (Overview).

14.3.4.1 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.

14.3.4.2 Training Topic Components.

1. Air carrier operational control concept. (Refer to the current edition of AC 120-101, Part 121 Air Carrier Operational Control.)
2. Dispatch and flight following differences and responsibilities.
3. Emergencies and decision making with joint pilot/dispatcher responsibilities.

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

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

14.3.5.2 Training Topic Components.

1. Introduction to MEL and CDL as dispatch documents (refer to FAA Order 8900.1, Volume 4, Chapter 4, Configuration Deviation List (CDL) and Minimum Equipment List (MEL)).
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 (e.g., speed restrictions) required in order to dispatch with components or items of equipment deferred or removed in accordance with the MEL or CDL.

14.3.6 Ground Operations.

14.3.6.1 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.

14.3.6.2 Training Topic Components.

1. Runway incursion prevention. (Refer to FAA Runway Safety—Resources, which can be found at https://www.faa.gov/airports/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 SA.
- Taxi route planning and briefings including hot spot identification and runway crossings.
- Technology (Electronic Flight Bag (EFB), moving maps).

2. Practical knowledge of airport surface operations, including:
   - Airport movement areas.
   - Ramp procedures and communications.
   - Coded taxi routes and complex taxi procedures.

14.3.7 Turbine Engines (Overview).

14.3.7.1 Learning Objective. Students should gain an understanding of turbine engine operation and common malfunctions.

14.3.7.2 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 restart 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 monitoring (ECAM)).
6. Engine Pressure Ratio (EPR), N1, N2, exhaust gas temperature (EGT) indications.

14.3.8 Transport Category Aircraft Performance.

14.3.8.1 Learning Objective. The student should have an understanding of the many considerations and requirements for transport category aircraft performance and how these elements are applied to air carrier flight operations.

14.3.8.2 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}), takeoff decision speed (V_1), and takeoff safety speed (V_2).
3. Proper use of rudder in a transport category aircraft 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 the current edition of 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.

14.3.9 Automation (Overview).

14.3.9.1 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. (Refer to the current edition of AC 120-123, Flightpath Management.)

14.3.9.2 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): automation monitoring, 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).
5. Automation dependency: phases of flight and situations where automation is (or is not) appropriate.

14.3.10 Navigation and Flightpath Warning Systems (Overview).

14.3.10.1 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.

14.3.10.2 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 Dependent Surveillance-Broadcast (ADS-B).
5. Traffic Alert and Collision Avoidance System (TCAS).
6. Terrain Awareness and Warning System (TAWS).

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

14.4.1 Leadership/Professional Development.

14.4.1.1 Learning Objective. Students should demonstrate an understanding of the professional responsibilities associated with being an ATP and describe how to apply leadership skills in the position of PIC. (Refer to the current edition of AC 121-42, Leadership and Command Training for Pilots in Command.)

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

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

14.4.1.2.2 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.

14.4.1.2.3 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.

14.4.1.2.4 Awareness. The Captain is expected to be operating the airplane with the "big picture" in mind. SA is paramount when making decisions.

14.4.1.2.5 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.

14.4.1.3 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 their 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.

14.4.2 CRM.

14.4.2.1 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).

14.4.2.2 CRM Philosophy and PM Intervention Strategies.

14.4.2.2.1 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 of applicable accident/incident reports and animations.
- Review of elements of effective CRM. (Refer to the current edition of AC 120-51, Crew Resource Management Training.)

14.4.2.2.2 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).

14.4.3 Safety Culture/Voluntary Safety Programs (Overview).

14.4.3.1 **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.

14.4.3.2 **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.)
3. Flight operations quality assurance (FOQA). (Refer to the current edition of AC 120-82, Flight Operational Quality Assurance.)
4. Line Operations Safety Audits (LOSA). (Refer to the current edition of AC 120-90, Line Operations Safety Audits.)

