European Aviation Safety Agency

Notice of Proposed Amendment 2015-13

Loss of control prevention and recovery training

RMT.0581 & RMT.0582 — 1.9.2015

EXECUTIVE SUMMARY

This Notice of Proposed Amendment (NPA) addresses a safety and regulatory coordination issue related to aeroplane Loss of Control In-flight (LOCI). The following initiatives are linked to this NPA: various accident Safety Recommendations; European Aviation Safety Plan (EASp) safety actions and amended International Civil Aviation Organization (ICAO) standards and recommended practices. This NPA proposes to integrate so-called upset prevention and recovery training (UPRT) requirements and provisions into the EU pilot training regulatory framework. An aeroplane upset is a condition whereby an aeroplane unintentionally exceeds the flight parameters experienced during normal flight. Upsets which are not timely corrected are likely to lead to Loss of Control In-flight (LOCI). The proposed training requirements aim to provide pilots with competencies to prevent upsets or to recover from developed upsets. As a result from taking a risk based approach to develop regulations, the main focus of the new training standards is on pilots who intend to pursue a pilot career with a commercial airline. Such pilots would likely complete either an aeroplane Airline Transport Pilot Licence (ATPL(A)) or a Multi-crew Pilot Licence (MPL) integrated course, followed by a type rating on a multi-pilot aeroplane. The proposed pilot training aims to deliver enhanced pilot competencies through additional upset prevention and upset recovery related theoretical knowledge (TK) and flight instruction. Nevertheless, upset *prevention* training is also to be integrated into existing flight syllabi for other aeroplane licence training courses, such as for the Light Aircraft Pilot Licence (LAPL(A)), Private Pilot Licence (PPL(A)) and Commercial Pilot Licence CPL(A). The provisions for the LAPL(A) and PPL(A) training courses mostly related to the General Aviation community are lighter and thus more proportionate when compared to the CPL(A) and ATPL(A) training courses. The newly developed upset *recovery* training in an aeroplane, which is to be mandated for the ATPL(A) training course and also serve as a pre-requisite prior to commencing the first multi-pilot type rating course, is seen as an important step towards enhancing a commercial pilot's resilience to the psychological and physiological aspects often associated with upset conditions, and towards providing them with an enhanced ability to not only overcome these human factor aspects, but to also apply appropriate recovery strategies to return the aeroplane to safe flight. In support of the new standards, the proposals place greater emphasis on the flight and Flight Simulator Training Device (FSTD) instructors who are foreseen to deliver the various UPRT elements. New instructor privileges are proposed for the upset *recovery* training course in an aeroplane. In addition, FSTD instructor training standards are to be increased, notably for those instructors that deliver upset recovery training in existing Full Flight Simulators (FFSs), to ensure that negative transfer of training is avoided.

The proposal also introduces further supporting amendments, such as guidance for NAA inspectors, and is expected to increase safety and ensure harmonisation with ICAO. The foreseen entry into force date of the proposed requirements and provisions is April 2018.

Applicability	
Affected regulations and decisions:	Part-FCL, Part-ARA, Part-ORA, Part-ORO, Part-ARO, CS-FCD, CS-SIMD, CS-FSTD(A) and associated AMC or GM
Affected stakeholders:	Flight crew, instructors, examiners, Approved Training Organisations, 'FSTD only' operators, aeroplane operators, FSTD manufacturers, NAAs
Driver/origin:	Safety, regulatory harmonisation
Reference:	Safety Recommendations: FRAN-2010-004, FRAN-2010-005, FRAN-2011-09, FRAN-2012-39, FRAN-2012-40, FRAN-2012-41, FRAN-2012-46, FRAN-2012-21, NETH-2010-007, SPAN-2011-018, and SOUF-2010-009 European Aviation Safety Plan (EASp) safety actions AER 4.8, 4.10 & 4.16

Process map	
Concept Paper:	Yes
Terms of Reference (Issue 2):	30.4.2015
Rulemaking group:	Yes
RIA type:	Full
Technical consultation during NPA drafting:	No
Duration of NPA consultation:	2 months
Review group:	Yes
Focussed consultation:	No
Publication date of the Opinion:	2016/Q1
Publication date of the Decision:	2017/Q1

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1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this NPA in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity is included in the Agency's Revised 2014–2017 Rulemaking Programme under RMT.0581.

The text of this NPA has been developed by the Agency based on the input of the RMT.0581 RMG. It is hereby submitted for consultation of all interested parties[3].

The process map on the title page contains the major milestones of this rulemaking activity to date and provides an outlook of the timescale of the next steps.

1.2. The structure of this NPA and related documents

Chapter 1 of this NPA contains the procedural information related to this task. Chapter 2 (Explanatory Note) explains the core technical content. Chapter 3 contains the proposed text for the new requirements. Chapter 4 contains the Regulatory Impact Assessment (RIA) showing which options were considered and what impacts were identified, thereby providing the detailed justification for this NPA.

1.3. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at http://hub.easa.europa.eu/crt/[4].

The deadline for submission of comments is **2 November 2015.**

1.4. The next steps in the procedure

The Agency will publish the related Comment-Response Document (CRD) with the Opinion.

The Opinion contains proposed changes to EU regulations and it is addressed to the European Commission, which uses it as a technical basis to prepare a legislative proposal.

The Decision containing the Acceptable Means of Compliance (AMC) and Guidance Material (GM) will be published by the Agency when the related Implementing Rule(s) is (are) adopted by the Commission.

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1 Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1).

2 The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See Management Board Decision 01-2012 of 13 March 2012 concerning the procedure to be applied by the Agency for the issuing of Opinions, Certification Specifications and Guidance Material (Rulemaking Procedure).

3 In accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

4 In case of technical problems, please contact the CRT webmaster (crt@easa.europa.eu).

2. Explanatory Note

This Rulemaking Task (RMT) concerns flight crew licensing requirements aiming to address LOCI. With the introduction of the UPRT concept, the Agency aims to mitigate the risk of future LOCI events.

2.1. Overview of the issues to be addressed

Background

Two Working Groups (WGs), the Loss of Control Avoidance and Recovery Training (LOCART) and the International Committee for Aviation Training in Extended Envelopes (ICATEE), have been examining various means and solutions to address the LOCI issue.

The Federal Aviation Administration (FAA) launched the LOCART initiative, with the Agency's participation, in March 2012 and was supported by ICAO. The LOCART WG consisted of technical experts, including experts of the FAA Aviation Rulemaking Committee (FAA ARC 208). The ARC is a committee established by the FAA Administrator with intent to provide the FAA with recommendations to address the LOCI issue. The LOCART WG has provided recommendations to ICAO and the FAA. The ICATEE was initiated by the Royal Aeronautical Society (RAeS) Flight Simulation Group in June 2009 with the task to deliver a long-term strategy to reduce the rate of LOCI accidents and incidents through enhanced UPRT. The Agency also participated in the ICATEE WG. The outcome of the work completed by both WGs was shared with the aviation community, notably with ICAO, the FAA and the Agency. In general, both WGs recommend an integrated approach reinforced throughout a pilot's career. The recommendations cover initial licensing and operator training requirements.

ICAO published amendments to Annex 1 and 6 in 2014, detailing Standards and Recommended Practices (SARPs) related to UPRT. The amendments to ICAO Annex 1 mandate UPRT for the MPL and multi-pilot type rating training course. In addition, ICAO recommends UPRT in an aeroplane for the CPL training course. Furthermore, the amendments to ICAO Annex 6 contain requirements for UPRT programmes for all Commercial Air Transport (CAT) aeroplane operators. ICAO also provided further supporting guidance on UPRT in ICAO Doc 9868 'Procedures for Air Navigation Services – Training (PANS-TRG)' and ICAO Doc 10011 'Manual on Aeroplane Upset Prevention and Recovery Training'. Moreover, ICAO published amendments to ICAO Doc 9625 containing provisions on FSTD aerodynamic modelling, Instructor Operating Station (IOS) and on what manoeuvres should and should not be trained in an FSTD to avoid negative transfer of training in support of UPRT.

In parallel to the LOCART, ICATEE and ICAO activities, the Agency scheduled RMT.0581 & RMT.0582 on 'Loss of control prevention and recovery training' in its 2014–2019 Rulemaking Programme. In addition, the Agency published various Safety Information Bulletins (SIBs) related to LOCI to bridge the gap until the requirements and provisions developed by RMT.0581 & RMT.0582 are in place.

Moreover, the Agency held workshops in 2009 and 2013 with selected leading industry experts to discuss the LOCI issue and the draft recommendations developed by ICATEE and LOCART. The outcome of the discussions served as a basis of the launch of RMT.0581 & RMT.0582.

Prior to the launch of RMT.0581 & RMT.0582, 13 Safety Recommendations (SRs) were also addressed to the Agency by various national Accident Investigation Boards (AIBs) in relation to the accidents attributed to LOCI, including the Air France flight 447, Spanair flight 5022, and Turkish Airlines flight 1951 accidents. These SRs are as follows:

— FRAN-2012-039: The French Accident Investigation Board (BEA) recommends that European Aviation Safety Agency ensure the integration, in type rating and recurrent training programmes, of exercises that take into account all of the reconfiguration laws. The objective sought is to make its recognition and understanding easier for crews especially when dealing with the level of protection available and the possible differences in handling characteristics, including at the limits of the flight envelope.

— FRAN-2012-040: The BEA recommends that more generally, EASA ensure that type rating and recurrent training programmes take into account the specificities of the aircraft for which they are designed.

— NETH-2010-007: The French Civil Aviation Authority (DGAC), International Civil Aviation Organization (ICAO), Federal Aviation Administration (FAA) and EASA should change their regulations in such a way that airlines and flying training organisations see to it that their recurrent training programmes include practising recovery from stall situations on approach.

