



Civil Aviation Safety Authority  
of Papua New Guinea

# Advisory Circular

## AC121-3

### Upset Prevention and Recovery Training

Initial Issue

1 March 2026

#### GENERAL

Civil Aviation Safety Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

This Advisory Circular also includes Explanatory Material (EM) where it has been shown that further explanation is required. Explanatory Material must not be regarded as an acceptable means of compliance.

#### PURPOSE

This Advisory Circular provides methods, acceptable to the Director, for showing compliance with the Upset Prevention Recovery Training requirements of Rule Part 121 and explanatory material to assist in showing compliance.

#### RELATED CAR

This AC relates specifically to Civil Aviation Rule Part 121 Subpart I and J

#### CHANGE NOTICE

There was no previous issue of this AC, consequently no change is in effect.

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## Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AC	Advisory Circular
AMC	Acceptable Means of Compliance
AMOC	Alternative Means of Compliance
AOA	Angle of Attack
AUPRTA	Airplane Upset Prevention and Recovery Training Aid (Rev 3, 2017)
AURTA	Airplane Upset Recovery Training Aid
CAR	Civil Aviation Rules (Papua New Guinea)
CASAPNG	Civil Aviation Safety Authority of Papua New Guinea
CBT	Competency and Competency-Based Training
CPL	Commercial Pilot License
CRM	Crew Resource Management
DCA	Director of Civil Aviation
EASA	European Union Aviation Safety Agency
EBT	Evidence-Based Training
EET	Extended Envelope Training
FAA	Federal Aviation Administration (USA)
FOQA	Flight Operational Quality Assurance
FSTD	Flight Simulation Training Device
FFS	Full Flight Simulator
FTD	Flight Training Device
ICAO	International Civil Aviation Organization
IOS	Instructor Operating Station
LOC-I	Loss of Control In-Flight
LOCART	Loss of Control Avoidance and Recovery Training
MBT	Maneuver-Based Training
MPL	Multi-crew Pilot License
NTSB	National Transportation Safety Board (USA)
OEM	Original Equipment Manufacturer
PF	Pilot Flying
PM	Pilot Monitoring
PNG	Papua New Guinea
QTG	Qualification Test Guide

Acronym	Description
SBT	Scenario-Based Training
SARPs	Standards and Recommended Practices
SMS	Safety Management System
SME	Subject Matter Expert
SOC	Statement of Compliance
UAS	Undesired Aircraft State
UPRT	Upset Prevention and Recovery Training
VTE	Valid Training Envelope

## Definitions

Terms that have specific meaning within this AC are defined below. Where definitions have been reproduced from civil aviation legislation for ease of reference, these are identified. Should there be a discrepancy between a definition given in this AC and the civil aviation legislation, the definition in the legislation prevails.

Term	Definition
aerodynamic stall	An aerodynamic loss of lift caused by exceeding the critical angle of attack (synonymous with the term 'stall').
aeroplane upset	An undesired airplane state characterized by unintentional divergences from parameters normally experienced during operations. An airplane upset may involve pitch and/or bank angle divergences as well as inappropriate airspeeds for the conditions. Specifically: pitch attitude greater than 25° nose up; pitch attitude greater than 10° nose down; bank angle greater than 45°; or within the above parameters but flying at airspeeds inappropriate for conditions. (FAA AC 120-111 / ICAO Doc 10011)
angle of attack	The angle between the oncoming air, or relative wind, and a reference line on the airplane or wing. AOA is the primary determinant of wing stall — not pitch attitude.
civil aviation legislation	The Civil Aviation Act and Civil Aviation Rules (CAR) of Papua New Guinea, and any instruments made under those laws.
competency-based training and assessment	Training and assessment characterized by a performance orientation, the development of training to specified performance standards, and the development of assessments to determine whether competencies have been achieved.
crew resource management	Effective use of all available resources: human resources, hardware, and information.
critical angle of attack	The angle of attack that produces the maximum coefficient of lift beyond which an aerodynamic stall occurs.
deep stall	A particularly dangerous form of stall that results in a substantial reduction or loss of elevator authority making normal stall recovery actions ineffective. Often associated with T-tail configured aircraft.
developing upset condition	Any time the aeroplane is diverging from the intended flightpath and has not yet exceeded the parameters or condition defining an upset.

Term	Definition
distraction	The diversion of attention away from the primary task of flying, which can allow a developing upset condition to progress undetected. (FAA AC 120-111)
evidence-based training	Training and assessment based on operational data characterized by developing and assessing the overall capability of a trainee across a range of core competencies.
extended envelope training	Flight training in the outer reaches of the aeroplanes certified flight envelope, including manually controlled slow flight; manually controlled loss of reliable airspeed; manually controlled instrument departure and arrival; upset recovery maneuvers; and instructor-guided hands-on recovery from full stall and stick pusher activation. (FAA AC 120-111)
flight simulation training device (FSTD)	A qualified flight simulator, qualified flight training device, or other device qualified in accordance with applicable PNG CAR or recognized foreign state standards.
flightpath management	Active manipulation — using onboard avionics systems or manual handling — to direct the aeroplane along a desired trajectory in the lateral and vertical planes. (FAA AC 120-111)
full stall	Characterized by uncommanded nose-down pitch; buffeting of severe magnitude; no further pitch increases at full aft control; or stick pusher activation. Refer FAA AC 120-109A.
instructor operating station (IOS)	The computer interface panel between the FSTD instructor and the FSTD.
loss of control in flight	A categorization of an accident or incident resulting from a deviation from the intended flightpath.
maneuver-based training	Training that focuses on a single event or maneuver, typically as a foundational level preceding or integrated with scenario-based training.
negative training	Training which unintentionally introduces incorrect information or invalid concepts, which could decrease rather than increase safety.
prevention	Actions and awareness to avoid any divergence from a desired aeroplane state.
scenario-based training	Training integrated into realistic scenarios rather than as stand-alone manual handling events.
startle	An uncontrollable, automatic muscle reflex, raised heart rate, blood pressure, etc., elicited by exposure to a sudden, intense event that violates a pilot's expectations. (FAA AC 120-111)
surprise	An unexpected event that violates a pilot's expectations and can affect the mental processes used to respond to the event. Distinguishable from startle, which is physiological; surprise is cognitive. (FAA AC 120-111)
transfer of training	The ability of a trainee to apply knowledge, skills and behavior acquired in one learning environment to another. Negative transfer occurs when knowledge or skills learned in training are inappropriately generalized to operations. (FAA AC 120-111)
undesired aircraft state	Flight crew-induced aircraft position or speed deviations, misapplication of flight controls, or incorrect systems configuration, associated with a reduction in margins of safety (ICAO Doc 9868). Also: a position, velocity, or attitude of an aircraft that reduces or eliminates safety margins. (FAA AC 120-111)
upset prevention and recovery training (UPRT)	A program of theory and practical training providing exposure to aeroplane upset conditions as defined in the Airplane Upset Prevention and Recovery

Term	Definition
	Training Aid Revision 3.
valid training envelope (VTE)	The region within which a simulator has been verified as offering adequate fidelity for training and within which UPRT activity should take place.

## PAPUA NEW GUINEA CIVIL AVIATION LEGISLATION

PNG Civil Aviation Rules are available from CASAPNG.

Document	Title
Part 60 of CAR	Flight Simulation Training Devices
Part 61 of CAR	Flight Crew Licensing
Part 91 of CAR	General operating and flight rules
Part 119 of CAR	Air Operator Certification
Part 121 of CAR	Air Operations – Large Aeroplane
Part 141 of CAR	Approved Training Organisation

### ICAO Documents

Document	Title
ICAO Doc 9625	The Manual of Criteria for the Qualification of Flight Simulation Training Devices — 4th Edition, including UPRT requirements for FSTDs.
ICAO Doc 9683	The Human Factors Training Manual — provides guidance on design of training programs to develop knowledge and skills in human performance.
ICAO Doc 9803	Line Operations Safety Audit (LOSA) manual, 1st edition.
ICAO Doc 9841	The Manual on the Approval of Training Organizations.
ICAO Doc 9859	ICAO Safety Management Manual (SMM).
ICAO Doc 9868	Procedures for Air Navigation Services — Training. Contains procedures for the development and implementation of competency-based training programs.
ICAO Doc 9995	Manual of Evidence-based Training.
ICAO Doc 10011	Manual on Aeroplane Upset Prevention and Recovery Training — the primary ICAO guidance document on UPRT.
ICAO Annexes 1, 6 and 19	These have been revised to include UPRT and references to related ICAO material.
AUPRTA / AURTA	Airplane Upset Prevention and Recovery Training Aid (Revision 3, 2017) — the core training and implementation document on UPRT.

### FAA Documents

Document	Title
FAA AC 120-111	Upset Prevention and Recovery Training — developed jointly by major OEMs, airlines, and simulator manufacturers. Recovery templates, training methodology, and scenario frameworks are adopted in this AC.
FAA AC 120-109A	Stall Prevention and Recovery Training — referenced for stall-first recovery technique.