14.4.3.3 **Safety Management Systems (SMS).** An SMS is an organization-wide comprehensive and preventive approach to managing safety. An SMS includes a safety policy, formal methods for identifying hazards and

[2] *Crew Resource Management,* B. Kanki, R. Helmreich, J. Anca, 2010, p. 61.

mitigating risk, and the promotion of a positive safety culture. (Refer to the current edition of AC 120-92, Safety Management Systems for Aviation Service Providers.)

15 ACADEMIC EVALUATIONS. Training providers are required by §§ 121.410(d), 135.336(d), and 142.54(d), and part 141 appendix K to conduct evaluations to ensure that the pilot understands the requisite academic areas and that the training techniques, procedures, and standards for the course are acceptable to the Administrator. 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.

15.1 Evaluation Procedures. During the approval process, the training provider should provide a description to the Administrator detailing the evaluation procedure used to measure the attendee's proficiency. This description should identify and describe the form of test (e.g., individual paper tests, 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 through a final test at the end of the program. The test will be in printed form and handed to the applicant for completion."

15.2 Written Test Questions. The training provider should provide a comprehensive written test or test question pool with an answer key to be submitted along with the application for the course as well as 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 taught. It is also recommended that the training provider administer closed book exams.

15.2.1 The student should answer at least 30 test questions throughout the academic training portion of the ATP CTP. 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 entirety of the academic course material.

15.2.2 A student's successful completion of the ATP CTP should be dependent upon the student demonstrating, through academic testing as described above, that they have met the objectives of the training and received adequate knowledge. To validate student knowledge, a minimum score of 70 percent is recommended on each test administered, as 70 percent is consistent with the minimum satisfactory score required for all FAA knowledge tests. The FAA recommends using a minimum passing score of at least 70 percent because this test is similar to the aeronautical knowledge tests administered under part 61, for which the FAA has specified a minimum passing score of 70 percent. Individual training providers may set higher standards. At the conclusion of the written test, the instructor should review all incorrect answers with the enrollee.

16 FSTD TRAINING PHILOSOPHY. An ATP CTP must include certain FSTD training. The intent of the FSTD training portion of the ATP CTP is to more directly reinforce the air carrier concepts and principles taught in the academic portion of the course in a hands-on manner. 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 initial familiarity and 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 shared amongst transport category airplanes.

16.1 Briefings Before and After Each Session. In order to consolidate the academic and FSTD portions of the course, FSTD instructors should conduct prebriefings before each session. The prebriefing 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.

16.2 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.

16.2.1 Demonstration-Based Training. The purpose of demonstration-based training is intended 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.

16.2.2 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.

17 FSTD TRAINING TOPICS. Pursuant to § 61.156(b), the ATP CTP must include at least 10 hours of training in an FSTD, qualified under part 60 that represents a multiengine turbine airplane. At least 6 hours of training must be completed in a Level C or higher FFS with a maximum takeoff weight (MTOW) of 40,000 pounds or greater. This training must include: low energy states/stalls, upset recovery techniques, and adverse weather conditions (including icing, thunderstorms, and crosswinds with gusts). The remaining 4 hours of training may be accomplished in a Level 4 or higher FTD. This training must include navigation (including FMSs) and automation (including autoflight).

17.1 FFS Training (6 hours). A minimum of 6 hours of training must be accomplished in a Level C or higher FFS. Pursuant to § 61.156(b)(1), the aeronautical experience areas to be trained must include low-energy states/stalls, upset recovery techniques, and adverse weather conditions (including icing, thunderstorms, and crosswinds with gusts). This paragraph provides a recommended structure of training for each required area, similar to the format of a curriculum or syllabus. Additionally, while the entirety of the training must equal at least 6 hours, a recommended 1-hour minimum is provided for each broken-down training topic.

17.1.1 Runway Safety and Adverse Weather (Recommended: 3 hours).

17.1.1.1 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.

17.1.1.2 Training Topic Components.

17.1.1.2.1 Taxi:

1. Adherence to SOPs and best practices used to maintain SA with complex taxi instructions **(D, E)**; and
2. Recognition of hot spots, Line Up and Wait (LUAW) terminology, runway incursion prevention techniques, and procedures for ensuring correct departure runway **(D, E)**.