— FRAN-2010-004: The BEA recommends that EASA undertake a safety study with a view to improving the certification standards of warning systems for crews during reconfigurations of flight control systems or the training of crews in identifying these reconfigurations and determining the immediate operational consequences.

— FRAN-2010-005: The BEA recommends that EASA, in cooperation with manufacturers, improve training exercises and techniques relating to approach-to-stall to ensure control of the aeroplane in the pitch axis.

— FRAN-2011-009: The BEA recommends that EASA review the content of check and training programmes and make mandatory, in particular, the setting up of specific and regular exercises dedicated to manual aircraft handling of approach-to-stall and stall recovery, including at high altitude.

— SPAN-2011-018: It is recommended that the FAA and EASA require take-off stall recovery as part of initial and recurring training programmes of airline transport pilots.

— SOUF-2010-009: It is recommended that the regulatory and certifying authorities of all States of Design and States of Manufacture should introduce requirements to operators that they should provide flight crews with more basic hand flying and simulator flight training on new generation aircraft to address the technological developments in aviation, inclusive of effective stall training.

— FRAN-2012-021: The BEA recommends that EASA introduce the surprise effect in training scenarios in order to train pilots to react to these phenomena and work under stress.

— FRAN-2012-041: The BEA recommends that EASA define recurrent training programme requirements to make sure, through practical exercises, that the theoretical knowledge, particularly on flight mechanics, is well understood.

— FRAN-2012-046: The BEA recommends that EASA ensure the introduction into the training scenarios of the effects of surprise in order to train pilots to face these phenomena and to work in situations with a highly charged emotional factor.

— FRAN-2013-023: The BEA recommends that EASA review the regulatory requirements for the first CS-25 type rating in order to make mandatory the performance of a go-around in the aeroplane with all engines operating.

— FRAN-2013-041: The BEA recommends that EASA, in cooperation with the national civil aviation authorities, major non-European certification authorities and manufacturers ensure that pilots have practical knowledge of the conduct required during a go-around at

low speed with pitch trim in an unusual nose-up position, and that they make a competence assessment.

— NETH-2014-005: EASA should review the applicable regulations on initial and recurrent flight crew training to assess whether they adequately address the potential degradation of situational awareness (basic pilot skills) and flight path management due to increased reliance on aircraft automation by flight crews.

— FINL-2014-002: EASA should consider the translation, provide more detailed comments on the purpose of this exercise, and clarify it with practical examples. In addition, it is recommended that the possible new translation and the practical examples would be mandated to be incorporated in the training programmes of the training organisations. (Ref.: Exercise 11, 'Spin Avoidance' training in the PPL(A) flight instruction syllabus)

Furthermore, LOCI has also been a recurring issue in the Agency's Annual Safety Review. In addition, EASp contains the following safety actions related to LOCI;

— AER4.8 Response to upset conditions,

— AER4.10 Response to unusual attitudes,

— AER4.16 Flight crew are not adequately trained to respond to loss of control.

Consequently, RMT.0581 & RMT.0582 was launched in 2013/Q4. During the ongoing RMT.0581 & RMT.0582 drafting activities, in 2014/Q3 the Agency, the Commission and the EASA Committee agreed to introduce UPRT requirements in April 2015, based on the ICAO Annex 1 amendments published in 2014, under the Part-FCL licensing rules. Moreover, in January 2015 the Agency decided to also apply an accelerated procedure to develop UPRT provisions for CAT operators as a result of recent LOCI-related accidents. Consequently, the Agency, in consultation with the RMT.0581 & RMT.0582 RMG experts, published new Part-ORO provisions in May 2015 with a date of entry into force in May 2016, thereby already partially addressing the SR and EASp action items.

RMT.0581 & RMT.0582 NPA

Based on the aforementioned developments and activities, the NPA proposals address the remaining parts of the SRs, where possible, and the EASp action items. These parts relate to the licensing requirements of Part-FCL (Annex I), the conditions for the acceptance of licences issued by or on behalf of third countries (Annex III), the authority requirements of Part-ARA (Annex VI), and the training organisation requirements of Part-ORA (Annex VII) to Commission Regulation (EU) No 1178/2011[5]. To ensure consistent oversight in both the Aircrew and Air Operations domains, GM was included in the authority requirements for aircrew in Part-ARA (Annex VI) to Commission Regulation 1178/2011 and in air operations in Part-ARO (Annex II) to Commission Regulation (EU) No 965/2012[6].

This NPA does not, however, address other aeroplane categories (such as helicopters) as the main focus of the aforementioned international working groups and the ICAO SARPs has been primarily

[5] Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011, p. 1).

[6] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).

on aeroplanes. For more detailed analysis of the issues addressed by this proposal, please refer to the RIA Section 4.1. 'Issues to be addressed'.

Connection with related RMTs

Considering the issue from a broader perspective, RMT.0581 & RMT.0582 was preceded by RMT.0411 (OPS.094) 'Crew Resource Management (CRM) training'[7], which was also driven by some of the aforementioned SRs. The publication of the corresponding Decision is planned for 2015/Q4 with a 1-year transition period to provide adequate time for implementation. RMT.0411 (OPS.094) contains provisions on UPRT-related issues, such as the surprise-and-startle effect as well as pilot resilience development. These CRM provisions mainly support UPRT for CAT operators. Moreover, industry-led RMT.595 'Technical review of theoretical knowledge syllabi, learning objectives, and examination procedures for the Air Transport Pilot Licence (ATPL(A)), Multi-Crew Pilot Licence (MPL), Commercial Pilot Licence (CPL), and Instrument Rating (IR)' was requested by the Agency to introduce UPRT Learning Objectives (LOs) into the theoretical knowledge (TK) syllabi for the ATPL(A), MPL and CPL(A) training courses. Furthermore, RMT.0412 & RMT.0413 'Updating Part-ARA/ORA' and RMT.0516 & RMT.0517 'Updating Part-ARO/ORO' were consulted in relation to inspector qualifications.

Full-stall training in the Full-Flight Simulator (FFS)

The FAA has published in 2014 a Part 121 provision for the conduct of full-stall training in the FFS applicable as of 2019 for its CAT operators based on a directive of the US Congress. Whilst the Agency is not bound by such a directive, it has been closely following the developments on this topic. In addition, several EU Member States have also expressed their interest in and support for introducing full-stall training. Several aeroplane manufacturers, notably Airbus and Boeing, are currently in the process of demonstrating certain solutions to provide validated data in support of FFS full-stall training. As the proposed solutions are still in a trial phase, the Agency is currently not in the position to amend the Certification Specifications for Aeroplane Flight Simulation Training Devices (CS-FSTD(A)) with additional standards, objective and subjective testing criteria for consultation with this NPA, and consequently not able to propose the conduct of full-stall training in FFS. However, should solutions be proposed, and also taking into account other manufacturers, the subsequent required qualification criteria becoming more mature, and the comments received on this NPA, the Agency may consider to introduce certain amendments to CS-FSTD(A) to qualify existing FFS devices to enable full-stall training during both type rating training and operator conversion and recurrent training. As a result, this would also mean that the currently proposed approach-to-stall exercises in the FFS during type rating training proposed with this NPA, and the already published approach-to-stall exercises for the operator conversion and recurrent training programmes, could be amended to require the full-stall training instead. In this case, the Agency intends to align the date of entry into force with that of the FAA rules becoming applicable in the US to ensure harmonisation also in the context of the so-called Bilateral Aviation Safety Agreement (BASA) between the EU and the US. If on the other hand the above-mentioned solutions and criteria are not mature enough upon the publication of the

[7] http://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2014-17

Opinion and the Decision, the Agency will incorporate this issue to RMT.0196 & RMT.0197 'Updating CS-FSTD', scheduled to be launched in 2016.

2.2. Objectives

The overall objectives of the EASA system are defined in Article 2 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Chapter 2 of this NPA.

The overall objective of this task is to ensure that initial and operator pilot training and checking is adequate to provide pilots with the knowledge, skills and attitude to be competent in preventing and, if necessary, recovering from a LOCI situation.

(It should be highlighted that the provisions for operator conversion and recurrent training have already been published in May 2015, and will become applicable in May 2016.)

The specific objectives of this task are:

— to ensure adequate transposition of the ICAO amendments into the European requirements, including:

- UPRT in an aeroplane for MPL and FSTD UPRT for type rating training;
- requirements for UPRT training programmes for CAT operators; and
- requirements for flight and FSTD instructors.

— to consider whether type rating and/or operator training programmes should consist of theoretical and practical training that includes:

- training in flight mechanics;
- training in all applicable flight control laws of the aeroplane type and the operational consequences resulting from law degradations;
- training in all the relevant specificities of the specific aeroplane type;
- recovery exercises from (impending) stall situations during the take-off and the approach phase;
- manual aeroplane handling exercises and techniques during stall prevention and stall recovery scenarios, including exercises at high altitude;
- realistic training scenarios that contain startle/surprise effects;
- more emphasis on manual aeroplane handling skills and for initial type rating training, a requirement to conduct a go-around in the aeroplane with all engines operating;
- training on the conduct of a go-around at low speed with pitch trim in an unusual nose-up position, and consider including this exercise in the skill test or proficiency check;
- more emphasis on the potential degradation of situational awareness (basic pilot skills) and flight path management due to the increased flight crew reliance on aircraft automation;

- for the PPL(A) flight instruction syllabus, clarification of the intent using practical exercise examples of Exercise 11 'Spin avoidance' training, and a consideration for mandating these sample exercises for inclusion in the training programme;

— to assess whether UPRT provisions should be extended to other licences, such as the CPL and PPL, and to develop additional requirements accordingly;

— to ensure that inspectors of competent authorities are able to perform adequate oversight of UPRT, including the aeroplane and FFS upset recovery training exercises.