Document	Title
Appendix A to FAR Part 60 FAA FSTD Directive No. 2	—Qualification Performance Standards for Airplane Full Flight Simulators
FAA AC 61-138	ATP Certification Training Program
FAA AC 120-109A (CHG 1)	Stall Prevention and Recovery Training
FAA Qualification Guidance Bulletin 11-05	“FSTD Evaluation and Qualification for UPRT Tasks” and similar bulletins for other extended envelope training tasks.
FAA AC 120-71B on crew monitoring	Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers
An Evaluation of Several Stall Models	a paper presented at the American Institute of Aeronautics and Astronautics Modeling and Simulation Technologies conference in 2014
An overview of the occurrence of stalls in Australian operations	Stall warnings in high-capacity aircraft: The Australian context 2008 to 2012”

### CASA Australia Documents

Document	Title
AC 121 -3	Upset Prevention and Recovery Training

### Other references

- EASA
  - EASA’s standards are contained in CS-FSTD (A) Issue 2 released in 2018. The Explanatory Note to Decision 2018/006/R “Update of flight simulation training device requirements” for UPRT was released with the changes from Issue 1.
- UK CAA
  - <https://www.caa.co.uk/Commercial-industry/Pilot-licences/Training-organisations/Upsetprevention-and-recovery-training-on-flight-simulation-training-devices/>
  - <http://publicapps.caa.co.uk/docs/33/InformationNotice2016044.pdf>

# 1. Introduction

## 1.1 Background

- 1.1.1 Between 2001 and 2011, aeroplane accidents resulting from a loss of control in flight (LOC-I) event were the leading cause of fatalities in commercial aviation worldwide. LOC-I accidents often have catastrophic results with very few, if any, survivors. Papua New Guinea's challenging operating environment — characterized by mountainous terrain, tropical weather, remote airstrips, and variable meteorological conditions — means that PNG operators face heightened exposure to the conditions that can precipitate LOC-I events.
- 1.1.2 The causes of inflight loss of control, whether transitory or extended, include
- loss of Situational Awareness (especially through distraction but also complacency)
  - wind shear or Clear Air Turbulence
  - structural or power plant damage caused by, for example, a bird strike, severe turbulence, or collision with another aircraft
  - intended or unintended mishandling
  - attempted flight with total load or load distribution outside of safe limits
  - mismanagement of pressurization systems
  - inadequate de-icing before take-off
  - airframe or engine icing
  - attempting to maneuver an aeroplane outside its capabilities
  - in-flight fire
  - fuel exhaustion or starvation
  - false instrument readings
  - malicious interference.
  - wake turbulence
- 1.1.3 Following a conference in June 2009 on aeroplane upsets and LOC-I, the Royal Aeronautical Society (RAeS) initiated a study through the International Committee on Aviation Training in Extended Envelopes (ICATEE) with ICAO support. ICATEE concluded that the most effective way of defining training solutions is to first clearly delineate the training needs, defined as the difference between current capabilities of an individual and the desired performance objective.
- 1.1.4 Analysis of LOC-I accident data indicated that contributory factors can be categorized as any, or a combination of: aeroplane systems induced; environmentally induced; and pilot/human induced. Of the three, pilot-induced accidents represented the most frequently identified cause, principally resulting from: application of improper procedures; spatial disorientation; poor energy management; distraction; and improper training.
- 1.1.5 The FAA and ICAO, through the Loss of Control Avoidance and Recovery Training (LOCART) initiative, identified that inappropriate pilot responses to upsets — often caused by inadequate or incorrect training — were the dominant causal factor. The Commercial Aviation Safety Team (CAST) studied 18 LOC-I accidents and incidents and found that 17 occurred when pilots did not have visual references available (IMC or night).
- 1.1.6 In response to NTSB recommendations, the Airplane Upset Recovery Training Aid (AURTA) was developed and is now in its third revision, renamed the Airplane Upset Prevention and Recovery Training Aid (AUPRTA) to reflect the criticality of recognition and prevention. ICAO then developed UPRT Standards and Recommended Practices (SARPs) in Annex 1 and Annex 6. FAA AC 120-111 was developed jointly by major aeroplane manufacturers (Airbus, ATR, Boeing, Bombardier, and Embraer), labor organizations, air carriers, training organizations, and simulator manufacturers. Papua New Guinea, as an ICAO contracting state, implements these international standards through this AC.

## 1.2 Training Philosophy — Prevention First

- 1.2.1 The fundamental shift in modern UPRT philosophy is the emphasis on prevention over recovery. Previous unusual attitude training focused primarily on recovering from a fully developed upset. Modern UPRT places prevention as the primary goal and treats recovery as the safety net when prevention fails.
- 1.2.2 A pilot who has successfully completed UPRT will demonstrate knowledge and skill in preventing, recognizing, and — if necessary — recovering from an upset. The three-stage

model, adopted from both ICAO Doc 10011 and FAA AC 120-111, is:

- 1.2.3 Prevention — developing the awareness and skills to avoid divergence from the intended flightpath. This is the primary UPRT goal.
- 1.2.4 Recognition — detecting divergence from the intended flightpath early, before a developing upset becomes a developed upset. Timely recognition is the last opportunity to prevent an accident without requiring recovery.
- 1.2.5 Recovery — correctly recovering from a developed upset using OEM-approved procedures, without creating secondary upsets or structural exceedances. Recovery is the last safety layer.

### 1.3 Training Objectives

- 1.3.1 A UPRT program should include clear training objectives stating what the trainee is expected to perform, the desired learning outcomes, and the competency-based training (CBT) focus of the training.
- 1.3.2 To meet the requirement for a compliant UPRT program, training required by CASAPNG will follow the prescription in ICAO Doc 10011 and relevant ICAO SARPs, aligned with international best practice. Flight crew members must be provided with ground training and flight training or flight simulator training:
  - to recognize and avoid a stall of an aircraft or if not avoided, to recover from the stall
  - to recognize and avoid an upset of an aircraft or if not avoided, to execute such techniques as available data indicate are appropriate to recover from the upset in a given make, model, and series of aircraft.
- 1.3.3 Current thinking (refer AUPRTA Revision 3) includes a wider definition of upsets and uses the established concept of undesired aircraft state and the pilot's awareness of this, regardless of airspeed or specific pitch and/or bank angle parameters.

### 1.4 Human Factors

- 1.4.1 Human factors training is central to a successful UPRT program. Research shows that in many LOC-I incidents and accidents, the monitoring pilot may have been more aware of the aeroplane state than the pilot flying. Training should emphasize crew interaction (including augmented flight crews) to identify and vocalize any divergence from the intended flightpath. A progressive intervention strategy is initiated by communicating a flightpath deviation (alert), then suggesting a course of action (advocacy and assertion), and then directly intervening, if necessary.

### 1.5 PNG-Specific Operating Environment

- 1.5.1 PNG's operating environment creates specific LOC-I risk factors that must be reflected in UPRT program design.

## 2. Considerations Regarding UPRT Implementation

### 2.1 Applicability of this AC

- 2.1.1 The contents of this AC reflect CASAPNG's pre-determined acceptable means of compliance with the regulatory requirements for certain aeroplane operators and training providers to provide UPRT programs as laid out in the PNG Civil Aviation Rules.
- 2.1.2 Operators and training providers may propose alternative means of compliance (AMC); however, they will need to provide significant explanation of how the proposed AMC achieves equivalent safety outcomes and must ensure it encompasses the areas covered under each chapter heading in this AC.
- 2.1.3 CASAPNG has adopted a phased approach to UPRT implementation. In the first phase CASAPNG will require a UPRT program for the following:
  - AOC holders conducting air transport operations using aeroplanes of 20 seats or more and/or MTOW greater than 5700 kg
  - any other operations as directed by CASAPNG where a safety requirement becomes apparent.
- 2.1.4 Requirements for UPRT for an implementation phase covering operations not included in the above will be developed and promulgated at a later date following consultation and significant industry involvement.

## 2.2 Expectations for UPRT Implementation

- 2.2.1 For all operations, all pilots should have completed a UPRT theory course (including any CASAPNG-directed online training) or have commenced participation in an operator's UPRT theory program by the end of 30 June 2026 or within a timeframe agreed with CASAPNG.
- 2.2.2 Operators and training providers should identify and remove negative training as soon as practicable. Before commencement of any UPRT program the initial group of instructors must complete a 'Train the Trainer' course acceptable to CASAPNG. The operator should also inform CASAPNG of the specific instructors that will be conducting UPRT.
- 2.2.3 Operators and training providers delivering any part of a UPRT program must have a sufficient number of instructors trained using an acceptable course to deliver theory and practical UPRT programs (refer Section 14 of this AC).
- 2.2.4 Operators and training providers must have a fully compliant UPRT program within the following timeframe or as agreed with CASA PNG;
- Operators and training providers should have a UPRT program by 30 June 2026
  - All pilots should have commenced or re-commenced participation in a UPRT practical handling course by 31 December 2026.

## 2.3 Focus of Training

- 2.3.1 Continued emphasis on stall and recovery training is warranted in training programs to undo years of applying incorrect stall or upset recovery procedures and use of training devices incapable of adequately representing the characteristics of the aeroplane in the post-stall warning regime.
- 2.3.2 Operators should review current training practices; as unnoticed or unaddressed negative training poses a threat to flight safety. Part of an operator's UPRT development and implementation program should include advising CASAPNG of the outcome of such training reviews and ensuring they document and follow their proposed mitigation procedures.