17.1.1.2.2 Takeoff:

1. Normal takeoff, PF (outside scan) and PM (engine monitoring) duties and responsibilities **(D, E)**;
2. V_{MCG} demonstration to show the effects of differential power with limited rudder aerodynamic authority **(D)**;
3. 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)**;
4. Rejected takeoffs with aircraft weight, runway length, and contamination considerations **(D, E)**; and
5. Ability to apply appropriate precautions for adverse weather during takeoff to include: windshear, contaminated runway surfaces, and crosswinds with gusts **(D, E)**.

17.1.1.2.3 V_2 Climb Performance:

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

17.1.1.2.4 Approach/Landing:

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

17.1.2 High-Altitude Operations, Stall and Upset Prevention and Recovery (Recommended: 3 hours).

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

17.1.2.2 Training Topic Components.

17.1.2.2.1 High-Altitude Operations:

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

17.1.2.2.2 Low-Energy States/Stall Prevention Training:

1. High-altitude/low-energy recovery demonstrating limited thrust capability and necessity to exchange altitude for airspeed **(D)**;
2. Acceleration performance from second regime (back side of power curve) at low altitude and high altitude **(D)**;
3. Demonstration of stall recovery without application of thrust **(D)**; and
4. Stall prevention training **(E)**. Emphasis on reduction of AOA for recovery in the following configurations (refer to AC 120-109):
   - 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 and demonstrations can be found in AC 120-109, Appendix 2, Sample Demonstrations, and Appendix 3, Sample Training Scenarios).

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

17.1.2.2.4 Considerations for Upset Prevention and Recovery Training (UPRT).

1. Techniques for working as a crew to return the aircraft to normal flight and communicating airplane state between pilots, including CRM callouts to improve SA, should be integrated into FSTD training.
2. 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 operations). 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.
3. Evidence shows that in many loss-of-control incidents and accidents, the PM may have been more aware of the aircraft state than the PF. Training should emphasize crew interaction to vocalize the divergence conditions, use CRM to stop the divergence, and return the aircraft to stabilized flight.
4. 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.

17.1.2.2.5 UPRT Elements.

1. 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) (refer to the current edition of AC 120-111, Upset Prevention and Recovery Training, Appendix 2) **(D, E)**.
2. 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 AC 120-111) **(D, E)**.

17.1.2.2.6 UPRT Recovery Template and Scenarios. See Appendix A, Upset Prevention and Recovery Training (UPRT) Recovery Template and Scenarios, for sample training scenarios and an Original Equipment Manufacturer (OEM) approved upset recovery template on:

1. Nose-High/Wings-level recovery.
2. 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.

17.2 FSTD Training (4 hours). The remaining 4 hours of FSTD training may be accomplished in a Level 4 or higher FSTD. An FFS (Level A, B, C, or D, motion on or off) may be used for the FSTD training portion of the program, provided the FSTD is qualified under part 60 and represents a multiengine turbine airplane. 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.

17.2.1 Navigation and Flight Management Systems (FMS).

17.2.1.1 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.

17.2.1.2 Training Topic Components:

1. Interpret navigation displays (ND), a primary flight display (PFD), and/or a multifunction display (MFD) **(D, E)**;
2. Perform FMS route input and modifications **(D, E)**;
3. Receive and understand air traffic control (ATC) instructions **(D, E)**; and
4. Use of RNAV systems in flight **(D, E)**.

17.2.2 Automation and Autoflight.

17.2.2.1 Learning Objective. Students should reinforce their understanding of the use of airplane automation and the relationship of these components with navigation, and learn how to manage both to achieve the desired flightpath.