2.3. Summary of the Regulatory Impact Assessment (RIA)

Option 0 implies no amendments to existing requirements and provisions. Option 1 affects the CPL(A) and ATPL(A) training courses, MPL training courses, single-pilot high-performance complex aeroplane (in multi-pilot operations) and multi-pilot type rating training courses, Flight and FSTD Instructors and NAA inspectors. Option 2 is based on option 1 and includes also the LAPL(A) and PPL(A) training courses.

The Agency and the RMG experts believe that the safety level will markedly increase by the proposed amendments in Option 2. The amendments are based on the ICAO SARPs and on the ICATEE and LOCART WG recommendations. Moreover, the Agency and the RMG experts decided to also propose to improve the training standards for the LAPL(A) and PPL(A), albeit to a more proportionate safety level when compared to the CPL(A) and ATPL(A) training courses. Option 2 is, therefore, considered to provide the most appropriate option, improving existing training standards for the LAPL(A), PPL(A), CPL(A), ATPL(A), MPL, for single-pilot high-performance complex aeroplane in multi-pilot operations and multi-pilot aeroplane type rating training courses, and for instructors.

The requirement for upset recovery training in an aeroplane during the ATPL(A) training course and/or prerequisite for the first type rating, which includes potential manoeuvres with more than 90 degrees bank, may have an impact on the psychological health of certain student pilots. This in turn could lead to the discontinuation of their training and consequently their intended future airline career. Conversely, for many student pilots this training is foreseen to provide them with increased resilience against the psychological and physiological effects often associated with aeroplane upset conditions, thereby enabling student pilots to better apply effective strategies and Standard Operating Procedures (SOPs) to recover from actual developed upsets.

With the introduction of UPRT in the various courses, an economic impact is expected in the order of magnitude of EUR 170 million over 10 years, i.e. EUR 17 million per year. However, in comparison to the overall cost of the training courses, the additional cost related to UPRT is minimal. In addition, it should be highlighted that insurance cost for commercial operators (i.e. airlines) may be reduced as a consequence of the reduced risk of pilots being better trained to cope with developing and developed upsets. Moreover, pilots trained in the EASA MSs are likely to have a higher level of competency compared to their peers outside the EASA MSs. This may be a real advantage when looking for job opportunities in the aviation domain worldwide.

Option 1 will not affect GA significantly as the UPRT is mainly focussed on CPL(A), ATPL(A) and MPL, and on type rating training courses. Upset recovery training in an aeroplane is optional for LAPL(A) and PPL(A), and may be credited towards an ATPL(A) training course. Only PPL(A) pilots

wishing to obtain a type rating will be required to conduct the upset recovery training in an aeroplane as a prerequisite for their first multi-pilot type rating.

Option 2 will affect GA through 'light' TK and flight training on upset prevention. Compared to the CPL(A), ATPL(A) and the MPL, the impact is more proportionate. Upset recovery training in an aeroplane according to FCL.745.A is optional for LAPL(A) and PPL(A), and may be credited towards an ATPL(A) training course. However, Option 1 includes a requirement for the conduct of the upset recovery training in an aeroplane as a prerequisite for the first multi-pilot type rating.

In addition, the type rating training course includes a requirement for type-specific UPRT. In case an FFS qualified for the training task is not available, the upset recovery training exercises in an FFS do not need to be conducted for the time being.

The requirement for the conduct of upset recovery training in an aeroplane will pose initial implementation challenges for ATOs. It is a new course and requires instructor training for an extension of the instructor privileges. Moreover, for some parts of the recovery course aeroplanes qualified and capable of delivering the training should be utilised in order to ensure that an adequate margin of safety is maintained. The Agency also proposes to set up a UPRT advisory board to support the implementation and provision of further guidance, in particular for the upset recovery training in an aeroplane. There is no danger of duplication at national level and the proposal does not have an impact on Member States' obligations towards ICAO. The Aircrew and Air Operations Regulations will be harmonised with the ICAO SARPs. Although Option 1 is fully in line with ICAO, Option 2 requires more than ICAO does, because the proposal also includes LAPL(A) and PPL(A).

If Option 0 is chosen, the high risk of LOCI events remains. Furthermore, the aforementioned SRs addressed to the Agency will not be dealt with, and the EASp and the EASA Annual Safety Review will continue to highlight the risk of LOCI. Moreover, the EU aviation regulations will not be harmonised with the ICAO SARPs and with other international aviation authorities' regulations, such as the FAA's. Option 2 also addresses GA pilots. This is also more than what ICAO requires; however, Option 2 is very cost-effective by providing a minimum UPRT training which could be beneficial to reduce the number of LOCI events in the GA community. In that respect, Option 2 is well in line with the 'better regulation' principles. In contrast, Option 1 is fully harmonised with ICAO. Based on an analysis of the LOCI occurrences in GA over the past years, it is clear that GA is also exposed to LOCI events. In addition, the RMG experts indicated that skill-based behaviours are most often the first type of behaviour encountered when a pilot-to-be begins their training. Therefore, exposing student pilots to upset prevention training at an early stage enhances their upset prevention skills later in life. The Agency and the RMG experts, therefore, believe that although ICAO has not included any UPRT provisions for PPL(A), a certain level of mitigating measures should be included in these proposals, albeit to a lesser and more proportionate safety level. The Agency and the RMG experts, therefore, agreed to propose Option 2 as the best option. Both Option 1 and 2 are considered to be cost-effective.

2.4. Overview of the proposed UPRT rules and provisions

Commission Regulation (EU) No 1178/2011 and associated AMC/GM

The Agency and the RMG propose that all UPRT be conducted within an Approved Training Organisation (ATO). The requirement to conduct UPRT within an ATO is also supported by the ICAO SARPs. The relevant rules and provisions for ATOs are already published and in force.

An ATO framework will ensure appropriate risk mitigation, especially when conducting the recovery training in an aeroplane. In this context, the Agency and the RMG propose a new AMC to ORA.ATO.125 for the upset recovery training course in an aeroplane. This AMC emphasises the need for the ATO to ensure that procedures for risk mitigation are established, such as specific flight planning, briefing procedures and dispatch criteria. Furthermore, the ATO should ensure that the aeroplane used is qualified for the recovery training exercise(s) and that the instructor is qualified and current to provide the training. Similarly, the GM to ORA.ATO.125 type rating course contains guidance for ATOs placing emphasis on the need to avoid negative transfer of training by ensuring that when an FSTD is used, it is qualified for the training task. Moreover, the ATO should ensure that existing FSTD instructors have received additional UPRT training prior to conducting any type rating training for single-pilot high performance complex aeroplanes used in multi-pilot operations or multi-pilot aeroplanes when the new rules enter into force.

It should also be highlighted that instructors play a key role in delivering UPRT, especially in the context of avoiding negative training and negative transfer of training. For this reason, the Agency and the RMG propose to amend FCL.920 'Instructor competencies' in order to ensure that all existing instructors will be competent in correctly delivering the upset prevention and/or recovery training principles. During every Assessment of Competence (AoC), instructors will need to demonstrate their knowledge, skills and attitude in this area.

Definitions and abbreviations

In order to standardise the detailed and technical terminology used in the context of UPRT, the Agency and the RMG propose to include overarching definitions for UPRT at Implementing Rule level. Although UPRT should be seen as one concept, for clarity purposes the definitions for prevention and recovery are provided separately. The definitions are linked to a further GM listing the various definitions and terms relating to UPRT based on the ICAO definitions contained in ICAO Doc 10011. The Agency and the RMG also added further definitions in relation to the incipient spin. Moreover, the definitions are aligned with the Air Operations UPRT definitions already published with ED Decision 2015/012/R[8]. Furthermore, the Agency also included relevant abbreviations in support of UPRT.

Upset recovery training in an aeroplane

The Agency and the RMG propose upset recovery training in an aeroplane to be mandated for the ATPL(A) and MPL training courses. Furthermore, the RMG proposes to require training in an aeroplane prior to commencing the first single-pilot high-performance complex aeroplane used in multi-pilot operations or multi-pilot aeroplane type rating course to ensure that also PPL(A)

8 http://www.easa.europa.eu/document-library/agency-decisions/ed-decision-2015012r

and CPL(A) training course graduates are covered. This proposal is based on the existing MCC course philosophy and therefore ensures a consistent approach.

The Agency would like to further explain that ICAO has highlighted that a review of transport category aeroplane major incidents and accidents shows that bank angles have exceeded 90 degrees in some upset events. Furthermore, studies show that most pilots who went into inverted flight for the first time during training incorrectly added back pressure even though they received instructions in academic training and briefings before flight not to increase back pressure. For that reason, ICAO has recommended upset recovery training in an aeroplane at licensing level. Therefore, the Agency and the RMG believe that mandating this type of training is an important step towards enhancing a commercial pilot's resilience to the psychological and physiological aspects often associated with upset conditions, and towards providing pilots with an enhanced ability to not only overcome these human factor aspects, but to also apply appropriate recovery strategies to return the aeroplane to safe flight.

The proposed upset recovery course requirements are contained in a new 'FCL.745.A' rule. As the course can be taken as a stand-alone course, other licences (such as the PPL(A) or CPL(A) training course graduates) may also benefit from the course on a voluntary basis. Upon successful completion of the course, students should receive a course completion certificate.