## 2.4 Threats to Successful Implementation

- 2.4.1 Clearly identified threats to standardized UPRT implementation include:
- untrained instructor with insufficient knowledge about UPRT theory and practical training
  - trained but under-supervised instructor deviating from standardized methods and practices without notice by management and/or QA processes
  - inappropriate, inadequate or poorly focused syllabi with emphasis on, for example, minimizing altitude loss during stall recovery and/or training concentrated in an invalid or very small part of the flight envelope
  - training that does not adequately focus on manual handling
  - unsuitable use of flight simulation training devices and lack of real time feedback information at the IOS
  - lack of appropriate theory and practical human factors training
  - extending simulated training beyond the capabilities of the aeroplane or instructor
  - programs that do not allow the pilot to connect the UPRT theory elements through to the practical elements in a robust and thorough manner
  - programs that do not allow or encourage training to proficiency, enabling the pilot to practice certain exercises to develop both cognitive and "muscle memory" skills
  - training providers waiting to upgrade their devices before doing anything further
  - training providers trying to cram their whole UPRT program into a single course, rather than integrate modules within the suite of initial and recurrent training programs
  - an inflexible syllabus that is not upgraded, as better and more focused information becomes available (for example via the operator's SMS after training and accident reports)
  - lack of robustness in post-implementation governance and/or oversight by the regulatory authority.
  - post-implementation "drift" if under-supervised instructors move away from the UPRT standards and syllabus requirements initially approved.

## 3. Training Standards for UPRT Instructors

### 3.1 General

- 3.1.1 UPRT programs will be competency-based training only, except for some UPRT-related elements of type rating and license programs which may require demonstrated competency in a proficiency test. This will not include proficiency requirements for maneuvers beyond the initial stall indication.

### 3.2 Instructors

- 3.2.1 Regardless of background, all instructors providing training in a UPRT program must successfully complete instructor qualification training via an acceptable 'Train the Trainer' course, in accordance with the applicable requirements in ICAO Docs 9868 and 10011 (refer to Section 14 of this AC).
- 3.2.2 In accordance with the provisions of ICAO Annex 1 and PNG CAR, CASAPNG, having issued a pilot license, shall not permit the holder thereof to carry out flight instruction required for the issue of a pilot license or rating unless such holder has received proper authorization from CASAPNG. Proper authorization shall comprise one of the following: a flight instructor rating on the holder's license the authority to act as an agent of an approved organization authorized by CASAPNG to carry out flight instruction a specific authorization granted by CASAPNG.
- 3.2.3 Training organizations wishing to conduct on-aeroplane UPRT training will need to obtain specific approval from CASAPNG and must comply with the requirements listed in Chapters 2, 3 and 5 of ICAO Doc 10011. Special attention must be given to the training, qualifications, competencies, safety and risk management relating to on-aeroplane UPRT instruction and training program management.
- 3.2.4 For training and checking systems for operations involving aeroplanes with 20 seats or more or MTOW above 5700 kg (primarily simulator training), operators are required to provide induction and recurrent UPRT training. This will require instructors specifically trained to deliver UPRT who are either:
- a holder of the appropriate training endorsement in accordance with PNG CAR Part 61 and provisions or
  - a pilot who has been specified in and has completed the acceptable course of training specified in the operator's exposition

### 3.3 Training for License Issue

- 3.3.1 Initial UPRT training for MPL will be conducted by qualified instructors within CASAPNG-approved integrated training organizations.
- 3.3.2 Initial UPRT is not yet required but is recommended for CPL trainees. If provided, it should be conducted by qualified and approved instructors within CASAPNG-approved flight training organizations.

### 3.4 Training for Type Ratings

- 3.4.1 Approved training providers may elect to provide UPRT modules (academic and practical) within their type rating programs. Such training must be in accordance with the contents of this AC.
- 3.4.2 A type rating UPRT program should include significant emphasis on:
- Causes and Contributing Factors: environmental, failures and pilot-induced
  - Safety Review and Demonstration (in-seat, instructor-guided)
  - Upsets and Energy Management (kinetic, potential, chemical)
  - Energy: relationship between pitch, power and performance
  - Energy: performance and effects of differing engines
  - Recognition: Pitch/Power/Roll/Yaw.
- 3.4.3 If training for the type rating does not include UPRT modules the trainee will be required to complete those modules in an induction program on entry (or return) to operations under the relevant PNG CAR.
- 3.4.4 Course completion certificates must indicate whether UPRT modules were delivered.

**Note:** CASAPNG will regard the implementation of a UPRT training program within an approved training organization as a significant change requiring notification and acceptance by CASAPNG.

## 4. Training Program Development Considerations

### 4.1 Background

- 4.1.1 Many LOC-I accident investigations revealed the affected flight crew had received misleading information from well-meaning training staff or their organizations. ICAO Doc 9868 notes that some existing training practices were found to be ineffective and a contributory factor to the inappropriate responses by some flight crews.
- 4.1.2 For example, in certain cases the methodologies being applied in training for recovery from an approach to stall were based on the pilot achieving recovery with a minimal loss of altitude. This resulted in training practices which emphasized rapid application of power with least AOA reduction to minimize altitude loss, rather than appreciating the importance of reducing AOA to effectively restore lift.

### 4.2 Outcomes from a UPRT Program

- 4.2.1 The elements in a UPRT program will provide pilots with the knowledge and skills to prevent an upset or, if not prevented, to recover from an upset.
- 4.2.2 Trainees will receive theory and practical competency-based training in the three key areas that comprise a compliant UPRT package:
- Upset Awareness
  - Upset Prevention
  - Upset Recovery.
- 4.2.3 Classroom training will be followed by practical training in the required array of manual skills in Maneuver-Based Training (MBT) modules. The training can then move progressively to Scenario-Based Training (SBT) modules. FAA AC 120-111 Section 3-1 mandates the building block approach: academic training must precede FSTD MBT, and FSTD MBT proficiency must precede SBT. CASAPNG will adopt a case-by-case risk-based approach to the assessment of UPRT programs for 'lower end' multi-crew aeroplanes for which a simulator may not be available.

### 4.3 Device Requirements

- 4.3.1 Initial and recurrent UPRT programs for type-rated aeroplanes must be conducted in a suitably equipped and approved Level C or D flight simulator, or equivalent as acceptable to CASAPNG.
- 4.3.2 For the introductory and theory components of a UPRT program, many of the required UPRT tasks and demonstrations relating to recognition, awareness and prevention can be completed in a non-upgraded flight simulator or flight training device.
- 4.3.3 Recognizing that fully developed stalls remain the leading cause of loss-of-control accidents, training must include:
- significant 'hands-on' exposure to stalls that are fully developed
  - stalls that are unexpected and involve autopilot disengagement
  - where applicable, stick-pusher familiarization training including an in-depth understanding of the system and the activation logic.

### 4.4 Syllabus Development

- 4.4.1 Syllabus development should be in accordance with ICAO Doc 10011 and the Airplane Upset Prevention and Recovery Training Aid (Rev 3) and follow the guidance for training programs in ICAO Doc 9868.
- 4.4.2 Training developers may also wish to refer to AURTA Revision 2 in so far as the guidance is not revised in Revision 3. The training elements in ICAO Doc 10011 Table 2-1, are simply a means to develop the appropriate proficiencies and assist in developing training programs. They should not lead to a tick box approach to completing a syllabus.
- 4.4.3 Training providers should consider establishing the entire program over a set of multiple modules, each with specific exercises. This enables the training to be readily integrated within ongoing recurrent simulator training sessions and encourages a training-to-proficiency paradigm.
- 4.4.4 Training providers should consider an immediate start to training in UPRT theory (including human factors), reinforced by awareness and prevention exercises, in order to be ready for more advanced

recovery situations in later training modules.

- 4.4.5 Training providers should develop close relationships with relevant original equipment manufacturers (OEMs). Manufacturers have typically devoted significant resources to the development of type-specific UPRT programs, and these must be taken as primary.
- 4.4.6 Operators should work with their aeroplane manufacturer(s) to ensure they have the manufacturer-approved, aeroplane-specific upset prevention and recovery guidance and techniques in their exposition or operations manual.
- 4.4.7 The most fundamental message for training sequences near, at or beyond the stall is recognition and deliberate action to reduce AOA, thereby 'unloading the wing'. Emphasis needs to be on:
- the recognition, prevention and when needed, recovery methods, rather than undue focus on how the aeroplane entered the condition
  - pilot understanding of the difference between attitude and AOA as this difference is often misunderstood.
- 4.4.8 UPRT should include instructor guided practice of manual handling at the edges of the flight envelope.
- Note:** *Training using procedures from one type may have a detrimental effect if carried over to a different type even if there are superficial similarities.*

## 4.5 Knowledge Levels

- 4.5.1 Care must be taken at the early stages of UPRT implementation not to assume the existence of a comprehensive level of UPRT-related knowledge, particularly at the type rating and recurrent training levels.
- 4.5.2 Accident data strongly indicate even highly experienced flight crews exhibited signs of shortcomings in understanding and reacting to their predicament, indicating potential knowledge deficiencies. It is realistically impossible for pilots to recognize and respond correctly to an undesired aircraft state, without having practical knowledge of the performance and handling characteristics available (or not available) to them throughout the entire operational flight envelope.
- 4.5.3 Trainees should be knowledgeable about aerodynamic effects at both high and low altitudes. The FSTD training should be accomplished at both high altitude (within 5,000 ft of the service ceiling of the aeroplane) and at low altitude (10,000 ft above mean sea level) to re-enforce the academic training described. High-altitude training should be conducted at normal operational cruise altitudes.
- 4.5.4 Some stalls and upsets are not associated with inaccurate information (such as an unreliable airspeed indication) and can be instantaneous and require deliberate inputs. Once positively identified, the recovery from these types of stalls and upsets, is often at a slower rate than the initiation of the problem. These situations can be extremely challenging, requiring recognition and recovery without creating stresses beyond certification limits.
- 4.5.5 It is known that when an upset occurs in actual flight, pilots often do not respond as they were trained. In such instances, the common belief is that “startle” and “surprise” were critical factors. In time-critical events, an incorrect reaction may worsen the situation and make recovery (both mentally and aerodynamically) more challenging. Fatigue and emotional stress can exacerbate this situation.
- 4.5.6 The tools pilots require to manage such sudden onset situations are knowledge and training to analyze and to resolve the problem. These tools should include procedures/techniques to recognize the stall event/upset and apply recovery in an appropriate manner.
- 4.5.7 Unfortunately, many airline pilots, including instructors, have not been in an actual stall since the single-engine flights in their early training. Compounding this, the aviation community has had a history of erroneously emphasizing “minimum loss of altitude” over immediate AOA reduction

