Annex II to ED Decision 2015/12/R

The Annex to ED Decision 2014/017/R is hereby amended as follows:

The text of the amendment is arranged to show deleted text, new or amended text as shown below:

(a) deleted text is marked with ~~strikethrough~~;

(b) new or amended text is highlighted in grey;

(c) an ellipsis (…) indicates that the remaining text is unchanged in front of or following the reflected amendment.

SUBPART FC — FLIGHT CREW

1. A new AMC1 ORO.FC.220&230 is added:

AMC1 ORO.FC.220&230 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/ 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, and — landing configuration during the approach phase.	•	•
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).

2. A new AMC2 ORO.FC.220&230 is added:

AMC2 ORO.FC.220&230 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 ORO.FC.220&230 for the conversion training course; and

(3) include upset prevention elements in Table 1 of AMC1 ORO.FC.220&230 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 ORO.FC.220&230 for the recurrent training programme, such that all the exercises are covered over a period not exceeding 3 years.

(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 specified in the Guidance Material (GM).

3. A new GM1 ORO.FC.220&230 is added:

GM1 ORO.FC.220&230 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.

4. A new GM2 ORO.FC.220&230 is added:

GM2 ORO.FC.220&230 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:

— Un-planned go-arounds expose the crew to the surprise and startle effect;
— Go-arounds with various aeroplane configurations and different weights; and
— 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.

5. A new GM3 ORO.FC.220&230 is added:

GM3 ORO.FC.220&230 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

Stall Event Recovery Template		
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*.		
Pilot Flying (PF)		**Pilot Monitoring (PM)**
1.	**AUTOPILOT – DISCONNECT** (A large out-of-trim condition could be encountered when the autopilot is disconnected.)	**MONITOR** airspeed and attitude throughout the recovery and **ANNOUNCE** any continued divergence
2.	**AUTOTHRUST/AUTOTHROTTLE – OFF**	
3.	**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.)	
4.	**BANK – WINGS LEVEL**	
5.	**THRUST – ADJUST** (as needed) (thrust reduction for aeroplanes with underwing mounted engines may be needed)	
6.	**SPEEDBRAKES/SPOILERS - RETRACT**	
7.	When airspeed is sufficiently increasing - **RECOVER** to level flight (Avoid the secondary stall due premature recovery or excessive g-loading.)	

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

<table>
<tr><th colspan="3">Nose HIGH Recovery Strategy</th></tr>
<tr><td colspan="3">Either pilot - Recognise and confirm the developing situation by announcing: ‘Nose High’</td></tr>
<tr><td colspan="2">PF</td><td>PM</td></tr>
<tr><td>1.</td><td>AUTOPILOT – DISCONNECT
(A large out of trim condition could be encountered when the AP is disconnected.)</td><td rowspan="6">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>APPLY as much nose-down control input as required to obtain a nose-down pitch rate</td></tr>
<tr><td>4.</td><td>THRUST – ADJUST (if required)
(thrust reduction for aeroplanes with underwing mounted engines may be needed)</td></tr>
<tr><td>5.</td><td>ROLL – ADJUST (if required)
(Avoid exceeding 60 degrees bank.)</td></tr>
<tr><td>6.</td><td>When airspeed is sufficiently increasing - RECOVER to level flight
(Avoid the secondary stall due premature recovery or excessive g-loading.)</td></tr>
<tr><td colspan="3">NOTE:
1) Recovery to level flight may require use of pitch trim.
2) If necessary, consider reducing thrust in aeroplanes with underwing-mounted engines to aid in achieving nose-down pitch rate.
3) WARNING: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.</td></tr>
</table>

Table 3: Recommended Nose Low Recovery Strategy Template

<table>
<tr><th colspan="3">Nose LOW Recovery Strategy Template</th></tr>
<tr><td colspan="3">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.)</td></tr>
<tr><th colspan="2">PF</th><th>PM</th></tr>
<tr><td>1.</td><td>AUTOPILOT – DISCONNECT
(A large out of trim condition could be encountered when the AP is disconnected.)</td><td rowspan="6">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>RECOVERY from stall if required</td></tr>
<tr><td>4.</td><td>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)</td></tr>
<tr><td>5.</td><td>THRUST and DRAG – ADJUST (if required)</td></tr>
<tr><td>6.</td><td>RECOVER to level flight.
(Avoid the secondary stall due premature recovery or excessive g-loading.)</td></tr>
<tr><td colspan="3">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.</td></tr>
</table>

6. A new GM4 ORO.FC.220&230 is added:

GM4 ORO.FC.220&230 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 competent authority. 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 competent authority in accordance with ORO.FC.145(c).

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

- 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;
- A six-degrees-of-freedom motion system should be provided; and
- 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.)

7. A new GM5 ORO.FC.220&230 is added:

GM5 ORO.FC.220&230 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:

(1) are able to demonstrate the correct upset recovery techniques for the specific aeroplane type;

(2) understand the importance of applying type-specific Original Equipment Manufacturers (OEMs) procedures for recovery manoeuvres;

(3) are able to distinguish between the applicable SOPs and the OEMs recommendations (if available);

(4) understand the capabilities and limitations of the FSTD used for UPRT;

(5) are aware of the potential of negative transfer of training that may exist when training outside the capabilities of the FSTD;

(6) understand and are able to use the IOS of the FSTD in the context of effective UPRT delivery;

(7) understand and are able to use the FSTD instructor tools available for providing accurate feedback on flight crew performance;

(8) understand the importance of adhering to the FSTD UPRT scenarios that have been validated by the training programme developer; and

(9) understand the missing critical human factor aspects due to the limitations of the FSTD and convey this to the flight crew receiving the training.

8. A new GM1 ORO.FC.105 is added:

GM1 ORO.FC.105 (b)(2) Route and aerodrome knowledge

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 specifc route, route area, or aerodrome used by the operator.