The Agency and the RMG would like to strongly emphasise that upset recovery training should not be referred to as aerobatic flight. Although basic aerobatics do contribute to certain pilot competencies, such as aeroplane flight path management, manual control, and situational awareness, aerobatic manoeuvres do not serve the same training objectives as upset recovery training does. Simply put, the focus of basic aerobatics is on a sequence of prescribed manoeuvres, such as passing through defined attitudes and using perfect energy management. In contrast to basic aerobatics, upset recovery training focusses exactly on the contrary. The training focusses on applying correct and timely recovery strategies to return the aeroplane to safe flight, whilst building the pilot's resilience against the associated psychological and physiological human factors (to better cope with the startle and surprise effect). In the context of the subsequent pilot career in commercial air transport, it is of the utmost importance that the potential for negative transfer of training is avoided, i.e. single-engine piston aeroplanes behave differently compared to large transport aeroplanes.

To be able to deliver the upset recovery training in an aeroplane, an extension of the instructor privileges is required. This extension would mostly be relevant for those instructors wishing to provide such training and in the context of the ATPL(A) training course and type rating (prerequisite) course requirement. The Agency and the RMG propose that any instructor with the privilege to instruct on aeroplanes should be able to extend their privileges subject to compliance with the associated instructor training and assessment requirements. The extension of privilege should be endorsed in the licence upon successful completion of the instructor upset recovery training course in an aeroplane in accordance with FCL.915(e). The Agency and the RMG propose to have a 3-month recency requirement to ensure that an adequate level of competency is maintained, taking into account the higher level of risk associated with this training when compared to other types of training.

The Agency and the RMG also introduced requirements in FCL.915(e) for instructors wishing to train other instructors (train the trainer) for an extension of the privilege for the upset recovery training in an aeroplane. In this context, the Agency is aware that with the introduction of this

new training course there will be no qualified instructors with the privilege to instruct in the course or to instruct other instructors for an extension of the privilege. Therefore, the Agency amended the existing special condition in FCL.900(b) for the introduction of a new aircraft type by including the possibility for Member States to issue a special instructor certificate to competent instructors having the ability to train other instructors in relation to the introduction of a new training course in Part-FCL. The Agency will also determine an adequate transition period to ensure that the necessary time is provided to train the instructors. Moreover, the Agency is also considering setting up an UPRT advisory board to monitor and recommend adjustments to the requirements of this training and to ensure a safe and standardised implementation of this training/course.

LAPL(A) and PPL(A) training courses

The Agency and the RMG propose to include upset prevention provisions in the TK and flight training syllabi for LAPL(A) and PPL(A). Only the prevention elements are in AMC, whereas the specific components of each element are in GM to ensure a more 'light', more proportionate level of TK compared to the CPL(A) and ATPL(A) theory. Although ICAO does not require any UPRT for PPL(A) (or LAPL(A)), the Agency and the RMG strongly believe that mandating some prevention elements will support the General Aviation (GA) community in reducing LOCI occurrences. In addition, the RMG considers that early exposure to the upset prevention concept should provide pilots with a better basis for their later piloting career.

Note: The exact location of the LAPL/PPL UPRT TK elements should mirror the developments in RMT.0595. As a result, changes to the location and content of the elements should be reflected in the Decision to be produced by the aforementioned rulemaking task.

Upset recovery training in an aeroplane (also referred to as 'all-attitude training'), however, is not mandated, but may be considered by a LAPL(A) or PPL(A) holder on a voluntary basis. Full credits, subject to certain conditions, towards the ATPL(A) training course are provided for PPL(A) pilots having completed the recovery training in an aeroplane prior to commencing the ATPL(A) training course.

No significant additional licensing requirements are proposed for existing instructors, other than additional training on how to integrate and deliver the newly proposed upset prevention provisions into the TK and flight training upon entry into force of the provisions, and the ability to demonstrate their competence in correctly delivering the upset prevention and/or recovery training principles.

The recovery training/course in an aeroplane requires an extension of the instructor privileges; however, this extension would mostly be relevant for those instructors wishing to provide such training. The Agency and the RMG propose that other types of flight instructors, such as Class Rating Instructor (CRI), may also deliver this training, provided such instructor successfully completes the upset recovery instructor training.

CPL(A) and ATPL(A) training courses

The requirement for UPRT during CPL(A) training courses was already introduced in April 2015 as a result of the ICAO amendments to Annex 1 in November 2014. The Agency amended the

requirement by moving the CPL(A) UPRT requirement to Appendix 3 for clarity and consistency purposes. This change ensures that UPRT is correctly specified under the course content and also applies to the ATPL(A) training course. These requirements will enter into force in April 2018, unless otherwise determined by the European Commission.

In support of the aforementioned high-level rules, the Agency and the RMG developed further provisions at AMC and GM level. The Agency and the RMG propose to include UPRT elements in the TK training, and upset prevention elements in the flight training syllabi for the CPL(A) and ATPL(A) training courses.

In addition, the upset recovery training in an aeroplane is mandated for the ATPL(A) training course, including the above-mentioned crediting provisions for PPL(A) holders. Initially, the RMG proposed to also mandate the upset recovery course in an aeroplane for CPL(A) training courses. Whilst taking into account the ICAO Annex 1 requirements and to ensure a more proportionate, consistent and risk-based approach, the Agency decided to limit the recovery training in an aeroplane requirement to ATPL(A) courses only. Nevertheless, CPL(A) course graduates may undertake the upset recovery course on a voluntary basis, and are in any case required to complete the course prior to their first type rating for multi-pilot type rating or in multi-pilot operations. This is a consistent approach also applied in relation to the existing MCC course/training requirement.

As mentioned in Section 2.1 above, the Agency determined that the industry-led RMT.595 was in a better position to develop the TK syllabi for UPRT. Therefore, no amendments to the TK syllabi are proposed with this NPA, but rather with the RMT.0595 NPA instead to be publicly consulted in 2015/Q4 or 2016/Q1.

An AMC was developed with the upset prevention elements that should be integrated into the respective courses. Furthermore, existing exercises related to upset prevention (such as spin avoidance) have been grouped together in a separate AMC and GM developed by the RMG to support the exercises further. The RMG also proposed to introduce the so-called ‘recommended training envelope’ for the prevention exercises. By placing more emphasis on upset prevention exercises in combination with the recommended training envelope, the Agency and the RMG believe this should result in more consistent and standardised training practices across the EASA MSs.

No significant additional licensing requirements are proposed for existing instructors, other than additional training on how to integrate and deliver the newly proposed upset prevention provisions into the TK and flight training upon entry into force of the provisions, and the ability to demonstrate their competence in correctly delivering the upset prevention and/or recovery training principles.

The upset recovery training/course in an aeroplane requires an extension of the instructor privileges; however, this extension would only be relevant for those instructors wishing to provide such training, as part of the ATPL(A) training course or as a stand-alone course.

Integrated MPL training course

The requirement for upset recovery training already existed for the MPL. The Agency and the RMG added the prevention part to the existing high-level rule and aligned the MPL provisions relating to the newly proposed upset recovery training course in an aeroplane.

No additional licensing requirements are proposed for existing MPL instructors, other than additional training on how to integrate and deliver the newly proposed upset prevention provisions into the TK and flight training upon entry into force of the provisions, and the ability to demonstrate their competence in correctly delivering the upset prevention and/or recovery training principles.

The recovery training in an aeroplane requires an extension of the instructor privileges; however, this extension would only be relevant for those instructors wishing to provide such training, as part of the integrated MPL training course.

Single-pilot high-performance complex aeroplanes and multi-pilot aeroplane type rating training courses

The Agency and the RMG propose to make the upset recovery training/course in an aeroplane a prerequisite for the first issue of a single-pilot high-performance complex aeroplane type rating in multi-pilot operations and multi-pilot aeroplane type rating training courses. As mentioned, graduates from the ATPL(A) and MPL training courses already fulfil this requirement through the respective training course requirements. By making it a prerequisite, a PPL(A) or CPL(A) training course graduate will need to complete the course prior to completing a respective type rating training course.

For single-pilot high-performance complex aeroplanes in multi-pilot operations and multi-pilot aeroplane type rating training courses, the RMG developed AMC and GM requiring the integration of the upset prevention elements, including Threat and Error Management (TEM), CRM and associated human factors into the type rating training exercises and scenarios. The prevention elements also provide for an increased focus on manual flying skills, as well as increased training on go-arounds from various stages during the approach, including in varying configurations. In addition, the proposal includes recovery exercises such as recovery from an approach to stall, and recovery from nose high and low attitudes at various bank angles. Similar to the CAT operator requirements already published in May 2015, the recovery exercises must be conducted in an FFS qualified for the training task, if such simulator is available. In case an FFS qualified for the upset recovery training task is not available, the upset recovery exercises in item 3.7 of Appendix 9 do not have to be completed. Whilst a level C or D FFS is deemed to be qualified for the above-mentioned tasks, further guidance is also provided to ATOs/FSTD operators on how to qualify a level B FFS for the recovery training exercises.

Note: As mentioned, the Agency is monitoring the developments with regard to full-stall training and may include qualification criteria in CS-FSTD(A) to enable this training.

The Agency and the RMG also propose to introduce at least one go-around exercise during the base training part of the type rating to expose students to somatogravic illusion. This illusion is known to have caused several LOCI events, mainly during go-arounds. In order to ensure that base

training does not become too burdensome, the Agency decided to take a more competency-based and balanced approach by requiring a minimum of three successive landings instead of the usual four for experienced pilots, or six for the first type rating.

