NOTICE OF PROPOSED AMENDMENT 2017-03

Issue 01
Date of Issue: 15th February 2017

SUBJECT:
UPSET PREVENTION AND RECOVERY TRAINING REQUIREMENTS

REFERENCE PUBLICATIONS:
CAR-ORA
ICAO Annex 1 (Personnel Licensing) – for UPRT requirements in licensing training
ICAO Annex 6, Part I (Aircraft Operations – Commercial Air Transport) – for recurrent training requirements
ICAO Doc 9868 (PANS – Training)
ICAO Doc 10011 (Manual on Upset Prevention and Recovery Training)
FSF: AURTA Rev2 (Rev3 expected in 2017 as AUPRTA)
IATA: Guidance Material and Best Practices for the Implementation of UPRT
American Airlines Training videos (youtube)

REASON:
During the UPRT Workshop organized by the GCAA on 13 December 2016, the UAE Aviation Industry requested clear guidance and realistic time scales for the implementation of UPRT requirements promulgated through DG DIRECTIVE 08-2016.

The GCAA has recently conducted a review of CAR PART IV (CAR-OPS-1, SUBPART N: FLIGHT CREW) as a result of ICAO ANNEX 1 and 6 amendments requiring the implementation of aircraft Upset Prevention and Recovery Training (UPRT)[1].

It is important to mention that:

a) this NPA will withdraw DG DIRECTIVE 2016-08, however Commercial Air Transport (CAT) operators should carefully assess their exposition to such operational risk and may elect to apply the changes proposed herein at the earliest;
b) this NPA applies to CAT operators, however operators other than CAT may elect to apply similar UPRT for their Flight Crews; and
c) the changes proposed will apply on 1st September 2017, however CAT operators may elect to apply the changes proposed herein at the earliest after careful assessment of their exposition to such operational risk.

CAT Operators should, prior to starting any UPRT, focus their initial UPRT implementation on preventive elements (knowledge development; and simulator training within the existing valid training envelope). The recovery

[1] Appendix A provides more information on UPRT.

training exercises for the aircraft type operated should be performed within the valid training envelope of the simulator. Generic upset recovery training on advanced simulators or suitable aircraft is recommended, at least for a core group of UPRT instructors.

Full use of extended VTE should be made as soon as practicable once the simulator has been approved for the extended envelope.

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~~Text to be deleted is shown with a line through it~~ followed or preceded by the replacement text which is highlighted with grey shading.	Existing text to be replaced by new text

RECOMMENDATION:
This notice is published to announce to the public amendment proposals to CAR-OPS-1 and to entitle all concerned parties to:

a) Review the attached proposed regulation (Appendix C);
b) Agree on the date of applicability to the proposed change set to 1st September 2017[2]; and
c) Submit their comments on the changes and date of applicability online through the GCAA website by 15th May 2017[3].

Comments must be submitted through the GCAA Website – E-Publication – Notice of Proposed Amendment, using the Action of "Submit NPA Feedback Request". Any comments submitted using another means will not be considered.

Comments and Responses may be viewed in the Comments Response Document CRD pertaining to this NPA on the GCAA website.

[2] A phased implementation is suggested to allow quick implementation of the preventive elements to achieve early safety benefits, while advanced flight simulator capabilities for more comprehensive recovery training are developed.
[3] Appendices A and B are only additional guidance for information. They do not constitute a part of the proposed change.

APPENDIX A – ADDITIONAL LITERATURE FOR DEVELOPMENT OF AN UPRT

ICAO Annex 6 Part I requires that Commercial Air Transport (CAT) Aeroplane Operators establish and maintain a ground and flight training programme for all flight crew members that includes effective Upset Prevention and Recovery Training (UPRT) to reduce the risk of Loss-Of-Control In-Flight (LOC-I) events.
Flight Crews shall be trained to proficiently

a) prevent aeroplane upsets;
b) recover from developing aeroplane upsets; and
c) recover from developed aeroplane upsets.

Only few FSTDs currently have the capability to accurately represent handling quality and flight characteristics (in particular g-loads) of fully developed upset conditions and recovery manoeuvers. While this capability should be developed as a matter of urgency, the focus of UPRT should be on the PREVENTION of upsets; and recognition of and recovery from DEVELOPING upsets. This can be achieved by academic training and in conventional FSTDs.

General UPRT objectives:

a) heightened situational awareness
b) early recognition of (developing) upsets
c) effective avoidance
d) effective and timely recovery (strictly following standard procedures)
e) Train to proficiency! Prevent inappropriate or incomplete training (some trained practices were found to be not only ineffective but were also considered a contributory factor, which led to inappropriate responses by some flight crews).

All instructors designated to provide training in a UPRT programme should have successfully completed an approved UPRT instructor qualification training course (Doc 9868 PANS TRG). The main objective is to ensure correct application of prevention strategies and recovery procedures.
Academic training is a pre-requisite. The historic background (incidents and accidents) leading to the need for improved UPRT and the theoretical foundations (e.g. basic and advanced aerodynamics; aircraft systems; …) can be acquired through computer based training (CBT) or through classroom instruction. Knowledge of the trainee should be confirmed/re-inforced during briefing for simulator training.