## 5. Preparation for Implementation

### 5.1 Preparation Steps Expected of Operators and Training Providers

- 5.1.1 Establishment of a UPRT implementation program team should involve the following:
- design and implementation of the operator's UPRT program and implementation schedule
  - provision for the UPRT core group to undergo high-level UPRT academic and practical training and a CASAPNG-acceptable 'Train the Trainer' course
  - conduct of a gap analysis of actual versus desired UPRT status, with the aim of identifying and

removing negative training and reporting on progress through the organization's SMS and/or quality management systems

- development of the operator's type-specific UPRT programs for each fleet and training program (in cooperation with the OEMs) and submission for review by CASAPNG
- completion of the initial instructor-training program for each fleet including assurance of capability for delivery of standardized instructor-guided hands-on experience of recovery from full stall on a compliant FSTD with a UPRT-capable IOS
- commencement of awareness and prevention within existing or extended validation envelopes
- development and operation of the post-implementation governance program including QA and SMS activities.

#### 5.1.2 Preparation Timelines

Implementation timelines will be established by CASAPNG in consultation with operators and training providers. All operators should contact CASAPNG to agree upon an acceptable implementation schedule. Refer to Section 3.2 of this AC for general expectations.

## 6. Implementation of A Compliant UPRT Program

### 6.1 Overview of Requirements

- 6.1.1 The requirements for a UPRT program are found in Chapter 2 of ICAO Doc 10011. The training elements and the appropriate training media are outlined in Chapter 3 of Doc 10011. Both areas are amplified in the AUPRTA.
- 6.1.2 The recommendations in Doc 10011 provide a comprehensive training program framework to mitigate the risk of LOC-I accidents. However, the material may include training elements which could be affected or invalidated by future aircraft-specific technology or other developments of an operational nature.
- 6.1.3 Although aeroplane OEMs have been consulted throughout development of Doc 10011, they may at some point develop differing guidance regarding procedures to address these areas of training. In such instances, OEM recommendations take precedence over any differing information contained within more general guidance material.

### 6.2 Elements of a Compliant Program

- 6.2.1 The loss of control avoidance and recovery training (LOCART) initiative<sup>3</sup> determined that the approach in mapping out a UPRT program should focus its design into satisfying three distinct areas/objectives
- (1) **heightened awareness** — of the potential threats from events, conditions or situations (Prevention)
  - (2) **effective avoidance** — at early indication of a potential upset-causing condition (Prevention)
  - (3) **effective and timely recovery** — from an upset to restore the aeroplane to safe flight parameters.

### 6.3 Need for an Integrated Program

- 6.3.1 Effective UPRT program development and supporting regulatory frameworks require an integrated comprehensive approach to ensure standardization in the levels of knowledge and skill sets within the pilot community.
- 6.3.2 An integrated UPRT program should comprise:
- academic (theory) training — designed to equip pilots with the knowledge and awareness needed to understand the threats to safe flight and the employment of mitigating strategies
  - practical training — designed to equip pilots with the required skill sets to effectively employ upset avoidance strategies and, when necessary, effectively recover the aeroplane to the originally intended flight path.
- 6.3.3 The practical training component should cover all elements broken down into two distinct subcomponents in ICAO Doc 10011 Tables 2-1 and 3-3 (as revised) involving:
- FSTD training on specific or generic aeroplane types to build on knowledge and experience and

- application of training to the multi-crew CRM environment, at all stages of flight, and in representative conditions, with appropriate aeroplane and system performance, functionality and response.

## 6.4 Elements of an Integrated Program

- 6.4.1 The following are the deliverables CASAPNG will expect from the theory and practical components of an integrated UPRT program:
- (1) provision of comprehensive academic training covering the broad spectrum of issues surrounding aeroplane upsets, at the earliest stages of commercial pilot development, during type rating training and throughout the professional career at scheduled recurrent training intervals
  - (2) provision of UPRT manual handling programs for MPL licensing levels on light aeroplanes capable of performing the recommended maneuvers while maintaining acceptable margins of safety
  - (3) provision of training scenarios involving conditions likely to result in upsets, as part of regular initial type rating and recurrent training exercises in type-specific FSTDs
  - (4) implementation of standards that require UPRT to be delivered by appropriately qualified and competent instructors
  - (5) implementation of standards that require UPRT in FSTDs to be conducted in an appropriately qualified device using the highest level of fidelity available
  - (6) provision of conditions under which FSTD instructors are trained and able to provide feedback in real time, using UPRT-specific debriefing tools of the instructor operating station (IOS).
- 9.4.2 The IATA Guidance Material and Best Practices for the Implementation of Upset Prevention and Recovery Training (UPRT). 2nd Edition (2018) offers useful guidance for UPRT implementation and should be read in conjunction with the AUPRTA and ICAO Documents 9868 and 10011 when the implementation plan is being developed.

## 7. Flight Simulator Qualification

*"Unless the UPRT FSTD's simulation model satisfactorily represents the aeroplanes behavior and performance during an aerodynamic stall, training demonstrating conditions beyond the critical angle of attack can create harmful misperceptions about such an event and the recovery experience. — ICAO Doc 10011 Section 4.1"*

### 7.1 Overview

- 7.1.1 Most current flight simulators can be used satisfactorily to conduct unusual attitude recovery training tasks, awareness and AOA related training and a significant portion of recognition, prevention and upset training not involving full stalls. Until now only approach-to-stall training was necessary in FSTDs and as such, FSTD data packages did not necessarily concentrate on flight characteristics at angles of attack beyond the first indication of a stall.
- 7.1.2 While current simulators are typically capable of supporting brief excursions beyond the initial stall indications, until UPRT upgrades began, simulation flight models were usually found to be deficient in adequately representing the post-stall indication regime.
- 7.1.3 Before being upgraded for UPRT, most simulators have not provided the cues and performance degradation needed, to train in recognition of an impending aerodynamic stall or in recovery techniques from a stalled condition. Instead, the simulators presented dynamic characteristics in the stall and post-stall regimes that were easier to recover from than in the actual aeroplane. In particular, the wing drop that may accompany a stall was seldom modelled.
- 7.1.4 The use of a simulator beyond the capabilities and fidelities necessary to complete the required training, can pose a significant threat to the achievement of the desired outcomes and ultimately, a threat to flight safety.
- 7.1.5 The development and utilization of a "type-representative post-stall aerodynamic model" to support demonstrations beyond the critical AOA is necessary, for such demonstrations and practice to be properly conducted.
- 7.1.6 The need to have FSTDs qualified for UPRT (including full stall) brings with it the requirement for fidelity levels adequate to support recognition cues, performance and handling qualities of a developing stall, through and beyond the stall identification AOA and recovery.

- 7.1.7 As the buffet associated with a developing stall may exceed the expectations of pilots and instructors not ordinarily exposed to buffet beyond the initial stall indications, care (such as thorough briefings and mandatory use of seat belts during stall training) should be taken to avoid physical injury within the simulator.
- 7.1.8 Many current FSTDs lack enhanced instructor feedback tools to allow for a complete and accurate assessment of the trainee's performance. Until the progressive implementation of upgrades to simulators is complete, these fidelities and IOS limitations, if not fully appreciated by training program designers and instructional staff, can result in the serious and long-term repercussions of trained flight crews and instructors with significant misunderstandings of upset events.
- 7.1.9 Traditionally flight test has been the preferred data source for FSTD objective evaluation, and it is expected that best endeavors will be made by FSTD modelers to secure flight test data. However, even if the traditional array of flight test data is available, strict time-history-based evaluations against that data may not adequately validate the aerodynamic model in an unsteady and potentially unstable flight regime, such as stalled flight

## 7.2 Statement of Compliance (SOC)

- 7.2.1 As objective testing requirements do not prescribe strict tolerances at angles of attack beyond the stall identification; an SOC will be required to define the source data and methods used to develop the stall aerodynamic model and hence construct the FSTD validation envelope.
- 7.2.2 The SOC must verify that each UPRT feature programmed at the IOS and the associated training maneuver has been evaluated by a suitably qualified SME pilot. The SOC must confirm that the recovery maneuver can be performed such that the FSTD does not exceed the validation envelope, or when exceeded, that it is within the realm of confidence in the simulation accuracy.
- 7.2.3 Where it is impractical to develop and validate a stall model with flight-test data (for example, due to safety concerns involving the collection of flight test data past a certain AOA), the data provider is expected to make a reasonable attempt to develop a stall model through the required AOA range, using analytical methods and utilization of the best available data.
- 7.2.4 The FSTD operator must declare the range of AOA and sideslip where the aerodynamic model remains valid for training.
- 7.2.5 For stall recovery training tasks, satisfactory aerodynamic model fidelity must be shown through at least 10 degrees beyond the stall identification AOA.
- 7.2.6 The model must be capable of capturing the variations seen in the stall characteristics of the aeroplane concerned (for example, the presence or absence of a pitch break, deterrent buffet or other indications of a stall where present on the aircraft).
- 7.2.7 Where OEM-supplied flight test-based data is not available or is incomplete, alternative sources of data used to construct the FSTD validation envelope may be acceptable using the following hierarchy of preferences:
- stall models developed using the aeroplane OEM's engineering simulation
  - wind tunnel or established analytical methods to extend stall modelling sufficiently
  - input from an SME pilot with full-stall experience in the aeroplane being simulated
  - unpublished sources acceptable to CASAPNG (for example, calculations, simulations, or other simple means of flight test analysis or recording).
- 7.2.8 The SOC must address, and the aerodynamic model must incorporate, the following stall characteristics where applicable (with explanation of methodology):
- degradation in static/dynamic lateral-directional stability
  - degradation in control response (pitch, roll, yaw)
  - uncommanded roll acceleration or roll-off requiring significant countering control deflection
  - apparent randomness or non-repeatability
  - changes in pitch stability
  - stall hysteresis
  - Mach effects
  - stall buffet
  - angle of attack rate effects

- engine effects (power reduction/variation, vibration, etc. if applicable).