17.2.2.2 Training Topic Components:

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

18 ATP CTP TRAINING FOOTPRINT. Training providers should consider if the ATP CTP will create an opportunity for a student to have an extended lapse in time between the academic portion of the ATP CTP and the FSTD portion. If so, the training provider should address how they intend to ensure retention of knowledge due to the lapse in time between the two portions of ATP CTP training. There are many acceptable methods by which a training provider may mitigate these concerns. For example, a training provider may develop written policies that describe that a student must complete the FSTD portion of the ATP CTP within a set number of days of finishing the academic portion, or the student must repeat the academic training. The training provider could also describe a method for evaluating student retention of knowledge (e.g., a written test) if the training provider's defined duration between academic and FSTD training has lapsed.

19 ATP CTP GRADUATION CERTIFICATE.

19.1 Academic Evaluation. Students who successfully pass the academic evaluations and complete the ATP CTP must be issued a graduation certificate by the training provider pursuant to § 61.156 certifying such. Graduation certificates may only be issued to students who have completed all curriculum requirements of the ATP CTP. Students who do not pass the academic evaluation(s) will not be issued a graduation certificate. It is up to the training provider to determine how to manage students with unsatisfactory performance or evaluations (e.g., remedial training hours, required benchmarks, or removal from the program). These policies should be provided to the FAA in the ATP CTP application.

19.2 Graduation Certificate. Pursuant to § 61.156, an applicant for the ATP must present an ATP CTP graduation certificate when they apply to take the ATP knowledge test. A graduation certificate should contain the following information in order to be considered valid:

19.2.1 The full name, address, and FAA certificate number of the training provider authorized to conduct the course.

19.2.2 The full name, FAA pilot certificate number, and address of the graduate.

19.2.3 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."

19.2.4 The date of issuance.

19.2.5 The signature of the authorized instructor who completed the academic portion of the course.

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

20 INTERNAL EVALUATION PROGRAM (IEP).

20.1 Identify and Eliminate Deficiencies. The FAA recommends the implementation of an IEP to ensure the quality of the ATP CTP. An effective IEP would identify and attempt to eliminate deficiencies identified within the training program. At minimum, the proposed IEP should measure, track, and analyze:

1. Student performance on both quiz and test scores;
2. Student graduation rates; and
3. Student feedback forms.

20.2 Amend Deficiencies. Based on the analysis of the data captured from the measurements above, the training provider should identify course deficiencies and 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, Internal Evaluation Programs.

21 FSTD MINIMUM EQUIPMENT REQUIREMENTS.

The following describes the minimum equipment the FSTD must have for use in the ATP CTP under § 61.156(b).

21.1 FSTD. A Level 4 or higher FSTD qualified under part 60 is required for the 4 hours of training under § 61.156(b)(2). The equipment used in the FSTD portion of the program should also be equipped with:

1. FMS;
2. Electronic Flight Information Systems (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.

21.2 FFS. A Level C or higher FFS qualified under part 60 is required for the 6 hours of training under § 61.156(b)(1). 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 an MTOW of at least 40,000 pounds is necessary to meet the objectives of the ATP CTP, as required by regulation.

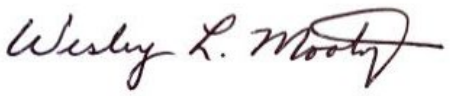
21.2.1 Minimum Weight of the Aircraft that the FFS Represents. The weight of the aircraft the simulator represents is an important factor in ensuring handling characteristics of a typical transport aircraft. The 40,000 pound minimum requirement will ensure that the device can replicate the lower performance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

21.2.2 Deviation Authority. 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 in the alternate device, it must apply for a deviation.

21.2.2.1 Deviation requests must be submitted to the CH's assigned POI 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 will forward to the appropriate OSS office for review.

21.2.2.2 If the OSS feels the deviation request is creditable, the OSS will issue the deviation request. Deviations are typically valid until rescinded, revised, or removed. The POI or TCPM will note the deviation on the CH's OpSpec/Training Specification (TSpec)/Letter of Authorization (LOA) A504, Initial Approval of an Airline Transport Pilot Certification Training Program, or A304, Approval of an Airline Transport Pilot Certification Training Program, as appropriate.

22 AC FEEDBACK FORM. For your convenience, the AC Feedback Form is the last page of this AC. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this AC on the Feedback Form.