Trainees should understand the systems of their aeroplane relevant to UPRT and how these systems can cause an upset; contribute to it; or help to recognize developing/developed upsets; or support the recovery manoeuvers:

a) Primary flight controls (elevator, rudder, aileron)
b) Secondary flight controls (trim, spoilers/speed brakes, thrust)
c) automation (including modes and mode reversions)
d) envelope protection (if applicable)
e) speed tape indications
f) angle of attack (AoA; “α”, can be approximated using flight path vector)
g) side-slip angle (“β”)

APPENDIX B – BASIC KNOWLEDGE OF AIRCRAFT AERODYNAMICS, ATTITUDE AND HANDLING QUALITY

Emphasis needs to be on providing pilots with the skill sets to prevent conditions that could lead to upsets or LOC-I. They need to recognize and avoid situations that are conducive to encountering an in-flight upset at the earliest opportunity.
Every aspect of UPRT should focus on PREVENTION. Correct energy management is key to flight safety. Training should emphasize what to monitor during normal operations (e.g. AoA, trim awareness; high/low speed indications on speed tape, including trend vector) and during an upset recovery.

The RECOVERY training should enhance the understanding, where the prevention strategies could fail or might have failed. A pilot must not wait until the aeroplane is in a fully developed upset before taking recovery action.

The operator needs to develop appropriate procedures based on the OEM's guidance and recommendations, which should be strictly followed.

1. **Relation between stall, stall recovery and upset**
   a) stall is always an upset.
   b) not every upset involves a stalled aircraft.
   c) stall recovery (if needed) is pre-requisite for upset recovery.

2. **Effective stall recovery vs minimizing altitude loss**
   a) attempting to minimize altitude loss might prolong the stall/upset recovery, especially when on the negative side of the power/drag curve. Be prepared to trade altitude.
   b) close to ground it is still important to keep or restore controllability, i.e. be out of stall to be able to achieve best performance for the ground collision avoidance.

Use load factor / speed diagram to demonstrate the g-load and speed changes during the recovery (provides better understanding of the "push to unload" strategy). The diagram shows clearly that negative g does not further improve the situation and should therefore be avoided. Similarly, although the wing is not stalled with speed zero at zero g, aircraft control can only be achieved by the thrust vectors and the speed range close to zero should be avoided. Remember that the target is a safe speed at 1g.

Use aircraft speed band clues (low and high speed indications, speed trend arrow) to fine-tune the recovery, but always observe the SOP sequence.

Simulator Limitations: FSTD regulations are designed to ensure a realistic representation of the aircraft and its flight characteristics. The motion system enables the perception of accelerations, can however create only a limited amount of g-forces. It is sufficient to give pilots a realistic feeling within the valid training envelope (VTE), which should encompass all "normal" flight maneuvers including engine failure, steep turns and approach to stall. It is essential that training (including UPRT) is conducted only within the VTE to avoid undesirable negative aspects of training. Operators are obliged to ensure that simulators they use are operating with valid OEM data.

ADDITIONAL AIRCRAFT KNOWLEDGE

1. **Basic knowledge of aircraft performance and aerodynamics include:**
   a) aircraft are designed for stability (dihedral, swept wing; stabilizer down force; ...) – instable on negative side of power/drag curve!
   b) stabilizer trim – wide range to provide stability over whole range of CG, configurations and speed; elevator not able to overcome large out-of-trim conditions (both nose-down and nose-up); for a given configuration and CG: stabilizer setting = speed
   c) rudder: designed to compensate the enormous yaw moments in case of an engine failure; way too powerful in normal and upset flight conditions; potential for catastrophic failure by cyclic application;
   d) pitch/power relationship and pitch effect of underslung engines
   e) pitch and power values for unreliable airspeed
   f) angle of attack (for many situations more relevant than indicated airspeed; approximation with "flight path vector" or similar device if no AoA indication);
   g) coefficient of lift (C/L diagram); influence of slats, flaps and spoilers
   h) lift vector – needs to point into the right direction to achieve best performance
   i) load factor diagram (envelope in clean configuration and with flaps extended; influence of bank angle): areas to avoid[4];
   j) use of indications on speed tape
   k) recovery sequence

2. **Advanced aerodynamic:**
   a) phugoid, dutch roll; pilot-induced oscillations
   b) crossover angle of attack (limited roll authority of ailerons; > support roll by rudder: gently)
   c) undesired lift loss (and increased drag) due to spoiler extension during roll support in situations where maximum performance is needed (e.g. terrain avoidance); > control roll by rudder: gently.

[4] avoid (during recovery):
- less than 0g (reduces stall margin); recovery target is ~0.5 g
- speeds close to 0 (potential for tail slide!)