7.2.9 Where known limitations exist in the aerodynamic model for particular stall maneuvers (such as aircraft configurations and stall entry methods), these limitations must be declared in the SOC.

7.2.10 The SOC will only be required at the time the FSTD is initially qualified, as long as the stall model remains unmodified from what was originally qualified.

### 7.3 The Training Focus in Evaluation

7.3.1 From the training perspective the requirements for the evaluation of stall training maneuvers are intended to ensure adequate levels of fidelity for the following:

- type specific recognition cues of the first indication of the stall (such as the stall warning system or aerodynamic stall buffet)
- type specific recognition cues of an impending aerodynamic stall demonstrate aircraft performance degradation in the stall recognition cues and handling qualities from the stall break through to recovery that are sufficiently similar to the characteristics of the aeroplane being simulated, to allow successful completion of the stall recovery training tasks.

7.3.2 The FSTD validation envelope may be thought of as the entire realm in which the FSTD may be flown as a function of AOA and sideslip and with a degree of confidence that the FSTD responds similarly to the aeroplane. The envelope can be divided into three subdivisions:

- **Flight test validated region:** The region of the flight envelope validated with flight test data, typically by comparing the performance of the FSTD against flight test data through tests incorporated in the Qualification Test Guide (QTG) and other flight test data utilized to further extend the model beyond minimum requirements. Within this region, there is high confidence that the simulator responds similarly to the aircraft.
- **Wind tunnel and/or analytical region:** This is the region of the flight envelope for which the FSTD has not been compared to flight test data, but for which there has been wind tunnel testing or the use of other reliable predictive methods (typically by the aircraft manufacturer) to define the aerodynamic model. Within this region, there is moderate confidence that the simulator will respond similarly to the aircraft.
- **Extrapolated:** The region extrapolated beyond the flight test validated and wind tunnel/analytical regions. It is a “best guess” only and within this region there is low confidence that the simulator will respond similarly to the aircraft.

7.3.3 For simulators upgraded to capability for high-AOA modelling the model must support stall training maneuvers in the following flight conditions:

- stall entry at wings level (1g)
- stall entry in turning flight of at least 25degree bank angle (accelerated stall)
- stall entry in a power-on condition (required only for propeller driven aircraft)
- aircraft configurations of second segment climb, high altitude cruise (near performance limited condition), and approach or landing.

7.3.4 In lieu of objective testing for the high-altitude cruise and turning flight stall conditions, these maneuvers may be subjectively evaluated by a qualified SME pilot and addressed in the required SOC.

7.3.5 Objective testing for characteristic motion vibrations is not required where the FSTD's stallbuffets have been subjectively evaluated by an SME pilot.

7.3.6 Where aerodynamic modelling data is not available or insufficient to meet the requirements of FAA Directive 2, CASA may limit qualified engine and airframe icing maneuvers to scenarios where sufficient aerodynamic modelling data does exist.

7.3.7 During the initial evaluation, a footprint test should be documented with an associated SME pilot subjective “sign off” of the model, as being fully representative. For the purposes of stall maneuver evaluation, the term ‘representative’ is defined as a level of fidelity that is type specific of the simulated aeroplane, to the extent that the training objectives can be satisfactorily accomplished.

7.3.8 Where correct trend and magnitude is used it is strongly recommended that an automatic recording system be used to ‘footprint’ the baseline results, thereby avoiding the effects of possible divergent subjective opinions on recurrent evaluation.

7.3.9 It is imperative that specific characteristics are shown to be present, and incorrect effects would be unacceptable. (for example, if the aeroplane has a weak positive spiral stability, it would not be

acceptable for the simulator to exhibit neutral or negative spiral stability).

- 7.3.10 Numerical tolerances are not applicable past the stall AOA but must demonstrate correct trend through the recovery.
- 7.3.11 The provisions for high AOA modelling should be applied to evaluate the recognition cues as well as performance and handling qualities of a developing stall, through the stall identification AOA and stall recovery.
- 7.3.12 In lieu of mandating such objective tolerances, an SOC should define the source data and methods used to develop the aerodynamic stall model.
- 7.3.13 The provisions for the evaluation of full stall training maneuvers should provide the following levels of fidelity:
- aeroplane-type-specific recognition cues of the first indication of the stall (such as the stall warning system or aerodynamic stall buffet)
  - aeroplane-type-specific recognition cues of an impending aerodynamic stall.
- 7.3.14 Where correct trend and magnitude is used, it is strongly recommended that an automatic recording system be used to footprint the baseline results, thereby avoiding the effects of possible divergent subjective opinions on recurrent evaluations.
- 7.3.15 Where qualification is being sought to conduct full stall training tasks in accordance with FAA Directive 2, the FSTD operator must conduct the required evaluations and modifications as prescribed in Directive 2 and report compliance to CASA's Flight Simulation Team on the UPRT application form. At a minimum the operator must supply the following information:
- (1) a description of any modifications to the FSTD necessary to meet the requirements of Directive 2
  - (2) statements of Compliance (High Angle of attack Modelling/Stick Pusher System) – as per Table A1A, Section 2.m., 3.f., and Attachment 7 to FAR Part 60
  - (3) statement of Compliance (SME Pilot Evaluation) – See FAR Part 60 Table A1A, Section 2.m. and Attachment 7
  - (4) copies of the required objective test results.
- 7.3.3 Instructor Operating Station requirements — refer to Section 11 of this AC.

## 8. Envelope Protection

### 8.1 Background

- 8.1.1 For many decades, aeroplane have been equipped with various devices and systems capabilities aimed at modifying natural aerodynamic characteristics, and/or protecting the aircraft from exceeding defined aerodynamic or structural limitations. These devices and systems have included:
- yaw dampers
  - rudder load limiters
  - Mach trim compensators
  - flight control software (with roll and pitch protection functions)
  - stick pushers
  - powered elevators (for stall recovery, e.g. DC-9).
- 8.1.2 In addition, there are systems to aid the pilot in normal flight activities and handling tasks. These include:
- powered controls
  - auto-throttle
  - auto-pilot
  - powered control trims.

### 8.2 Knowledge

- 8.2.1 Trainees should understand envelope protection systems and associated failure modes relevant to UPRT and how these systems can cause or contribute to an upset or simply increase the likelihood of an upset. Upset-inducing failures/malfunctions related to systems, instruments, power and automation should be incorporated into training whenever applicable, if specified or approved by the OEM.

- 8.2.2 Trainees should be made particularly aware of the insidious nature of inaccurate information (for example, unreliable airspeed, failures of stall and icing alerting devices, degradation of envelope protection systems), so they are trained to recognize the problem/error, prevent an upset and maintain control of the aeroplane.

### 8.3 Simulation Considerations

- 8.3.1 To adequately support UPRT activity a compliant simulator must demonstrate an acceptable level of capability and fidelity in areas of the training envelope beyond the protection and operational limits where history (and OEM advice) show that unexpected or inadvertent flight may occur. In addition, the IOS must be capable of readily providing feedback to the instructor on control inputs and the position of the aeroplane in relation to the flight envelope.
- 8.3.2 History has shown that system failure (full or partial) or flight with some form of degraded control capability is often the precursor to an upset event. These situations can include:
- mechanical or systems failure (either directly or through the failure of a supporting system)
  - such as an air-data computer)
  - inappropriate pilot actions (for example, pulling circuit breakers during pilot-initiated fault)
  - diagnosis in-flight other than as directed by a Non-Normal Checklist)
  - aircraft inadequately de-iced before departure
  - incorrect performance calculations (for example, entering incorrect Zero Fuel Weight)
  - inappropriate aircraft loading leading to out of envelope center of gravity
  - incorrect configuration for phase of flight.
- 8.3.3 Unless specified as a required training exercise by the OEM, for aeroplanes so equipped, there is no UPRT requirement to disable or override the stick pusher to get closer to or beyond the aerodynamic stall. The ICAO standard is that the aerodynamic model must extend to at least 10 degrees beyond the stall identification AOA, which is generally the stick pusher activation on stick pusher equipped aircraft. This standard is central to the FAA FSTD Directive 2 (refer paragraph 9.4.7 below).
- 8.3.4 While training requirements only go to stick-pusher activation then recovery, in practice, pilots may overshoot beyond the activation AOA, possibly a significant overshoot, hence the need for simulator fidelity well beyond the stick pusher.