With regard to instructors, the Type Rating Instructor for Aeroplane (TRI(A)), the Type Rating Instructor for Single-Pilot Aeroplane (TRI(SPA)), the Synthetic Flight Instructor for Aeroplane (SFI(A)), and the Synthetic Flight Instructor for Single-Pilot Aeroplane (SFI(SPA)) hold the privilege to instruct during the above-mentioned type rating training courses in an FSTD. The Agency and the RMG propose to not develop an additional privilege for teaching UPRT in an FSTD environment, but to include UPRT-related provisions in the initial instructor qualification course, i.e. in the TRI training course. These provisions are fully in line with the provisions already contained in the published CAT operator provisions and, therefore, ensure that both the Aircrew and the Air Operations regulations are fully aligned. Consequently, existing instructors will require additional training on how to integrate and deliver the newly proposed upset prevention and recovery provisions into the FSTD training exercises and scenarios upon entry into force of the provisions. In addition, all future instructors will need to demonstrate their ability in correctly delivering the upset prevention and/or recovery training principles in an FSTD environment during the assessment of competence.

The RMG had initially proposed to include UPRT for all class and type ratings. Whilst taking into account the ICAO Annex 1 requirements and to ensure a more proportionate and risk-based approach, the Agency decided to limit UPRT to type ratings for multi-pilot type ratings or used in multi-pilot operations only. However, the Agency did include additional items indirectly related to aeroplane upsets also for single-pilot high-performance complex type ratings not necessarily used in multi-pilot operations, such as go-arounds from various stages during the approach, and increased emphasis on practising manual flying skills.

NAA inspectors

The Agency, based on the ICAO guidance, added GM for inspectors involved in the approval and oversight of UPRT. The guidance mainly focusses on the approval and oversight of recovery training courses in an aeroplane, and on the FSTD instructor and FSTD qualification requirements. The guidance applies to inspectors in both the Aircrew and the Air Operations domains.

Cover regulation

The cover regulation consists of articles in support of the transition to the newly proposed rules. The proposed date for publication of the proposed amendments is 8 April 2017, with a date of entry into force on 8 April 2018, unless otherwise determined by the European Commission.

The Agency and the RMG propose the ‘grandfathering’ of existing CPL(A), ATPL(A) and MPL holders and, therefore, they will not be required to complete additional training, such as the upset recovery training in an aeroplane.

The Agency included transition measures for existing instructors by requiring them to complete additional training on how to integrate the newly proposed upset prevention and/or recovery

provisions into the flight training and on how to deliver it upon their entry into force in April 2018.

The Agency also foresees that some training organisations will commence providing a certain UPRT, including upset recovery training in an aeroplane, prior to the entry into force of these provisions. Whilst this training may not fully comply with the newly proposed requirements, the Agency believes that this type of training should at least be partially credited towards the ATPL(A) training courses for pilots who have commenced their training prior to the entry into force of this Regulation. The amount of crediting should be determined by the competent authority in consultation with the ATO.

Note: If the aforementioned FAA and industry developments with regard to full-stall training in an FFS and the related qualification criteria in CS-FSTD(A) are eventually included into the related Opinion and Decision, the Agency will consider recommending to the European Commission to extend the transition period from 8 April 2018 to at least 8 April 2019 to provide more time to FSTD operators to upgrade their FFSs to the new standards to enable full-stall training, and to ensure a harmonised approach with the FAA.

Figure 1 below gives an overview of the proposed amendments related directly to UPRT. Note that the provisions related to operators have already been published and will enter into force May 2016.

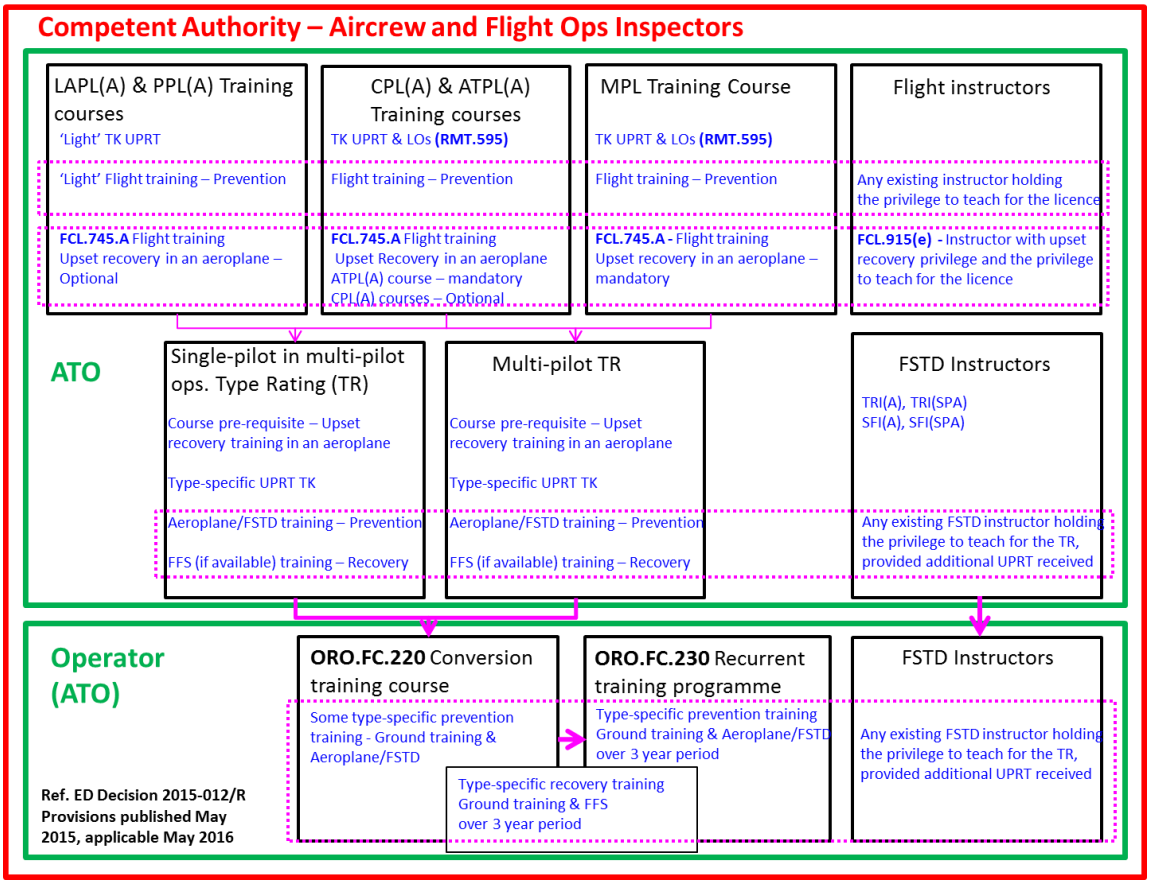


Figure 1

Other proposed amendments

The Agency and the RMG propose to replace the references to 'unusual attitudes' in the existing aerobatic course with the wording 'aeroplane upsets' to ensure a consistent approach.

The Agency, based on recommendations by the RMT.0595 RMG, proposes to merge the VFR and IFR TK subject 'Communications' for the IR, CPL and ATPL training courses, and delete the reference to Multiple-Choice Questions (MCQ) in ARA.FCL.300(b) pertaining to the European Central Question Bank (ECQB).

The Agency believes that by merging the VFR and IFR TK subject 'Communications', any pilot successfully undertaking the 'Communications' examination would be fully cognisant of the terminology and phraseology applicable to both VFR and IFR flight operations. Given that frequently VFR and IFR operations take place in the same airspace, or the VFR and IFR departures/arrivals at the same airport, it is considered important that all pilots should be familiar with the terminology which may be used in communications with both types of traffic. A pilot who has assimilated satisfactorily the information associated with the LOs for the merged 'Communications' examination will have the capability to develop a high level of situational awareness regarding proximate traffic in the airspace or at the airport where they are operating. Through a thorough and complete understanding of the role of communications and good situational awareness, the pilot will have greater capacity to consider the other important competencies including aircraft flight path management, leadership and teamwork, problem-solving and decision-making, and workload management which are highly relevant also in the context of preventing upset conditions.

In relation to the deletion of the MCQ requirement, the Agency and the RMT.0595 RMG believe that there is a need for the possibility to pose more open questions that require a student to better apply TK theory to practice, including UPRT TK. This approach should also provide for a better transition of a pilot from the initial licensing into the Air Operations domain.

3. Proposed amendments

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

(a) deleted text is marked with ~~strike through~~;

(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.

3.1. Draft Regulation (Draft EASA Opinion)

Article 1

Annex I, III and VI to Commission Regulation (EU) No 1178/2011 are amended in accordance with the annexes to this Regulation.

Article 2
Transitional provisions

1. Holders of an instructor certificate issued before this Regulation applies shall receive additional relevant instructor training prior to delivering:

   (a) upset prevention training in an aeroplane;

   (b) upset prevention and recovery training in an FSTD.

2. In respect of issuing Part-FCL licences in accordance with Annex I to Commission Regulation (EU) No 1178/2011, aeroplane upset prevention and recovery training commenced prior to the application of this Regulation under the regulatory oversight of a Member State may be given credit until 8 April 2019.

   The credit given shall be determined by the Member State to which the pilot applies for the issue of a licence, rating or certificate on the basis of a recommendation from an approved training organisation that provides the course.

Article 3

Entry into force

This Regulation shall enter into force on the 20th day following that of its publication in the *Official Journal of the European Union*.

It shall apply from 8 April 2018, except for the amendments to FCL.310, FCL.515, FCL.615, FCL.900, Appendix 1 to Annex I and ARA.FCL.300 of Annex VI to Commission Regulation (EU) No 1178/2011, which shall apply from 8 April 2017.