APPENDIX C – PROPOSED CHANGES TO CAR-OPS 1

---- START PROPOSAL ----

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SUBPART A. APPLICABILITY

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CAR-OPS 1.003 Terminology

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Upset Prevention And Recovery Training (UPRT) definitions:

1. 'Aeroplane upset prevention and recovery training' means a combination of theoretical knowledge and flying training with the aim of providing flight crew with the required competencies to prevent or recover from developing or developed aeroplane upsets.
2. 'Aeroplane upset' means an aeroplane in flight unintentionally exceeding the parameters normally experienced in line operations or training, normally defined by the existence of at least one of the following parameters:
   (a) pitch attitude greater than 25 degrees nose up;
   (b) pitch attitude greater than 10 degrees nose down;
   (c) bank angle greater than 45 degrees; or
   (d) within the above parameters, but flying at airspeeds inappropriate for the conditions.
3. 'Angle of attack (AOA)' means the angle between the oncoming air, or relative wind, and a defined reference line on the aeroplane or wing.
4. 'Approach-to-stall' means flight conditions bordered by the stall warning and stall.
5. 'Competency' means a combination of skills, knowledge, and attitudes required to perform a task to the prescribed standard.
6. 'Developed upset' means a condition meeting the definition of an aeroplane upset.
7. 'Developing upset' means any time the aeroplane begins to unintentionally diverge from the intended flight path or airspeed.
8. 'Energy state' means how much of each kind of energy (kinetic, potential or chemical) the aeroplane has available at any given time.
9. 'Error' means an action or inaction by the flight crew that leads to deviations from organisational or flight crew intentions or expectations.

10. ‘Error management’ means the process of detecting and responding to errors with countermeasures that reduce or eliminate the consequences of errors, and mitigate the probability of further errors or undesired aircraft states.

11. ‘First indication of a stall’ means the initial aural, tactile or visual sign of an impending stall, which can be either naturally or synthetically induced.

12. ‘Flight crew resilience’ means the ability of a flight crew member to recognise, absorb and adapt to disruptions.

13. ‘Fidelity level’ means the level of realism assigned to each of the defined FSTD features.

14. ‘Flight path’ means the trajectory or path of the aeroplane travelling through the air over a given space of time.

15. ‘Flight path management’ means active manipulation, using either the aeroplanes automation or manual handling, to command the aeroplane flight controls to direct the aeroplane along a desired trajectory.

16. ‘Load factor’ factor means the ratio of a specified load to the weight of the aeroplane, the former being expressed in terms of aerodynamic forces, propulsive forces, or ground reactions.

17. ‘Loss of control in flight (LOCI)’ means a categorisation of an accident or incident resulting from a deviation from the intended flight path.

18. ‘Manoeuvre-based training’ means training that focuses on a single event or manoeuvre in isolation.

19. ‘Negative training’ means training which unintentionally introduces incorrect information or invalid concepts, which could actually decrease rather than increase safety.

20. ‘Negative transfer of training’ means the application (and ‘transfer’) of what was learned in a training environment (i.e., a classroom, an FSTD) to normal practice, i.e. it describes the degree to which what was learned in training is applied to actual normal practices. In this context, negative transfer of training refers to the inappropriate generalisation of knowledge and skill to a situation or setting in normal practice that does not equal the training situation or setting.

21. ‘Post-stall regime’ means flight conditions at an angle of attack greater than the critical angle of attack.

22. ‘Scenario-based training’ means training that incorporates manoeuvres into real-world experiences to cultivate practical flying skills in an operational environment.

23. 'Stall' means a loss of lift caused by exceeding the aeroplane's critical angle of attack.
Note: A stalled condition can exist at any attitude and airspeed, and may be recognised by continuous stall warning activation accompanied by at least one of the following:
(a) buffeting, which could be heavy at times;
(b) lack of pitch authority and/or roll control; and
(c) inability to arrest the descent rate.

24. 'Stall Event' means an occurrence whereby the aeroplane experiences conditions associated with an approach-to-stall or a stall.

25. 'Stall (event) recovery procedure' means the manufacturer-approved aeroplane-specific stall recovery procedure. If an OEM-approved recovery procedure does not exist, the aeroplane-specific stall recovery procedure developed by the operator, based on the stall recovery template contained in GM5 CAR-OPS 1.945&1.965, may be used.

26. 'Stall warning' means a natural or synthetic indication provided when approaching a stall that may include one or more of the following indications:
a) aerodynamic buffeting (some aeroplanes will buffet more than others);
b) reduced roll stability and aileron effectiveness;
c) visual or aural cues and warnings;
d) reduced elevator (pitch) authority;
e) inability to maintain altitude or arrest rate of descent; and
f) stick shaker activation (if installed).
Note: A stall warning indicates an immediate need to reduce the angle of attack.

27. 'Startle' means the initial short-term, involuntary physiological and cognitive reactions to an unexpected event that commence the normal human stress response.

28. 'Stick pusher' means a device that, automatically applies a nose down movement and pitch force to an aeroplane's control columns, to attempt to decrease the aeroplane's angle of attack. Device activation may occur before or after aerodynamic stall, depending on the aeroplane type.
Note: A stick pusher is not installed on all aeroplane types.