Wesley L. Mooty
Acting Deputy Executive Director, Flight Standards Service

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

A.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

A.2 Upset Recovery Scenarios. Two scenarios were constructed using the philosophies and concepts described in this appendix. 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 appendix.

SCENARIO 1: NOSE HIGH	
INSTRUCTOR ROLE	Initiate a condition which will result in an unexpected nose high attitude (40 degrees 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 stabilizer 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. • 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 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 B. DOCUMENTING PREVIOUS EXPERIENCE GUIDANCE

To be eligible to teach the airline transport pilot (ATP) Certification Training Program (CTP), an instructor must have at least 2 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 is defunct; or

3. The air carrier or program manager 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.

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 and 14 CFR part 61 that could result in a fine, imprisonment, and action against any certificate or rating held.

Figure B-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_____

Figure B-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(a)(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 C. RELATED GUIDANCE

C.1 Related Reading Material (current editions):

1. Advisory Circular (AC) 61-107, Aircraft Operations at Altitudes Above 25,000 Feet Mean Sea Level or Mach Numbers Greater Than .75.
2. AC 90-48, Pilots' Role in Collision Avoidance.
3. AC 91-74, Pilot Guide: Flight in Icing Conditions.
4. AC 91-79, Mitigating the Risks of a Runway Overrun Upon Landing.
5. AC 120-35, Flightcrew Member Line-Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
6. AC 120-51, Crew Resource Management Training.
7. AC 120-62, Takeoff Safety Training Aid.
8. AC 120-64, Operational Use and Modification of Electronic Checklists.
9. AC 120-66, Aviation Safety Action Program.
10. AC 120-71, Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers.
11. AC 120-74, Parts 91, 121, 125, and 135 Flightcrew Procedures During Taxi Operations.
12. AC 120-82, Flight Operational Quality Assurance.
13. AC 120-109, Stall Prevention and Recovery Training.
14. AC 120-111, Upset Prevention and Recovery Training.
15. AC 120-123, Flightpath Management.
16. AC 121.195-1, Operational Landing Distances for Wet Runways; Transport Category Airplanes.
17. AC 121-42, Leadership and Command Training for Pilots in Command.
18. Commercial Aviation Safety Team (CAST) – Safety Enhancement 30, Mode Awareness and Energy State Management Aspects of Flight Deck Automation.
19. Information for Operators (InFO) 07009, Runway Lights Required for Night Takeoffs in Part 121.
20. InFO 07018, Taxi Clearances: Know the Rules, Understand Your Clearance.
21. InFO 08029, Approach and Landing Accident Reduction (ALAR): Recommended Flightcrew Training.
22. InFO 08034, Design and Content of Checklists for In-Flight Smoke, Fire and Fumes (SFF).
23. InFO 08049, Preventing Wrong Runway Takeoffs.
24. InFO 10010, Enhanced Upset Recovery Training.