#### Notes:

- *From observations, most instructors state that, regardless of previous academic training, pilots usually resist the stick pusher on their first encounter.*
  - *Usually, trainees immediately pull back on the control yoke/stick rather than releasing pressure. This issue has been a factor in several LOCI accidents.*
- 8.3.5 CASAPNG expects UPRT training providers to liaise with OEMs to ascertain the usefulness of developing relevant scenarios where, for demonstration purposes only, the disabling of appropriate envelope protection systems might allow introduction of demonstrations of approach to and recovery from stall in various degraded modes. The primacy of the aeroplane OEM must be recognized and operators must not independently develop their own training protocols for this critical flight regime.
- 8.3.6 Safety considerations may mean that that the collection of data or obtaining SME experience beyond the pusher activation, will be very limited. However, simulator modelling beyond the stall indication AOA does not necessarily require flight test validation data. Wind tunnel and analytical methods may be used to develop an adequate representative model.

### 8.4 UPRT Considerations

- 8.4.1 The model validity range must extend to 10 degrees AOA beyond the stall identification AOA, with the protection systems disabled or otherwise degraded (such as a degraded flight control mode because of a pitot/static system failure).
- 8.4.2 Training may not necessarily extend far into this range unless the OEM requires that protection systems be disabled for training purposes.
- 8.4.3 An assessment of the FSTD's stall characteristics should be accomplished by an SME pilot (see section 10) and where possible, should be complemented with aircraft OEM or other suitable documentation (such as flight test reports or aircraft certification data) that fully describes the stall characteristics of the simulated aircraft.
- 8.4.4 For 'fly-by-wire' aircraft the FSTD should be evaluated in both 'normal' and 'non-normal' control modes.

Reversion to degraded control laws (such as secondary, alternate, or direct control laws) should be conducted with consideration of potential failure scenarios that may be encountered in an operational environment, or as necessary to support the operator's training requirements.

- 8.4.5 If necessary, an SME pilot will be expected to initiate "fine-tuning" of the operations of the aerodynamic model in the FSTD. This might include:
- minor longitudinal stability adjustment before stall
  - adjustments to "roll-off" due to asymmetric stall
  - adjustments to a randomizer algorithm.
- 8.4.6 For aeroplanes equipped with a stick pusher, the SOC should verify that the stick pusher system has been modelled, programmed and validated, using the aeroplane manufacturer's design data or other approved data source. At a minimum, the following characteristics should be addressed in the SOC:
- stick pusher activation logic
  - stick pusher system dynamics, control displacement, and forces
  - stick pusher cancellation logic.
- 8.4.7 The model must also be capable of simulating the dynamics of the aeroplane concerned because of a pilot initially (and possibly very forcefully) resisting the stick pusher in training.
- 8.4.8 Simulators may be used to demonstrate the activation of a stick pusher system, however, training providers are cautioned that the range beyond stick pusher activation, may not accurately represent the aeroplane unless the post-stick pusher regime is properly modelled and evaluated.
- 8.4.9 The FSTD sponsor/FSTD manufacturer may limit maximum buffet based on motion platform capability/limitations or other simulator system limitations.
- 8.4.10 Tests may be conducted at centers of gravity and weights typically required for airplane certification stall testing. Tolerances on stall buffet are not applicable where the first indication of the stall is the activation of the stall warning system (i.e. stick shaker).
- 8.4.11 As the pitch down from stick pusher activation or the buffet associated with a developing stall may exceed the expectations of pilots and instructors not ordinarily exposed to buffet beyond the initial stall indications, care (such as thorough briefings and mandatory use of seat belts during stall training) should be taken to avoid physical injury within the simulator
- 8.4.12 The stall model should be evaluated by an SME pilot with knowledge of the cues necessary to accomplish the required training objectives, and experience in conducting training and stalls in the type of aeroplane being simulated.
- 8.4.13 The purpose of the subjective evaluation is to provide an additional layer of protection to ensure FSTD fidelity. The intent is for the simulation to be qualified initially only once by an SME. Objective recording can then be made and used without an SME for initial or recurrent qualification of FSTDs for the same aeroplane make, model and series.

## 9. Adherence To The FSTD Training Envelope

- 9.1.1 Most FSTDs can be used satisfactorily for AOA-related training and for a significant portion of upset training not involving full stalls. If the simulated aeroplane remains within its valid training envelope (VTE) (the aeroplane flight envelope data provided by the OEM and used for the FSTD qualification) for AOA and sideslip, upsets that subsequently have large (AOA or sideslip) excursions can be represented faithfully.
- 9.1.2 Use of FSTDs in regions of the flight envelope beyond the FSTD's ability to provide accurate fidelity can result in a negative training experience and high risks. The operator is responsible for ensuring that simulators used beyond 'normal' events can accurately support the inclusion of added activities.
- 9.1.3 The FAA Handbook on Air Transport makes each operator responsible for ensuring that the simulators used beyond the "normal" events can accurately support the inclusion of added activities (see FAA HBAT 95-10).
- 9.1.4 While various levels of training devices may be appropriate for the illustration and practice of a variety of elements of UPRT, they should always be qualified appropriately for the delivery of UPRT-specific training.
- 9.1.5 FAA AC 120-111 Appendix 3 acknowledges that the dividing line between a valid and invalid training envelope may be grey. The actual response of the aircraft may vary whether inside or outside the intended training envelope. Where a minor excursion from the validated envelope occurs, the instructor must inform the trainee that the actual aircraft response may differ — this is the required response,

not automatic session termination. Significant sustained excursions must be reported to the SMS.

## 10. The Instructor Operating Station (IOS)

*"The instructor must be provided with minimum feedback tools for the purpose of determining if a training maneuver is conducted within FSTD validation limits and the aircraft's operating limits. — FAA FSTD Directive 2 and FAR Part 60 Table A1A"*

### 10.1 Feedback to the Instructor

10.1.1 For the instructor to provide feedback to the trainee during UPRT, additional information should be accessible that indicates the fidelity of the simulation, the magnitude of the trainee's flight control inputs and aeroplane operational limits. Specifically, instructors should have available and be properly trained to effectively utilize IOS tools that convey:

- when the simulator model is no longer valid
- when the aeroplane operational envelope is exceeded
- when inappropriate control inputs are used
- information to support adequate debriefing, including how far recovery went into the extrapolated envelope.

10.1.2 Incorrect recoveries from upsets in simulation can result in:

- excursions outside of the FSTD training envelope
- excursions outside the aeroplanes operational envelope
- inappropriate flight control inputs such as excessive rudder pedal inputs.

10.1.3 An IOS can be as simple as a low-cost hand-held tablet which gives the instructor the ability to activate the scenario, monitor pilot actions, then have immediate information regarding control inputs and forces.

10.3.4 Until IOS representation of the FSTD Training Envelope is provided, operators must ensure instructors are not training beyond the FSTD training envelope. Pro-active identification and removal of negative training should be undertaken even ahead of formal UPRT program development and approval.

### 10.2 The IOS Display

10.2.1 FSTDs qualified for full stall training tasks must meet the IOS requirements for UPRT tasks as detailed in ICAO Doc 9625, 4th Edition. FAA AC 120-111 Appendix 3 specifies that the instructor must be provided with an indication of when the FSTD has exceeded the validation limits of its aerodynamic model. The IOS must clearly display:

- FSTD validation envelope — employing a method to record and display the FSTD's fidelity with respect to the validation envelope.
- Flight control inputs. The FSTD should employ a method for the instructor/evaluator to assess the trainee's flight control inputs during the upset recovery maneuver.
- Aeroplane operational limits. The FSTD should provide the instructor/evaluator with information concerning the aeroplane operating limits

### 10.3 Additional IOS Functions

10.3.1 If available, IOS selectable dynamic upsets must provide guidance to the instructor concerning the method(s) used to drive the FSTD into the upset condition, including any malfunction or degradation in the FSTD's functionality required to initiate the upset.

**Note:** *The unrealistic degradation of simulator functionality to drive an airplane upset is generally not acceptable unless used purely as a tool for repositioning the FSTD with the pilot out of the loop.*

## 11. Subject Matter Expert Pilot (SME)

11.1 To qualify as an acceptable SME to evaluate an FSTD's stall characteristics, an SME must meet the following requirements:

- have held a type rating/qualification in the aircraft being simulated
- have direct and significant experience in conducting stall maneuvers in an aircraft that shares the same type rating as the make, model and series of the simulated aircraft, including hands-on

- manipulation of the controls at angles of attack sufficient to identify the stall through recovery to stable flight
- be familiar with the intended stall training maneuvers to be conducted in the FSTD and the cues necessary to accomplish the required training objectives
  - cannot be self-proclaimed — the designation of an SME is related to a certain type of aeroplane and maneuvers and is linked to the SME's recency of experience.
- 11.2 Where the SME's stall experience is on an airplane of a different make, model, and series within the same type rating, differences in aircraft specific stall recognition cues and handling characteristics must be addressed using available documentation. This documentation may include aircraft operating manuals, OEM flight test reports, or other documentation that describes the stall characteristics of the aircraft.
- 11.3 Where an SME pilot with the required qualifications is unavailable for a specific aircraft type, an FSTD operator should justify how equivalent safety outcomes will be achieved. This justification must include the following:
- demonstration that a suitably qualified pilot meeting the experience requirements of this section cannot be practically located
  - alternative methods to subjectively evaluate the FSTD's capability to provide the stall recognition cues and handling characteristics needed to accomplish the training objectives.
- 11.4 SME pilots can be a valuable resource. They will be knowledgeable of the flight characteristics of the particular aeroplane and have significant stall experience in the aeroplane. However, the knowledge of an SME pilot will not be accepted as sufficient to build a model "from scratch". The use of an SME pilot requires the existence of a well-developed solid baseline model ready for small adjustments.