29. 'Stick shaker' means a device that automatically vibrates the control column to warn the pilot of an approaching stall.
Note: A stick shaker is not installed on all aeroplane types.

30. 'Stress (response)' means the response to a threatening event that includes physiological, psychological and cognitive effects. These effects may range from positive to negative and can either enhance or degrade performance.

31. 'Surprise' means the emotionally-based recognition of a difference in what was expected and what is actual.

32. 'Threat' means events or errors that occur beyond the influence of the flight crew, increase operational complexity and must be managed to maintain the margin of safety.

33. 'Threat management' means the process of detecting and responding to threats with countermeasures that reduce or eliminate the consequences of threats and mitigate the probability of errors or undesired aircraft states.

34. 'Train-to-proficiency' means approved training designed to achieve end-state performance objectives, providing sufficient assurances that the trained individual is capable to consistently carry out specific tasks safely and effectively.
Note: In the context of this definition, 'train-to-proficiency' can be replaced by 'training-to proficiency'.

35. 'Undesired aircraft state' means flight crew-induced aircraft position or speed deviation, misapplication of controls, or incorrect systems configuration, associated with a reduction in margins of safety.
Note: Undesired states can be managed effectively, restoring margins of safety, or flight crew response(s) can induce an additional error, incident, or accident.
Note: All countermeasures are necessary flight crew actions. However, some countermeasures to threats, errors and undesired aircraft states that flight crew employ, build upon 'hard'/systemic-based resources provided by the aviation system.

36. 'Unsafe situation' means a situation, which has led to an unacceptable reduction in safety margin.

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CAR-OPS 1.945 Conversion training and checking

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a) An operator shall ensure that a flight crew member
   i. completes a Type Rating course which satisfies the requirements applicable to the issue of Flight Crew Licences; and
   ii. completes Upset Prevention and Recovery Training before conducting commercial air transport operations

   when changing from one type of aeroplane to another type or class for which a new type or class rating is required

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CAR-OPS 1.965 Recurrent training and checking

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a) *General:* An operator shall ensure that:
   1) Each flight crew member undergoes recurrent training and checking including Upset Prevention and Recovery Training when conducting commercial air transport operations and that all such training and checking is relevant to the type or variant of aeroplane on which the flight crew member operates;

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AMC1 CAR-OPS 1.945&1.965 OPERATOR CONVERSION TRAINING AND CHECKING & RECURRENT TRAINING AND CHECKING

UPSET PREVENTION AND RECOVERY TRAINING (UPRT) FOR COMPLEX MOTOR-POWERED AEROPLANES WITH A MAXIMUM OPERATIONAL PASSENGER SEATING CONFIGURATION (MOPSC) OF MORE THAN 19

(a) Upset prevention training should:

(1) consist of ground training and flight training in an FSTD or an aeroplane;

(2) include upset prevention elements from Table 1 for the conversion training course; and

(3) include upset prevention elements in Table 1 for the recurrent training programme at least every 12 calendar months, such that all the elements are covered over a period not exceeding 3 years.

Table 1: Elements and respective components of upset prevention training

	Elements and components	Ground training	FSTD or Aeroplane training
A.	**Aerodynamics**		
1.	General aerodynamic characteristics	•	
2.	Aeroplane certification and limitations	•	
3.	Aerodynamics (high and low altitudes)	•	•
4.	Aeroplane performance (high and low altitudes)	•	•
5.	Angle of attack (AOA) and stall awareness	•	•
6.	Stick shaker or other stall-warning device activation (as applicable)	•	•
7.	Stick pusher (as applicable)	•	•
8.	Mach effects (if applicable to the aeroplane type)	•	•
9.	Aeroplane stability	•	•
10.	Control surface fundamentals	•	•
11.	Use of trims	•	•
12.	Icing and contamination effects	•	•
13.	Propeller slipstream (as applicable)	•	•
B.	**Causes of and contributing factors to upsets**		
1.	Environmental	•	•
2.	Pilot-induced	•	•
3.	Mechanical (aeroplane systems)	•	•
C.	**Safety review of accidents and incidents relating to aeroplane upsets**		

1.	Safety review of accidents and incidents relating to aeroplane upsets	•	•
D.	**g-load awareness and management**		
1.	Positive/negative/increasing/decreasing g-loads	•	•
2.	Lateral g awareness (sideslip)	•	•
3.	g-load management	•	•
E.	**Energy management**		
1.	Kinetic energy vs potential energy vs chemical energy (power)	•	•
F.	**Flight path management**		
1.	Relationship between pitch, power and performance	•	•
2.	Performance and effects of differing power plants (if applicable)	•	•
3.	Manual and automation inputs for guidance and control	•	•
4.	Type-specific characteristics	•	•
5.	Management of go-arounds from various stages during the approach	•	•
6.	Automation management	•	•
7.	Proper use of rudder	•	•
G.	**Recognition**		
1.	Type-specific examples of physiological, visual and instrument clues during developing and developed upsets	•	•
2.	Pitch/power/roll/yaw	•	•
3.	Effective scanning (effective monitoring)	•	•
4.	Type-specific stall protection systems and cues	•	•
5.	Criteria for identifying stalls and upsets	•	•
H.	**System malfunction** (including immediate handling and subsequent operational considerations, as applicable)		
1.	Flight control defects	•	•
2.	Engine failure (partial or full)	•	•
3.	Instrument failures	•	•
4.	Loss of reliable airspeed	•	•
5.	Automation failures	•	•
6.	Fly-by-wire protection degradations	•	•
7.	Stall protection system failures including icing alerting systems	•	•