(…)

ANNEX I

Proposed amendments to Annex I to Commission Regulation (EU) No 1178/2011

'**FCL.010 Definitions**

For the purposes of this Part, the following definitions apply:

(…)

'Aeroplane upset prevention training' means a combination of theoretical knowledge and flying training with the aim to provide flight crew with the required competencies to prevent developing aeroplane upsets.'

'Aeroplane recovery training' means a combination of theoretical knowledge and flying training with the aim to provide flight crew with the required competencies to recover from developed aeroplane upsets.'

(…)

'**FCL.310 CPL — Theoretical knowledge examinations**

An applicant for a CPL shall demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(…)

— ~~Visual Flight Rules (VFR)~~ Communications.'

~~**FCL.315.A CPL Training course**~~

~~Theoretical Knowledge and flight instruction for the issue of a CPL(A) shall include upset prevention and recovery training.~~

FCL.410.A MPL — Training course and theoretical knowledge examinations

(a) Course. An applicant for MPL shall have completed a training course of theoretical knowledge and flight instruction in an ATO in accordance with Appendix 5 to this Part. ~~Theoretical knowledge and flight instruction for the issue of an MPL shall include upset prevention and recovery training.~~

'**FCL.515 ATPL — Training course and theoretical knowledge examinations**

(…)

(b) Examination. Applicants for an ATPL shall demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(…)

— ~~VFR~~ Communications,

~~— IFR Communications.~~'

'**FCL.615 IR — Theoretical knowledge and flight instruction**

(…)

(b) Examination. Applicants shall demonstrate a level of theoretical knowledge appropriate to the privileges granted in the following subjects:

(…)

— ~~IFR~~ Communications.'

'**FCL.720.A Experience requirements and prerequisites for the issue of class or type ratings — aeroplanes**

Unless otherwise determined in the operational suitability data established in accordance with Part-21, an applicant for a class or type rating shall comply with the following experience requirements and prerequisites for the issue of the relevant rating:

(…)

(h) In addition to (c) and (d), an applicant for the first type rating shall have completed the upset recovery training course in FCL.745.A prior to commencing the type rating course.'

(…)

'**FCL.725.A Theoretical knowledge and flight instruction for the issue of class and type ratings — aeroplanes**

Unless otherwise determined in the operational suitability data established in accordance with Part-21:

(…)

(c) Single-pilot high-performance complex aeroplanes used in multi-pilot operations and multi-pilot aeroplane~~s~~ type ratings. The training course for the first issue of the ~~multi-pilot~~ aeroplane type rating shall include theoretical knowledge and flight instruction in upset prevention and recovery.'

'**FCL.745.A Upset recovery training course — aeroplanes**

(a) The upset recovery training course shall comprise at least:

(1) 5 hours of theoretical knowledge instruction;

(2) pre-flight briefings and post-flight debriefings; and

(3) 3 hours of upset recovery training in an aeroplane qualified for the training task.

(b) The course shall be completed at an ATO.

(c) Upon completion of the course, the applicant shall be issued with a certificate of completion.'

'**FCL.900 Instructor certificates**

(…)

(b) Special conditions:

(1) ~~In the case of introduction of new aircraft in the Member States or in an operator's fleet, when compliance with the requirements established in this Subpart is not possible, the competent authority may issue a specific certificate giving privileges for flight instruction. Such a certificate shall be limited to the instruction flights necessary for the introduction of the new type of aircraft and its validity shall not, in any case, exceed 1 year.~~ The competent authority may issue a specific certificate granting privileges for flight instruction when compliance with the requirements established in this Subpart is not possible in the case of introduction of:

(i) a new training course in the Member State; or

(j) a new aircraft in the Member State or in an operator's fleet.

The certificate shall be limited to the instruction flights necessary for the introduction of the new training course or new type of aircraft and its validity shall not, in any case, exceed 1 year.'

(…)

'**FCL.915 General prerequisites and requirements for instructors**

(…)

(e) Upset recovery instructor training course in an aeroplane.

(1) In addition to (b), in the case of flight instruction privileges for the upset recovery training course in FCL.745.A, the instructor shall:

(i) have completed an upset recovery instructor training course at an ATO;

(ii) have at least 500 hours of flight time as a pilot on aeroplanes, including 200 hours of flight instruction; and

(iii) hold an aerobatic rating.

(2) The training course shall include the assessment of the instructor's competence.

(3) In order to maintain the upset recovery privileges, the instructor shall have conducted, within the preceding 3 months, at least one upset recovery exercise in an aeroplane during an upset recovery training course.

(4) If the instructor has not fulfilled the requirement in (e)(3), before exercising the privilege to conduct flight instruction for the upset recovery course, he/she shall receive theoretical and practical refresher training at an ATO to reach the required level of competence.

(5) The privileges in (e)(1) may be extended to include the privilege to instruct in the upset recovery instructor training course, provided that the instructor has 25 hours of upset recovery instruction experience in an aeroplane and has completed the assessment of competence to demonstrate to a Flight Instructor Examiner (FIE) the ability to instruct in the course.'

'**FCL.920 Instructor competencies and assessment**

All instructors shall be trained to achieve the following competences:

(…)

— Integrate Threat and Error Management (TEM) and Ccrew Rresource Mmanagement (CRM) to prevent undesired aircraft states,'

(…)

'*Appendix 1*

Crediting of theoretical knowledge

A. CREDITING OF THEORETICAL KNOWLEDGE FOR THE ISSUE OF A PILOT LICENCE IN ANOTHER CATEGORY OF AIRCRAFT — BRIDGE INSTRUCTION AND EXAMINATION REQUIREMENTS

(…)

3. **ATPL**

(…)

3.3. An applicant for an ATPL(A) having passed the relevant theoretical examination for a CPL(A) is credited towards the theoretical knowledge requirements in subject ~~VFR~~ Communications.

3.4. An applicant for an ATPL(H), having passed the relevant theoretical examinations for a CPL(H) is credited towards the theoretical knowledge requirements in the following subjects:

— Air Law,

— Principles of Flight (Helicopter),

— ~~VFR~~ Communications.

3.5. An applicant for an ATPL(A) having passed the relevant theoretical examination for an IR(A) is credited towards the theoretical knowledge requirements in subject ~~IFR~~ Communications.

(…)

4. **IR**

(…)

4.2. An applicant for an IR(H) having passed the relevant theoretical examinations for an ATPL(H) VFR is required to pass the following examination subjects:

— Air Law,

— Flight Planning and Flight Monitoring,

— Radio Navigation,

— ~~IFR~~ Communications.'

'*Appendix 3*

Training courses for the issue of a CPL and an ATPL

(…)

3. Theoretical knowledge instruction for the issue of a CPL(A) or an ATPL(A) shall include upset prevention and recovery elements.

4. Flight instruction for the issue of a CPL(A) or an ATPL(A) shall include upset prevention training.'

'A. **ATP integrated course — Aeroplanes**

GENERAL

(…)

'4.1. The course shall comprise:

(a) theoretical knowledge instruction to the ATPL(A) knowledge level;

(b) visual and instrument flying training; ~~and~~

(c) training in MCC for the operation of multi-pilot aeroplanes~~.~~; and

(d) upset recovery training in an aeroplane.

4.2. Crediting. Applicants having completed the upset recovery training course in an aeroplane prior to commencing the course may be credited towards the requirement in 4(d).

5. An applicant failing or being unable to complete the entire ATP(A) course may apply to the competent authority for the theoretical knowledge examination and skill test for a licence with lower privileges and an IR if the applicable requirements are met.

THEORETICAL KNOWLEDGE

6. An ATP(A) theoretical knowledge course shall comprise at least 750 hours of instruction.

7. The MCC course shall comprise at least 25 hours of theoretical knowledge instruction and exercises.

8. The upset recovery training shall comprise at least 5 hours of theoretical knowledge instruction.'

THEORETICAL KNOWLEDGE EXAMINATION

~~8~~9. An applicant shall demonstrate the level of knowledge appropriate to the privileges granted to the holder of an ATPL(A).

FLYING TRAINING

~~9~~10. The flying training, not including type rating training, shall comprise a total of at least 195 hours, to include all progress tests, of which up to 55 hours for the entire course may be instrument ground time. Within the total of 195 hours, applicants shall complete at least:

(…)

(g) 3 hours dual instruction on aeroplane upset recovery training.'

(…)

‘*Appendix 5*

Integrated MPL training course

(…)

FLYING TRAINING

8. The flying training shall comprise a total of at least 240 hours, composed of hours as PF and PNF, in actual and simulated flight, and covering the following 4 phases of training:

(…)

Flight experience in actual flight shall include all the experience requirements of Subpart H, upset prevention and recovery training, night flying, flight solely by reference to instruments and the experience required to achieve the relevant airmanship.’

‘*Appendix 9*

Training, skill test and proficiency checks for MPL, ATPL, type and class ratings, and proficiency checks for IRs

(…)

B. Specific requirements for the aeroplane category

(…)

6. Multi-pilot aeroplanes and single-pilot high-performance complex aeroplanes

(…)

(b) The practical training shall be conducted at least at the training equipment level shown as (P), or may be conducted up to any higher equipment level shown by the arrow (----->).

The following abbreviations are used to indicate the training equipment used:

A	=	Aeroplane
FFS	=	Full-Flight Simulator qualified for the training task
FTD	=	Flight Training Device
OTDs	=	Other Training Devices

(…)

(f) Manoeuvres and procedures ~~shall include MCC~~ for multi-pilot aeroplanes and for single-pilot high-performance complex aeroplanes in multi-pilot operations shall include:

(i) MCC; and

(ii) the upset prevention elements using TEM, CRM and human factors.