## 12. Icing Models

- 12.1 In-flight icing is one of the environmentally induced causes of aeroplane upsets and represents a serious hazard. By disturbing the smooth flow of air on the aeroplane, icing will increase drag, decrease the ability of an airfoil to produce lift and degrade control authority. Unexpected handling characteristics can be expected with ice build-up.
- 12.2 During the progression of a stall condition, flow separation on the contaminated aero foil may be affected and the pitch and/or roll characteristics may be different from those of an uncontaminated wing.
- 12.3 Historically, the effects of icing were typically simulated by adding weight to the simulated aircraft without incorporating abnormal aerodynamic characteristics (such as aerodynamic changes because of ice accretion) or altered engine performance.
- 12.4 Studies of airplane accidents where loss of control (LOC) was attributed to icing, have suggested that existing FSTD icing models that do not capture additional effects may be inadequate for training.
- 12.5 Requirements for FSTD qualification for UPRT have been developed to define aeroplane-specific icing models that support training objectives for the recognition and recovery from an in-flight ice accretion event.
- 12.6 Icing models must be upgraded to simulate the aerodynamic degradation effects of ice accretion on the aircraft lifting surfaces. Systems (such as the stall protection system and auto-flight systems) must respond properly to ice accretion, consistent with the simulated aircraft.
- 12.7 Systems (such as the stall protection system and auto-flight systems) must respond properly to ice accretion, consistent with the simulated aircraft. A description of the anti-ice system operation will be required to assist both instructors and trainees in interpreting FSTD behavior.
- 12.8 Where a particular airframe has demonstrated vulnerabilities to a specific type of ice accretion (due to accident/incident history) which may require specific training (such as supercooled large-droplet icing or tailplane icing), ice accretion models should be developed that address the training requirements.
- 12.9 Ice accretion models and the associated training should:
- demonstrate the cues necessary to recognize the onset of ice accretion on the airframe, lifting surfaces and engines
  - have the capability of providing procedures for use of on-board anti-icing equipment and monitoring and maintaining appropriate airspeeds in icing conditions
  - provide exemplar degradation in performance and handling qualities to the extent that a recovery can be executed

- provide procedures for responding to decaying airspeed situations, stall protection system activation and early stalls that can occur without stall protection system activation.
- 12.10 FSTD capability for stall-related training must also include the ability to simulate stall conditions and changes in handling characteristics arising from failures in ice-alerting systems. Trainees should be made particularly aware of the insidious nature of inaccurate information arising from such failures, to ensure they are trained to:
- recognize the error
  - prevent an upset
  - maintain control of the aeroplane.
- 12.11 An objective demonstration is required to demonstrate that ice accretion models as described in the SOC, have been implemented correctly and demonstrate the proper cues and effects as defined in the approved data sources.
- 12.12 An objective demonstration should include two tests to demonstrate engine and airframe icing effects as follows:
- The first test should demonstrate the FSTDs baseline performance without ice accretion.
  - The second test should demonstrate the aerodynamic effects of ice accretion relative to the baseline test.
- 12.13 The outcome of the tests will include descriptions of the icing effects being demonstrated. These effects may include, but are not limited to, the following effects as applicable to the particular airplane type:
- decrease in stall angle of attack
  - changes in pitching moment
  - decrease in control effectiveness
  - changes in control forces
  - increase in drag
  - change in stall buffet characteristics and threshold of perception
  - engine effects (power reduction/variation, vibration, etc. where expected to be present on the aircraft in the ice accretion scenario being tested).
- 12.14 Evaluation requirements define a minimum level of fidelity required to adequately simulate the aircraft specific aerodynamic characteristics, of an in-flight encounter with engine and airframe ice accretion as necessary, to accomplish the required training objectives.
- 12.15 OEM data or other analytical methods must be utilized to develop ice accretion models. Acceptable methods may include wind tunnel and/or engineering analysis, coupled with tuning and supplemental subjective assessment by an SME pilot.
- 12.16 The SOC should explain the relevant source data, such as aeroplane OEM's subjective evaluation guidance material, to the FSTD operator for evaluation of the implemented model.

## 13. 'Train The Trainer':- Training Uppt Instructors

### 13.1 General

- 13.1.1 When starting a UPRT project, operators should first select an individual or a team to be charged with the design and implementation of the program. This team should form the core group of instructors to set up the UPRT program. As an example, operators with several fleets might select two instructors per fleet as core instructors.
- 13.1.2 The core group of FSTD instructors will have to complete an acceptable 'Train-the-Trainer' course with the aim of qualifying them to deliver UPRT and enabling them to train the remaining regular instructors. An initial course for core-group FSTD instructors may include:
- (1) identification of negative training and risk mitigation strategies
  - (2) pre-studies in UPRT theory
  - (3) academic instructor training
  - (4) on-aeroplane UPRT (if relevant)
  - (5) human factors
  - (6) FSTD training (use and limitations of simulators including the IOS).

- 13.1.3 The operator may build an “in-house” “Train-the-Trainer” course (preferably supported by the operator’s own or visiting experts, i.e. training captains with previous experience as test pilots, etc.) or send the core-group to an experienced UPRT provider. The capabilities of such a provider and the course content, should be discussed with CASA PNG before committing to the training course
- 13.1.4 ICAO Doc 10011 Chapter 5 and FAA AC No: 120-111 Change 1 Chapter 2.5, describe training elements and subject areas of instructor training that will assist in ensuring the adequacy of UPRT instructor preparation and minimize the risk of negative transfer of training.

## 13.2 Training for the Core Group

- 13.2.1 On-aeroplane training for the core-group instructors is not a requirement. However, it is recommended to allow the core-group to acquire first-hand experience of the success-critical human factors during recoveries of upsets. The core-group will later train the operator’s regular FSTD instructor staff, who normally do not possess this experience and who will have to rely on the expertise of the core-group to compensate for this gap.
- 13.2.2 FSTD instructor training for the core-group should include a part where the instructor flies the recovery maneuvers as a trainee, and a second part where he/she practices teaching under supervision. Such instructor training does not necessarily need to be type-specific. Once qualified, the core-group will develop the operator’s type-specific UPRT programs for each fleet (in cooperation with the OEMs) and finally submit them for approval to CASA.
- 13.2.3 Before qualifying the remaining regular FSTD instructors of the organization, it would be beneficial for the core-group instructors to gain experience in the delivery of UPRT by teaching trainees for a certain time. Ideally this phase would be supervised/accompanied by an experienced mentor, preferably from the initial UPRT Train-the-Trainer course.

## 13.3 Instructor Training Requirements

- 13.3.1 FAA AC 120-111 Section 2-5 establishes specific instructor training elements that CASAPNG requires all UPRT instructor courses to address. The following table summarizes the mandatory elements:

FAA AC 120-111 Ref	Training Element
Section 2-5(a)	FSTD limitations — data and motion limitations for each specific FSTD used for UPRT; instructor must understand validation data basis
Section 2-5(b)	IOS Use — proper operation of controls, systems, environmental and fault panels for each specific FSTD
Section 2-5(c)	Minimum FSTD equipment required for each UPRT event; UPRT must only be conducted with minimum equipment functional
Section 2-5(d)	LOC-I event review — accidents and incidents at instructor level
Section 2-5(e)	Energy management — instructor must understand and be able to apply and demonstrate energy management in training
Section 2-5(f)	Spatial disorientation — causes, prevention, recognition, recovery; FSTD limitations for SD training
Section 2-5(g)	Distraction — instructor use of distraction to develop startle; distraction types (ATC, heads-down work, abnormal events, noise, ergonomics, fatigue)
Section 2-5(h)	Recognition and Recovery Strategies. Instructors must teach pilots how to recognize developing upsets and apply correct recovery techniques, using both academic explanation and practical examples.
Section 2-5(i)	Recognition and Correction of Pilot Errors. Errors Instructors must identify common pilot errors, understand root causes, and train pilots to avoid incorrect inputs (e.g., over-controlling during TCAS RAs)
Section 2-5(j)	Type-specific characteristics — unique handling, stall buffet, envelope protection

	for specific type
Section 2-5(k)	OEM-specific recommendations — use OEM-approved procedures; awareness that procedures from one type may be detrimental on another
Section 2-5(m)	Startle and surprise — balancing startle/surprise in training with sound judgment and FSTD limitations; spirit of collaborative learning
Section 2-5(n)	Benefits of FSTD demonstration — some UPRT elements are more assessable when instructor demonstrates from pilot seat
Section 2-5(o)	Assessing pilot performance to completion standards — judge proficiency achievement, not just exercise completion

### 13.4 Instructor Standardization

- 13.4.1 FAA AC 120-111 Section 2-6) states Following completion of UPRT instructor training, and before providing unsupervised instruction, each instructor must complete an Initial Standardization Validation assessing: UPRT knowledge and skills; ability to teach, brief, assess and debrief all required elements; FSTD instructor ability to operate the device and all debriefing capabilities; effective recognition of pilot errors and root cause; and assessment of proficiency achievement.
- 13.4.2 FAA AC 120-111 Section 2-6(b) notes that instructors who do not follow the curriculum may provide pilots with negative training. CASAPNG requires annual standardization audit per instructor (minimum 2-hour observed instructional session), with biennial academic refresher covering ICAO Doc 10011, FAA AC 120-111 editorial updates, OEM guidance, and PNG CAR changes.