I.	**Manual handling skills** (no autopilot, no autothrust/autothrottle and, where possible, without flight directors)		
1.	Flight at different speeds, including slow flight, and altitudes within the full normal flight envelope		•
2.	Procedural instrument flying and manoeuvring including instrument departure and arrival		•
3.	Visual approach		•
4.	Go-arounds from various stages during the approach		•
5.	Steep turns		•

(b) Upset recovery training should:

(1) consist of ground training and flight training in an FFS qualified for the training task;

(2) be completed from each seat in which a pilot's duties require him/her to operate; and

(3) include the recovery exercises in Table 2 for the recurrent training programme, such that all the exercises are covered over a period not exceeding 3 years.

Table 2: Exercises for upset recovery training

	Exercises	**Ground training**	**FFS training**
A.	**Recovery from developed upsets**		
1.	Timely and appropriate intervention	•	•
2.	Recovery from stall events, in the following configurations; — take-off configuration, — clean configuration low altitude, — clean configuration near maximum operating altitude, — landing configuration during the approach phase; and — terrain-critical scenarios.	•	•
3.	Recovery from nose high at various bank angles	•	•
4.	Recovery from nose low at various bank angles	•	•
5.	Consolidated summary of aeroplane recovery techniques	•	•

(c) The operator should ensure that personnel providing FSTD UPRT are competent and current to deliver the training, and understand the capabilities and limitations of the device used.

(d) The FFS qualification requirements in (b)(1) are further clarified in the Guidance Material (GM).

AMC2 CAR-OPS 1.945&1.965 OPERATOR CONVERSION TRAINING AND CHECKING & RECURRENT TRAINING AND CHECKING

UPSET PREVENTION AND RECOVERY TRAINING (UPRT) FOR COMPLEX MOTOR-POWERED AEROPLANES WITH A MAXIMUM OPERATIONAL PASSENGER SEATING CONFIGURATION (MOPSC) OF 19 OR LESS

a) Upset prevention training should:

1) consist of ground training and flight training in an FSTD or an aeroplane;

2) include upset prevention elements in Table 1 of **AMC1 CAR-OPS 1.945&1.965** for the conversion training course; and

3) include upset prevention elements in Table 1 of **AMC1 CAR-OPS 1.945&1.965** for the recurrent training programme at least every 12 calendar months, such that all the elements are covered over a period not exceeding 3 years.

b) Upset recovery training should:

(1) consist of ground training and flight training in an FFS qualified for the training task, if available;

(2) be completed from each seat in which a pilot's duties require him/her to operate; and

(3) include the recovery exercises in Table 2 of **AMC1 CAR-OPS 1.945&1.965** for the recurrent training programme, such that all the exercises are covered over a period not exceeding 3 years.

(b) The operator should ensure that personnel providing FSTD UPRT are competent and current to deliver the training, and understand the capabilities and limitations of the device used.

(c) The FFS qualification requirements in (b)(1) are further specified in the Guidance Material (GM).

GM1 CAR-OPS 1.945 OPERATOR CONVERSION TRAINING AND CHECKING

OPERATOR CONVERSION COURSE (OCC) FOR MULTI-CREW PILOT LICENCE (MPL) HOLDERS

When defining the amount of training for MPL holders, who undertake their first conversion course on a new type or at an operator other than the one that was involved in their training for the MPL, the operator should put a process in place to ensure that corrective action can be taken if post-MPL licence training evaluation indicates the need to do so.

GM1 CAR-OPS 1.945&1.965 OPERATOR CONVERSION TRAINING AND CHECKING & RECURRENT TRAINING AND CHECKING

UPSET PREVENTION AND RECOVERY TRAINING (UPRT) FOR COMPLEX MOTOR-POWERED AEROPLANES

The objective of the UPRT is to help flight crew acquire the required competencies in order to prevent or recover from a developing or developed aeroplane upset. Prevention training prepares flight crew to avoid incidents whereas recovery training prepares flight crew to prevent an accident once an upset condition has developed.

HUMAN FACTORS

Threat and Error Management (TEM) and Crew Resource Management (CRM) principles should be integrated into the UPRT. In particular, the surprise and startle effect, and the importance of resilience development should be emphasised.