25. InFO 10024, Airline Transport Pilot (ATP) Certificate Requirement for Pilots in Part 121 Operations.
26. Safety Alert for Operators (SAFO) 07003, Confirming the Takeoff Runway.
27. SAFO 10006, In-Flight Icing Operations and Training Recommendations.
28. SAFO 10012, Possible Misinterpretation of the Practical Test Standards (PTS) Language "Minimal Loss of Altitude."
29. Order 8900.1, Volume 4, Chapter 2, Section 2, All Weather Operations Approach and Landing Concepts.
30. Order 8900.1, Volume 3, Chapter 32, Section 12, Safety Assurance System: Aircraft Checklists for 14 CFR Parts 121/135.
31. Aerodynamics for Naval Aviators, https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/00-80T-80.pdf.
32. Degani, A., and Wiener, E.L. (1994). On the Design of Flight-Deck Procedures. (NASA Contractor Report 177642). Washington, DC: National Aeronautics and Space Administration.
33. FAA, Air Traffic Organization, Office of Safety. (n.d.). Pilot 'Best Practices' for Airfield Safety.
34. FAA, Office of Integrated Safety Analysis, Human Factors Analysis Division. (1995). Human Performance Considerations in the Use and Design of Aircraft Checklists.
35. FAA-H-8083-3C, Airplane Flying Handbook.
36. FAA-H-8083-25B, Pilot's Handbook of Aeronautical Knowledge.
37. International Civil Aviation Organization. (1991). Human Factors Digest Number 3: Training of Operational Personnel in Human Factors. (ICAO Circular 227-AN/136).
38. McDonnell, L.K., Jobe, K.K., and Dismukes, R.K. (1997). Facilitating LOS Debriefings: A Training Manual. (NASA Technical Memorandum 112192).
39. Prince, C. (n.d.). Guidelines for Situation Awareness Training. NAWCTSD/UCF/FAA Partnership for Aviation Training.
40. Svatek, N. (1990). Techniques in CRM Training. ICAO Journal, 45(10), 12-13.
41. Tarnowski, E. (1999). Understanding Design Philosophy Can Help Pilots Benefit from Modern Automated Flight Systems. ICAO Journal, November/December 1999, 22-24, 29-30.
42. Turner, J.W. and Huntley, M.S. (1991). The Use and Design of Flightcrew Checklists and Manuals (Report No. DOT/FAA/AM-91/07).
43. U.S. Air Force, Air Education and Training Command. (2012). Cockpit/Crew Resource Management Program. (Air Force Instruction 11-290).

C.2 Decision Making, Crew Resource Management (CRM), and Human Factors:

1. AC 60-22, Aeronautical Decision Making.
2. Adams, R.J. (1993). How Expert Pilots Think. (Report No. DOT/FAA/RD-93/9).
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).
4. Driskell, J.E., and Adams, R.J. (1992). Crew Resource Management: An Introductory Handbook. (FAA Report No. DOT-VNTSC-FAA-92-8).
5. FAA Report No. DOT-VNTSC-FAA-03-07. (2003). Human Factors Considerations in the Design and Evaluation of Electronic Flight Bags (EFBs).
6. Helmreich, R.L., Merritt, A.C., and 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.
7. InFO 07015, Flight Risk Assessment Tool.
8. Jensen, R.S. (1989). Aeronautical Decision Making—Cockpit Resource Management (Report No. DOT/FAA/PM-86/46).
9. Johnston, A.N., and Maurino, D.E. (1990). Human Factors Training for Aviation Personnel. ICAO Journal, No. 5, May 1990, pp. 16-19.
10. Kochan, J.A., Jensen, R.S., and Chubb, G.P. (1997). A New Approach to Aeronautical Decision-Making: The Expertise Method (Report No. DOT/FAA/AM-97/6).
11. Merritt, A.C., and Helmreich, R.L. (1996). Creating and sustaining a safety culture: Some practical strategies. In B. Hayward and A. Lowe (Eds.), Applied Aviation Psychology: Achievement, Change and Challenge (pp. 20-26). Sydney: Avebury Aviation.
12. Reason, J. (1990). Human Error. New York: Cambridge University Press.
13. Seamster, T.L., Boehm-Davis, D.A., Holt, R.W., and 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.
14. Sumwalt, R.L., Thomas, R.J., and 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.

C.3 Related References:

1. Airplane Upset Recovery Training Aid Revision 2.
2. Helmreich, R.L. (n.d.) Culture, Threat, and Error: Assessing System Safety.
3. Defensive Flying for Pilots: An Introduction to Threat and Error Management. Ashleigh Merritt, Ph.D. and James Klinect, Ph.D. The University of Texas Human Factors Research Project. The LOSA Collaborative.

Advisory Circular Feedback Form

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by contacting the Air Transportation Division at 9-AFS-200-Correspondence@faa.gov or the Flight Standards Directives Management Officer at 9-AWA-AFB-120-Directives@faa.gov.

Subject: AC 61-138A, Airline Transport Pilot Certification Training Program

Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____

_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____

_____

☐ Other comments:

_____

_____

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____