(…)

MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES	PRACTICAL TRAINING					ATPL/MPL/TYPE RATING SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures	OTD	FTD	FFS	A	Instructor initials when training completed	Chkd in FFS A	Examiner initials when test completed
SECTION 1							
1 Flight preparation 1.1 Performance calculation	P						
1.2 Aeroplane external visual inspection; location of each item and purpose of inspection	P#			P			
1.3 Cockpit inspection		P----->	----->	----->			
1.4 Use of checklist prior to starting engines, starting procedures, radio and navigation equipment check, selection and setting of navigation and communication frequencies	P----->	----->	----->	----->		M	
1.5 Taxiing in compliance with air traffic control or instructions of instructor			P----->	----->			
1.6 Before take-off checks		P----->	----->	----->		M	

SECTION 2							
2 Take-offs 2.1 Normal take-offs with different flap settings, including expedited take-off			P----->	----->			
2.2* Instrument take-off; transition to instrument flight is required during rotation or immediately after becoming airborne			P----->	----->			
2.3 Crosswind take-off			P----->	----->			
2.4 Take-off at maximum take-off mass (actual or simulated maximum take-off mass)			P----->	----->			
2.5 Take-offs with simulated engine failure: 2.5.1* shortly after reaching V2			P----->	----->			
(In aeroplanes which are not certificated as transport category or commuter category aeroplanes, the engine failure shall not be simulated until reaching a minimum height of 500 ft above runway end. In aeroplanes having the same performance as a transport category aeroplane regarding take-off mass and density altitude, the instructor may simulate the engine failure shortly after reaching V2)							
2.5.2* between V1 and V2			P	X		M FFS Only	

2.6 Rejected take-off at a reasonable speed before reaching V1			P----->	---->X		M	
SECTION 3							
3 Flight m~~M~~anoeuvres and p~~P~~rocedures 3.1 ~~Turns with and without spoilers~~ Manual flight with and without flight directors (no autopilot, no autothrust/autothrottle, and at different control laws, where possible)			P----->	---->			
3.1.1 At different speeds (including slow flight) and altitudes ~~within the normal/full flight envelope.~~			P----->	---->			
3.1.2 Steep turns using 45° bank, 180° to 360° left and right			P----->	---->			
3.1.3 Turns with and without spoilers			P----->	---->			
3.1.4 Procedural instrument flying and manoeuvring including instrument departure and arrival, and visual approach			P----->	----->			
3.2 Tuck under and Mach buffets (if applicable) ~~after reaching the critical Mach number~~, and other specific flight characteristics of the aeroplane (e.g. Dutch Roll)			P----->	---->X An ~~aircraft~~ aeroplane ~~may~~shall not be used for this exercise		FFS only	

3.3 Normal operation of systems and controls engineer's panel (if applicable)	P----->	----->	----->	----->			
Normal and abnormal operations of following systems:						M	A mandatory minimum of 3 abnormal shall be selected from 3.4.0 to 3.4.14 inclusive
3.4.0 Engine (if necessary propeller)	P----->	----->	----->	----->			
3.4.1 Pressurisation and air-conditioning	P----->	----->	----->	----->			
3.4.2 Pitot/static system	P----->	----->	----->	----->			
3.4.3 Fuel system	P----->	----->	----->	----->			
3.4.4 Electrical system	P----->	----->	----->	----->			
3.4.5 Hydraulic system	P----->	----->	----->	----->			
3.4.6 Flight control and t~~T~~rim~~-~~ system	P----->	----->	----->	----->			
3.4.7 Anti-icing/de-icing system, g~~G~~lare shield heating	P----->	----->	----->	----->			
3.4.8 Autopilot/f~~F~~light director	P----->	----->	----->	----->		M (single pilot o~~O~~nly)	

3.4.9 Stall warning devices or stall avoidance devices, and stability augmentation devices	P----->	----->	----->	----->			
3.4.10 Ground proximity warning system, weather radar, radio altimeter, transponder		P----->	----->	----->			
3.4.11 Radios, navigation equipment, instruments, flight management system	P----->	----->	----->	----->			
3.4.12 Landing gear and brake	P----->	----->	----->	----->			
3.4.13 Slat and flap system	P----->	----->	----->	----->			
3.4.14 Auxiliary power unit	P----->	----->	----->	----->			
Intentionally left blank							
3.6 Abnormal and emergency procedures:						M	A mandatory minimum of 3 items shall be selected from 3.6.1 to 3.6.9 inclusive
3.6.1 Fire drills, e.g. engine, APU, cabin, cargo compartment, flight deck, wing and electrical fires including evacuation		P----->	----->	----->			
3.6.2 Smoke control and removal		P----->	----->	----->			
3.6.3 Engine failures, shutdown and restart at a safe height		P----->	----->	----->			
3.6.4 Fuel dumping (simulated)		P----->	----->	----->			

3.6.5 Wind shear at take-off/landing			P	X		FFS only	
3.6.6 Simulated cabin pressure failure/emergency descent			P----->	----->			
3.6.7 Incapacitation of flight crew member		P----->	----->	----->			
3.6.8 Other emergency procedures as outlined in the appropriate Aeroplane Flight Manual		P----->	----->	----->			
3.6.9 ~~A~~TCAS event	P----->	----->	----->	An ~~aircraft~~ aeroplane ~~may~~shall not be used		FFS only	
~~3.7 Steep turns with 45° bank, 180° to 360° left and right~~		~~P----->~~	~~----->~~	~~----->~~			

3.7 Upset recovery training for multi-pilot aeroplanes and single pilot, high-performance, complex aeroplanes in multi-pilot operations only. ~~3.8 Early recognition and counter measures on approaching stall (up to activation of stall warning device) in take-off configuration (flaps in take-off position), in cruising flight configuration and in landing configuration (flaps in landing position, gear extended)~~ Recovery from stall events in: — take-off configuration — clean configuration at low altitude — clean configuration near maximum operating altitude — landing configuration leading to a go-around			P~~—>~~ FFS qualified for the training task only	X~~—>~~ An aeroplane shall not be used for this exercise		FFS only. The examiner shall not select this item for testing or checking.	
3.7.1 ~~3.8.1 Recovery from full stall or after activation of stall warning device in climb, cruise and approach configuration~~ The following upset exercises: — recovery from nose-high at various bank angles — recovery from nose-low at various bank angles			P FFS qualified for the training task only	X An aeroplane shall not be used for this exercise		FFS only. The examiner shall not select this item for testing or checking.	
3.~~9~~8 Instrument flight procedures							

3.~~9~~8.1* Adherence to departure and arrival routes and ATC instructions		P----->	----->	----->		M	
3.~~9~~8.2* Holding procedures		P----->	----->	----->			
3.~~9~~8.3* Precision approaches down to a D~~d~~ecision H~~h~~eight (DH) not less than 60 m (200 ft)							
3.~~9~~8.3.1* M~~m~~anually, without flight director			P----->	----->		M (skill test only)	
3.~~9~~8.3.2* M~~m~~anually, with flight director			P----->	----->			
3.~~9~~8.3.3* W~~w~~ith autopilot			P----->	----->			
3.~~9~~8.3.4* M~~m~~anually, with one engine simulated inoperative; engine failure has to be simulated during final approach before passing the O~~o~~uter M~~m~~arker (OM) until touchdown or through the complete missed approach procedure							
In aeroplanes which are not certificated as transport category aeroplanes (JAR/FAR 25) or as commuter category aeroplanes (SFAR 23), the approach with simulated engine failure and the ensuing go-around shall be initiated in conjunction with the non-precision approach as described in 3.9.4. The go-around shall be initiated when reaching the published O~~o~~bstacle C~~c~~learance H~~h~~eight (OCH/A);~~,~~ however, not later than reaching a M~~m~~inimum D~~d~~escent			P----->	----->		M	

H~~h~~eight/A~~a~~ltitude (MDH/A) of 500 ft above runway threshold elevation. In aeroplanes having the same performance as a transport category aeroplane regarding take-off mass and density altitude, the instructor may simulate the engine failure in accordance with 3.9.3.4.							
3.~~98~~.4* Non-precision approach down to the MDH/A			P*--->	----->		M	
3.~~98~~.5 Circling approach under the following conditions: (a)* approach to the authorised minimum circling approach altitude at the aerodrome in question in accordance with the local instrument approach facilities in simulated instrument flight conditions; followed by: (b) circling approach to another runway at least 90° off centreline from final approach used in item (a), at the authorised minimum circling approach altitude. Remark: ~~i~~if (a) and (b) are not possible due to ATC reasons, a simulated low-visibility pattern may be performed.			P*---> P*--->	-----> ----->			
3.~~98~~.6 Visual approaches			P----->	---->			
SECTION 4							
4 Missed a~~A~~pproach p~~P~~rocedures 4.1 Go-around with all engines operating* after an ILS approach on reaching decision height			P*--->	----->			

4.1.1 Go-around with all engines operating* from various stages during an instrument approach			P--->	----->			
4.2 Other missed approach procedures			P*--->	----->			
4.3* Manual go-around with the critical engine simulated inoperative after an instrument approach on reaching DH, MDH or MAPt			P*----->	----->		M	
4.4 Rejected landing and go-around with all engines operating:~~;~~ • f~~F~~rom various positions beyond the CAT I decision height~~ 15 m (50 ft) above runway threshold~~ • a~~A~~fter touchdown (balked landing)			P----->	----->			
SECTION 5							
5 Landings 5.1 Normal landings* also after an ILS approach with transition to visual flight on reaching DH			P				
5.2 Landing with simulated jammed horizontal stabiliser in any out-of-trim position			P----->	An ~~aircraft~~ aeroplane ~~may~~shall not be used for this exercise		FFS only.	
5.3 Crosswind landings (a/c, if practicable)			P----->	----->			
5.4 Traffic pattern and landing without extended or with partly extended flaps and slats			P----->	----->			