Training should also emphasise that an actual upset condition may expose flight crew to significant physiological and psychological challenges, such as visual illusions, spatial disorientation and unusual g-forces, with the objective to develop strategies to deal with such challenges.

USE OF FSTD FOR UPRT

The use of an FSTD provides valuable training without the risks associated with aeroplane training. In order to avoid 'negative transfer of training', the capabilities of the specific FSTD to be used should be considered when designing and delivering the training programme, especially when manoeuvre training could involve operation outside the normal flight envelope of the aeroplane, for example during aerodynamic stall. Type specific content contained in the training programme should be developed in consultation with the Original Equipment Manufacturers (OEMs).

Some FSTDs may offer capabilities that could enhance the UPRT, such as Instructor Operating Station (IOS) features. Operators may consider the value of such features in support of their training objectives.

ADDITIONAL GUIDANCE

Specific guidance to the UPRT elements and exercises contained in the AMC is available from the latest revision of the ICAO Document 10011 ('Manual on UPRT').

Further guidance is available from revision 2 of the aeroplane upset recovery training aid (AURTA), the UK CAA Paper 2013/02 ('Monitoring Matters'), and the Flight Safety Foundation Publication ('A Practical Guide for Improving Flight Path Monitoring'), November 2014. + IATA

GM2 CAR-OPS 1.945&1.965 OPERATOR CONVERSION TRAINING AND CHECKING & RECURRENT TRAINING AND CHECKING

UPSET PREVENTION TRAINING FOR COMPLEX MOTOR-POWERED AEROPLANES

The recurrent training should prioritise the upset prevention elements and respective components according to the operator's safety risk assessment.

Upset prevention training should use a combination of manoeuvre-based and scenario-based training. Scenario-based training may be used to introduce flight crew to situations, which, if not correctly managed, could lead to an upset condition. Relevant TEM and CRM aspects should be included in scenario-based training and the flight crew should understand the limitations of the FSTD in replicating the physiological and psychological aspects of exposure to upset prevention scenarios.

In order to avoid negative training and negative transfer of training, operators should ensure that the selected upset prevention scenarios and exercises take into consideration the limitations of the FSTD and the extent to which it represents the handling characteristics of the actual aeroplane. If it is determined that the FSTD is not suitable, the operator should ensure that the required training outcome can be achieved by other means.

GO-AROUNDS FROM VARIOUS STAGES DURING THE APPROACH

Operators should conduct the go-around exercises from various altitudes during the approach with all engines operating, taking into account the following considerations:

a) Un-planned go-arounds expose the crew to the surprise and startle effect;

b) Go-arounds with various aeroplane configurations and different weights; and

c) Balked landings (between Decision Altitude and touchdown or after touchdown unless thrust reversers have been activated).

In addition to full thrust all engine go-arounds, operators should consider including exercises using the 'limited thrust' go-around procedure, when available. This procedure reduces the risk of the airframe structural limits being exceeded and reduces the risk of crew being exposed to somatogravic illusion and disorientation effects, thereby reducing the risk of aeroplane upsets further.

The go-around exercises should always be performed in accordance with the OEM procedures and recommendations.

GM3 CAR-OPS 1.945&1.965 OPERATOR CONVERSION TRAINING AND CHECKING & RECURRENT TRAINING AND CHECKING

UPSET RECOVERY TRAINING FOR COMPLEX MOTOR-POWERED AEROPLANES

The upset recovery training exercises should be manoeuvre-based, which enables flight crew to apply their handling skills and recovery strategy whilst leveraging CRM principles to return the aeroplane from an upset condition to a stabilised flight path.

The flight crew should understand the limitations of the FFS in replicating the physiological and psychological aspects of upset recovery exercises.

In order to avoid negative training and negative transfer of training, operators should ensure that the selected upset recovery exercises take into consideration the limitations of the FFS.

STALL EVENT RECOVERY TRAINING

It is of utmost importance that stall event recovery training takes into account the capabilities of the FFS used. Most current and grandfathered FFS models are deficient in representing the aeroplane in the aerodynamic stall regime, thus practising of 'full stall' in such a device could potentially result in negative training or negative transfer of training. The term 'stall event' is therefore introduced to cater for the capability of current and grandfathered FFS, and for potential future FFS enhancements. A 'stall event' is defined as an occurrence whereby the aeroplane experiences one or more conditions associated with an approach-to-stall or an aerodynamic stall.

IMPORTANT – when using current or grandfathered FFS, the stall event recovery exercises should only be conducted as approach-to-stall exercises.

Stall event recovery training should emphasise the requirement to reduce the angle of attack (AOA) whilst accepting the resulting altitude loss. High-altitude stall event training should be included so that flight crew

appreciate the aeroplane control response, the significant altitude loss during the recovery, and the increased time required. The training should also emphasise the risk of triggering a secondary stall event during the recovery.

Recovery from a stall event should always be in accordance with the stall event recovery procedures of the OEMs. If an OEM-approved recovery procedure does not exist, operators should develop and train the aeroplane-specific stall recovery procedure based on the template in Table 1 below.