## 14. The UPRT Instructor

### 14.1 General

- 14.1.1 Instructor training is one of the most critical elements in a UPRT program. FAA AC 120-111 Section 2-3 emphasizes: 'The key to effective UPRT is the instructor. The safety implications and consequences of applying poor instructional technique, or providing misleading information, are more significant in UPRT compared with some other areas of pilot training.'
- 14.1.2 Training should be delivered within an approved Part 141 training organization or as part of a training and checking system
- 14.1.3 A simulator instructor may have little formalized training in on-aeroplane upset and may have never been beyond 60 degrees of bank angle or flown beyond the initial indications of a stall in an aircraft. Due to lack of formal guidance, many instructors have been found to teach recovery techniques they personally decided were appropriate, without any quality assurance to prevent negative transfer of training.

### 14.2 Instructor Qualification Requirements

- 14.2.1 All UPRT instructors must:
- hold an Airline Transport Pilot License and aeroplane type rating in the aircraft type for which they are conducting UPRT (a second-in-command-only type rating does not satisfy this requirement — FAA AC 120-111 Section 2-4)
  - have successfully completed the operator's UPRT program as a student prior to conducting instruction
  - have completed all UPRT instructor training requirements in listed in this AC
  - be able to teach, assess, and debrief all elements of the programs they are conducting
  - be trained and qualified to conduct training in the specific FSTD to be used for UPRT.

### 14.3 Instructor Selection

- 14.3.1 UPRT training for instructors will represent in whole or in part a new skill set. Instructors must:
- be selected to ensure the right attributes
  - meet the requirements detailed in Chapter 5 of ICAO Doc 10011

- have the prerequisites detailed in Chapter 3 of ICAO Doc 9868
- be able to teach 'hands-on' human factors/non-technical skills/multi-crew cooperation
- have thorough understanding of CBT for UPRT
- have knowledge and practical skills in both handling and human factors
- have appropriate instructor training.

14.3.2 Instructors delivering FSTD-based UPRT programs must be fully trained to deliver the training sequences and understanding in the AUPRTA. Initial and recurrent instructor training should address, as a minimum:

- specific additional academic and practical training modules for the initial cadre of senior instructors
- aerodynamics theory covering all areas of the operational envelope
- energy management
- demonstration of correct upset recovery techniques including early recognition
- improved manual handling skills, monitoring and understanding the consequences of inappropriate flight control inputs such as excessive rudder pedal inputs
- human factors and CRM including progressive intervention strategies
- capabilities and limitations of FSTDs and the risks of negative training when elements of training go beyond the VTE capabilities of the FSTD
- type-specific characteristics and the need to respect the operational envelope
- specific guidance on the flight configurations and stall maneuvers that have been evaluated in the FSTD for use in training
- effective use of the IOS for UPRT delivery and for providing accurate feedback on trainee performance
- the importance of adhering to the FSTD Upset Recovery Training scenarios that have been validated by the training program developer, whether using AUPRTA, ICAO Doc 10011 or OEM recommendations and the consequences of excursions outside of the validated training envelope.
- Distinguishing between generic UPRT strategies and OEM specific recommendations.
- The ability to accurately deliver theory and assess levels of understanding while employing sound instructional techniques.
- The need for a “safety first” attitude and daily practice in simulator training where buffet levels, unusual attitudes and even the possibility of mechanical failure, require the routine use of full seat belts, seat locks and security of loose objects.

## 15. Human Factors and UPRT

### 15.1 The Importance of Human Factors Training

15.1.1 Human Factors (HF) are an integral part of UPRT. The focus of HF integration into UPRT is to address the pilot behaviors and physiological responses leading up to and in the event of, a flight path divergence or a sudden upset.

15.1.2 Until recently, initial and recurrent training did not promote and test the capacity to react to the unexpected. The vast proportion of training has involved standardized and predictable responses to non-normal events whether they involve weather, systems or human factors issues such as incapacitation.

15.1.3 This training, though worthwhile, has implicitly excluded “surprise” and “startle” events and hence has not provided crews with the opportunity to experience events with a significant “surprise and startle” factor. In particular, the rapid increase in crew workload and degradation of communications and coordination in sudden events is something that traditionally trained crews have rarely been exposed to. Analysis shows that in response to “startle” events, both pilots can attempt to take control and act with little co-ordination and lose their teamwork focus.

### 15.2 A Human Factors Example

15.2.1 Most human factors issues required to be included in an UPRT program were encapsulated in the report on the Air France A330 accident over the Atlantic Ocean. The report noted that the 'startle effect' has typically played a major role both in the destabilization of the flightpath and in the failures of crews to adequately comprehend and respond to the situation.

### 15.2.2 Recommendations from that investigation included:

- Review the requirements for initial, recurrent and type rating training, in order to develop and maintain a capacity to manage crew resources when faced with the surprise generated by unexpected situations.
- Ensure that operators reinforce CRM training, to enable acquisition and maintenance of adequate behavioral automatic responses in unexpected and unusual situations with a highly charged emotional factor.
- Define instructor selection and recurrent training criteria, that would allow a high and standardized level of instruction to be maintained.
- Modify the basis of the regulations, in order to ensure better fidelity for simulators in reproducing realistic scenarios of abnormal situations.
- Ensure the introduction into the training scenarios of the effects of surprise, to train pilots to face these phenomena and work in situations with a highly charged emotional factor, taking into account the unique characteristics of the type being flown.

## 16. UPRT Entry Control and Post-Implementation Oversight

### 16.1 General

- 16.1.1 For a new operator, UPRT assessments will be included in the wider assessment of an exposition under applicable PNG CAR. Elements to be considered will follow the guidance in Chapter 6 of ICAO Doc 10011.
- 16.1.2 For an existing air transport operator implementing their UPRT program, CASAPNG will work with each operator or training provider to define an implementation strategy which will initially involve amendments to the existing training and checking program. These would then become accepted elements of the operator's exposition.
- 16.1.3 The world-wide shift towards systems-based approaches (for example, SMS and QA) requires the implementation and maintenance of good governance practices in UPRT by industry and authorities alike.
- 16.1.4 The UPRT implementation process should include a re-evaluation of documented policies, processes and procedures, to confirm that training providers have a well-articulated and developed SMS and QA system as described in ICAO Doc 10011.
- 16.1.5 This quality-based approach should not be viewed simply as a paper exercise, where the training provider submits a copy of their quality and safety manuals to CASA for review. CASA will ensure that the documents are consistently being adhered to by all training personnel and their clients.

### 16.2 Manual Flying Operations Policy

- 16.2.1 FAA AC 120-111 identifies degradation of manual flying skills as a contributing factor to LOC-I events. PNG air operators are encouraged to have documented policies addressing manual flight operations. These policies may include:
- encourage manual flight operations when appropriate — including during non-RVSM airspace transits and low workload conditions
  - identify when automation should be used (high workload, airspace procedures requiring precision)
  - ensure augmented crew operations do not prevent pilots from obtaining adequate manual flying practice
  - ensure all pilots have appropriate opportunities to exercise manual flight knowledge and skills in operations.
- 16.2.2 These policies must be documented in the operator's operations manual and reviewed annually as part of the UPRT QA program.

### 16.3 UPRT Approvals

- 16.3.1 Acceptance of FSTD use in a specific UPRT program is separate to the qualification for UPRT. CASAPNG's UPRT 'Assess and Accept' processes will involve reviewing device qualification and training capability of the user.
- 16.3.2 In considering whether to grant an approval or modification to an existing approval for a training

organization to use a qualified device in a UPRT training program, CASAPNG must take into account:

- the capabilities of the training device
- the differences between the characteristics of the flight simulator or flight training device and the characteristics of a specific type of aircraft
- the proposed user's operating and training competencies
- any other matter that affects simulator or device operation or use.

## 16.4 Post-Implementation Oversight

- 16.4.1 The safety consequences of applying poor instructional technique or providing misleading information are arguably more significant with UPRT than in some other areas of training. Training must be effectively managed by the applicable quality and safety management related practices of the training provider, under thorough oversight of the organization's QA program activities.
- 16.4.2 The QA system of a UPRT training provider shall ensure that all UPRT instructors are qualified, competent and current in delivering the course material, and possess the ability to make accurate performance assessments and recommendations for remediation whenever necessary.
- 16.4.3 CASAPNG would expect a training provider to be alert for any signs of developing non-standardization in instructional technique or outcomes. Early lessons from worldwide UPRT program implementation regarding possible shortcomings by UPRT instructors include:
- not noticing getting outside simulator envelope
  - not diagnosing significant errors (for example, rolling pullouts, steps out of order)
  - not understanding the new instructor operating station
  - not training to proficiency
  - not understanding what proficiency is.
- 16.4.4 CASAPNG's oversight responsibilities include entry control processes for training organizations and the continued surveillance of training delivery after UPRT program approval. The main elements of UPRT-related training activities subject to CASAPNG oversight include:
- staff adequacy in terms of number and qualifications
  - validity of instructors' licenses, certificates, ratings and authorizations
  - logbooks
  - appropriate and adequate facilities for the training and the number of students
  - documentation process, with particular emphasis on course documentation including records of system updates, training/operations manuals, etc.
  - training delivery in the classroom and in simulation devices, including briefing and debriefing instructor training
  - QA practices
  - SMS functionality, including pro-active flight data analysis
  - evaluation and checking, where applicable
  - training, examination and assessment records
  - training device qualification and approval.