Refer to revision 2 of the AURTA for a detailed explanation and rationale on the stall event recovery template as recommended by the OEMs.

Table 1: Recommended Stall Event Recovery Template

<table>
<tr><td colspan="3">Stall Event Recovery Template</td></tr>
<tr><td colspan="3">Pilot Flying - Immediately do the following at first indication of a stall (aerodynamic buffeting, reduced roll stability and aileron effectiveness, visual or aural cues and warnings, reduced elevator (pitch) authority, inability to maintain altitude or arrest rate of descent, stick shaker activation (if installed).) – during any flight phases except at lift-off.</td></tr>
<tr><td colspan="2">Pilot Flying (PF)</td><td>Pilot Monitoring (PM)</td></tr>
<tr><td>1.</td><td>AUTOPILOT – DISCONNECT
(A large out-of-trim condition could be encountered when the autopilot is disconnected.)</td><td rowspan="7">MONITOR airspeed and attitude throughout the recovery and ANNOUNCE any continued divergence</td></tr>
<tr><td>2.</td><td>AUTOTHRUST/AUTOTHROTTLE – OFF</td></tr>
<tr><td>3.</td><td>a) NOSE DOWN PITCH CONTROL apply until stall warning is eliminated
b) NOSE DOWN PITCH TRIM (as needed)
(Reduce the angle of attack (AOA) whilst accepting the resulting altitude loss.)</td></tr>
<tr><td>4.</td><td>BANK – WINGS LEVEL</td></tr>
<tr><td>5.</td><td>THRUST – ADJUST (as needed)
(Thrust reduction for aeroplanes with underwing mounted engines may be needed)</td></tr>
<tr><td>6.</td><td>SPEEDBRAKES/SPOILERS – RETRACT</td></tr>
<tr><td>7.</td><td>When airspeed is sufficiently increasing - RECOVER to level flight
(Avoid the secondary stall due premature recovery or excessive g-loading.)</td></tr>
</table>

NOSE HIGH AND NOSE LOW RECOVERY TRAINING

Nose-high and nose-low recovery training should be in accordance with the strategies recommended by the OEMs contained in the Tables 2 and 3 below. As the OEM procedures always take precedence over the recommendations, operators should consult their OEM on whether any approved type- specific recovery procedures are available prior to using the templates.

Refer to revision 2 of the AURTA for a detailed explanation and rationale on the nose high and nose low recovery strategies as recommended by the OEMs.

Table 2: Recommended Nose High Recovery Strategy Template

Nose HIGH Recovery Strategy		
Either pilot - Recognise and confirm the developing situation by announcing: **'Nose High'**		
PF		**PM**
1.	**AUTOPILOT – DISCONNECT** (A large out of trim condition could be encountered when the AP is disconnected.)	**MONITOR** airspeed and attitude throughout the recovery and **ANNOUNCE** any continued divergence
2.	**AUTOTHRUST/AUTOTHROTTLE – OFF**	
3.	**APPLY** as much nose-down control input as required to obtain a nose-down pitch rate	
4.	**THRUST – ADJUST** (if required) (Thrust reduction for aeroplanes with underwing mounted engines may be needed.)	
5.	**ROLL – ADJUST** (if required) (Avoid exceeding 60 degrees bank.)	
6.	When airspeed is sufficiently increasing - **RECOVER** to level flight (Avoid the secondary stall due premature recovery or excessive g-loading.)	

Table 3: Recommended Nose Low Recovery Strategy Template

Nose LOW Recovery Strategy Template		
Either pilot - Recognise and confirm the developing situation by announcing: **'Nose Low'** (If the autopilot or autothrust/autothrottle is responding correctly, it may not be appropriate to decrease the level of automation while assessing if the divergence is being stopped.)		
PF		**PM**
1.	**AUTOPILOT – DISCONNECT** (A large out of trim condition could be encountered when the AP is disconnected.)	**MONITOR** airspeed and attitude throughout the recovery and **ANNOUNCE** any continued divergence
2.	**AUTOTHRUST/AUTOTHROTTLE – OFF**	
3.	**RECOVERY** from stall if required	
4.	**ROLL** in the shortest direction to wings level. (It may be necessary to reduce the g-loading by applying forward control pressure to improve roll effectiveness)	
5.	**THRUST** and **DRAG – ADJUST** (if required)	
6.	**RECOVER** to level flight. (Avoid the secondary stall due premature recovery or excessive g-loading.)	
NOTE: 1) Recovery to level flight may require use of pitch trim. 2) **WARNING:** Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.		

GM4 CAR-OPS 1.945&1.965 OPERATOR CONVERSION TRAINING AND CHECKING & RECURRENT TRAINING AND CHECKING

FFS QUALIFIED FOR THE UPSET RECOVERY TRAINING TASK

The FFS used for the upset recovery training should be qualified to ensure the training task objectives can be achieved and negative transfer of training is avoided.

A level C or D FFS is qualified for the upset recovery training task, such as the approach-to-stall exercises. Full aerodynamic stall or other exercises outside the validated training envelope (VTE) should not be conducted.

A level B FFS may become qualified for the upset recovery training task if equivalency to at least level C for the specific features needed for the task can be demonstrated in accordance with CS-FSTD(A) Appendix 8 to AMC1 FSTD(A).300 General Technical Requirements for FSTD Qualification Levels, and associated FSTD validation tests. FSTD operators may achieve such demonstration of equivalency through the conduct of a special evaluation by the GCAA. Once the level B FFS is deemed to be qualified, the competent authority should enter the additional capability on the certificate using the wording 'upset recovery training'. FSTD Operators are reminded that the individual FFS used must be approved for the training by the GCAA.

Equivalency to at least level C for the specific features needed for the training task may be demonstrated using the following guidance and list in Table 1 of minimum objective and subjective functional test.

General

1) Refer to Subpart C Aeroplane Flight Simulation Training Devices AMC1 FSTD(A).300(c)(1)(i) and (2)(ii) for the scope of the qualification criteria;
2) A six-degrees-of-freedom motion system should be provided; and
3) The response to control inputs should not be greater than 150 ms more than that experienced on the aeroplane (see Appendix 1 to CS-FSTD(A).300 General r.1).

Table 1: Minimum FSTD standards, validation tests, and functions and subjective tests

FSTD Standards
Appendix 1 to CS-FSTD(A).300 Flight Simulation Training Device Standards (Ref. CS-FSTD(A) pages 9 - 22)
1. General - q.1, r.1, s.1, t.1, w.1
2. Motion System - b.1(3)
3. Visual System - b.2
FSTD Validation Tests
AMC1 FSTD(A).300 Qualification Basis – Table of FSTD Validation Tests (Ref. CS-FSTD(A) pages 46 - 75)
1. Performance - *Climb* - c.(4)
2. Handling Qualities - *Dynamic Control Checks* - b.(1), b.(2), b.(3), b.(4), b.(5), b.(6)
3. Motion System - e.
4. Visual System - a.(1) or a.(2), b.(1)(a)
Functions and Subjective Tests
AMC1 FSTD(A).300 Qualification Basis – Functions and Subjective Tests (CS-FSTD(A) page 115)
p. Special Effects - *Effects of Airframe and Engine Icing* - (2)(a) (See Appendix 1 to CS FSTD(A).300 1.t.1.)

GM5 CAR-OPS 1.945&1.965 OPERATOR CONVERSION TRAINING AND CHECKING & RECURRENT TRAINING AND CHECKING

PERSONNEL PROVIDING FSTD UPSET PREVENTION AND RECOVERY TRAINING (UPRT)

It is of paramount importance that personnel providing UPRT in FSTDs have the specific competence to deliver such training, which may not have been demonstrated during previous instructor qualification training. Operators should, therefore, have a comprehensive training and standardisation programme in place, and may need to provide FSTD instructors with additional training to ensure such instructors have and maintain complete knowledge and understanding of the UPRT operating environment, and skill sets.

Standardisation and training should ensure that personnel providing FSTD UPRT:

a) are able to demonstrate the correct upset recovery techniques for the specific aeroplane type;
b) understand the importance of applying type-specific Original Equipment Manufacturers (OEMs) procedures for recovery manoeuvres;
c) are able to distinguish between the applicable SOPs and the OEMs recommendations (if available);
d) understand the capabilities and limitations of the FSTD used for UPRT;
e) are aware of the potential of negative transfer of training that may exist when training outside the capabilities of the FSTD;
f) understand and are able to use the IOS of the FSTD in the context of effective UPRT delivery;
g) understand and are able to use the FSTD instructor tools available for providing accurate feedback on flight crew performance;
h) understand the importance of adhering to the FSTD UPRT scenarios that have been validated by the training programme developer; and
i) understand the missing critical human factor aspects due to the limitations of the FSTD and convey this to the flight crew receiving the training.

…

CAR-OPS 1.975 Route and Aerodrome Competence qualification
(See AMC OPS 1.975)

(a) An operator shall ensure that, prior to being assigned as commander or as pilot to whom the conduct of the flight may be delegated by the commander, the pilot has obtained adequate knowledge of the route to be flown and of the aerodromes (including alternates), facilities and procedures to be used.

…

GM1 CAR-OPS 1.975(a) Route and aerodrome competence qualification
ENVIRONMENTAL KNOWLEDGE RELATED TO THE PREVENTION OF AEROPLANE UPSETS

The knowledge should include understanding of:

(a) the relevant environmental hazards, such as:
- Clear Air Turbulence (CAT),
- Intertropical Convergence Zone (ITCZ),
- thunderstorms,
- microbursts,
- wind shear,
- icing,
- mountain waves,
- wake turbulence, and
- temperature changes at high altitude;

(b) the evaluation and management of the associated risks of the relevant hazards in (a); and

(c) the available mitigating procedures for the relevant hazards in (a) related to the specific route, route area, or aerodrome used by the operator.

---- END PROPOSAL ----