5.5 Landing with critical engine simulated inoperative			P----->	----->		M	
5.6 Landing with two engines inoperative: — aeroplanes with 3 engines: the centre engine and 1 outboard engine as far as practicable according to data of the AFM~~;~~ — aeroplanes with 4 engines: 2 engines at one side			P	X		M FFS only (skill test only)	
General remarks: Special requirements for the extension of a type rating for instrument approaches down to a decision height of less than 200 f~~ee~~t (60 m), i.e. CAT~~at~~ II/III operations.							
SECTION 6							
Additional authorisation on a type rating for instrument approaches down to a DH ~~decision height~~ of less than 60 m (200 ft) (CAT II/III) The following manoeuvres and procedures are the minimum training requirements to permit instrument approaches down to a DH of less than 60 m (200 ft). During the following instrument approaches and missed approach procedures all aeroplane equipment required for type certification of instrument approaches down to a DH of less than 60 m (200 ft) shall be used							

6.1* Rejected take-off at minimum authorised RVR			P*----->	---->X An ~~aircraft~~ aeroplane ~~may~~shall not be used for this exercise		M*	
6.2* ILS approaches: in simulated instrument flight conditions down to the applicable DH~~,~~ using flight guidance system. Standard procedures of crew coordination (task sharing, call-out procedures, mutual surveillance, information exchange and support) shall be observed			P----->	----->		M	
6.3* Go-around: after approaches as indicated in 6.2 on reaching DH. The training shall also include a go-around due to (simulated) insufficient RVR, wind shear, aeroplane deviation in excess of approach limits for a successful approach, ~~and~~ ground/airborne equipment failure prior to reaching DH, and~~,~~ go-around with simulated airborne equipment failure			P----->	----->		M*	
6.4* Landing(s): with visual reference established at DH following an instrument approach. Depending on the specific flight guidance system, an automatic landing shall be performed			P----->	----->		M	

NOTE: CAT II/III operations shall be accomplished in accordance with the applicable A~~a~~ir O~~o~~perations requirements.

ANNEX II

Proposed amendments to Annex III to Commission Regulation (EU) No 1178/2011

ANNEX III

CONDITIONS FOR THE ACCEPTANCE OF LICENCES ISSUED BY OR ON BEHALF OF THIRD COUNTRIES

A. VALIDATION OF LICENCES

'(…)

Pilot licences for commercial air transport and other commercial activities

3. In the case of pilot licences for commercial air transport and other commercial activities, the holder shall comply with the following requirements:

   (…)

   (e) in the case of aeroplanes, shall have completed the upset recovery course in an aeroplane in accordance with FCL.745.A and shall comply with the experience requirements set out in the following table:

   (…)'

ANNEX III

Proposed amendments to Annex VI to Commission Regulation (EU) No 1178/2011

ANNEX VI

AUTHORITY REQUIREMENTS FOR AIRCREW

SECTION III

Theoretical knowledge examinations

‘**ARA.FCL.300 Examination procedures**

(b) In the case of the ATPL, MPL, commercial pilot licence (CPL), and instrument ratings, those procedures shall comply with all of the following:

(…)

(2) Questions for an examination shall be selected by the competent authority, according to a common method which allows coverage of the entire syllabus in each subject, from the European Central Question Bank (ECQB). The ECQB is a database of ~~multiple choice~~ questions held by the Agency.

(…)’

3.2. Draft Acceptable Means of Compliance and Guidance Material (Draft EASA Decision)

AMC1 Article 2(1)(b)

ADDITIONNAL INSTRUCTOR TRAINING FOR UPRT IN AN FSTD

It is of paramount importance that instructors have the specific competence to deliver UPRT during the type rating course, including the ability to demonstrate knowledge and understanding of the type-specific upset recovery procedures and recommendations developed by the Original Equipment Manufacturers (OEMs). Prior to conducting UPRT training, existing TRI(A), TRI(SPA), SFI(A), SFI(SPA) should:

(a) be able to demonstrate application of the type-specific upset recovery procedures and recommendations developed by the OEMs;

(b) understand the importance of applying type-specific OEMs procedures for recovery manoeuvres;

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

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

(g) understand and be able to use the FSTD instructor tools available for providing accurate feedback on pilot 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 student pilot(s) receiving the training.'

GM1 FCL.010 Definitions
ABBREVIATIONS

The following abbreviations apply to the Acceptable Means of Compliance and Guidance Material to Part-FCL:

A	Aeroplane
AC	Alternating Current
ACAS	Airborne Collision Avoidance System
ADF	Automatic Direction Finding
ADS	Aeronautical Design Standard
AFCS	Automatic Flight Control System
AFM	Aircraft Flight Manual
AGL	Above Ground Level
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication

AIRAC	Aeronautical Information Rregulation and Ccontrol
AIS	Aeronautical Information Services
AMC	Acceptable Means of Compliance
AeMC	Aero-medical Centre
AME	Aero-medical Examiner
AoA	Angle of Attack
AOM	Aircraft Operating Manual
APU	Auxiliary Power Unit
As	Airship
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATO	Approved Training Organisation
ATP	Airline Transport Pilot
ATPL	Airline Transport Pilot Licence
ATS	Air Traffic Service
AUM	All Up Mass
B	Balloon
BCAR	British Civil Airworthiness Requirement
BEM	Basic Empty Mass
BITD	Basic Instrument Training Device
BPL	Balloon Pilot Licence
CAS	Calibrated AirsSpeed
CAT	Clear Air Turbulence
CB-IR	Competency-based training course for Iinstrument Rrating
CDI	Course Deviation Indicator
CFI	Chief Flying Instructor
CG	Centre of Gravity
CGI	Chief Ground Instructor
CP	Co-pilot
CPL	Commercial Pilot Licence
CRE	Class Rating Examiner
CRI	Class Rating Instructor
CRM	Crew Resource Management
CS	Certification Specification
ECQB	European Central Question Bank

DC	Direct Current
DF	Direction Finding
DME	Distance Measuring Equipment
DPATO	Defined Point After Take-Oeff
DPBL	Defined Point Before Landing
DR	Dead Reckoning navigation
EFIS	Electronic Flight Instrument System
EIR	En route Iinstrument Rrating
EOL	Engine Off Landings
ERPM	Engine Revolution Per Minute
ETA	Estimated Time of Arrival
ETOPS	Extended-range Twin-engine Operation Performance Standard
FAF	Final Approach Fix
FAR	Federal Aviation Regulations
FCL	Flight Crew Licensing
FE	Flight Examiner
F/E	Flight Engineer
FEM	Flight Examiner Manual
FFS	Full-Flight Simulator
FI	Flight Instructor
FIE	Flight Instructor Examiner
FIS	Flight Information Service
FMC	Flight Management Computer
FMS	Flight Management System
FNPT	Flight and Navigation Procedures Trainer
FS	Flight Simulator
FSTD	Flight Simulation Training Device
ft	feet
FTD	Flight Training Device
G	Gravity forces
GLONASS	Global Orbiting Navigation Satellite System
GM	Guidance Material
GNSS	Global Navigation Satellite Systems

GPS	Global Positioning System
H	Helicopter
HF	High Frequency
HOFCS	High Order Flight Control System
HPA	High-Performance Aeroplane
hrs	Hours
HUMS	Health and Usage Monitoring System
HT	Head of Training
IAS	Indicated AirsSpeed
ICAO	International Civil Aviation Organizsation
IGE	In-Ground Effect
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IR	Instrument Rating
IRE	Instrument Rating Examiner
IRI	Instrument Rating Instructor
ISA	International Standard Atmosphere
JAR	Joint Aviation Requirements
kg	Kilogram
LAPL	Light Aircraft Pilot Licence
LDP	Landing Decision Point
LMT	Local Mean Time
LO	Learning Objectives
LOCI	Loss of Control In-flight
LOFT	Line-Orientated Flight Training
m	Meter
MCC	Multi-Crew Cooperation
MCCI	Multi-Crew Cooperation Instructor
ME	Multi-Eengine
MEL	Minimum Equipment List
MEP	Multi-Eengine Piston

MET	Multi-Eengine Turboprop
METAR	Meteorological Aerodrome Report
MI	Mountain Rating Instructor
MP	Multi-Ppilot
MPA	Multi-Ppilot Aeroplane
MPL	Multi-Ccrew Pilot Licence
MPH	Multi-Ppilot Helicopter
MTOM	Maximum Take-Ooff Mass
NDB	Non-Ddirectional Beacon
NM	Nautical Miles
NOTAM	Notice To Airmen
NOTAR	No Tail Rotor
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
OEI	One Engine Inoperative
OEM	Original Equipment Manufacturers
OGE	Out of Ground Effect
OML	Operational Multi-pilot Limitation
OSL	Operational Safety Pilot Limitation
OTD	Other Training Devices
PAPI	Precision Approach Path Indicator
PF	Pilot Flying
PIC	Pilot-In-Command
PICUS	Pilot-In-Command Under Supervision
PL	Powered-lift
PNF	Pilot Not Flying
PPL	Private Pilot Licence
QDM	Magnetic heading
QFE	Atmospheric pressure at aerodrome elevation
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
RNAV	Radio Navigation
RPM	Revolution Per Minute
RRPM	Rotor Revolution Per Minute
R/T	Radio-telephony

S	Sailplane
SATCOM	Satellite C~~c~~ommunication
SE	Single-E~~e~~ngine
SEP	Single-E~~e~~ngine Piston
SET	Single-E~~e~~ngine Turboprop
SFE	Synthetic Flight Examiner
SFI	Synthetic Flight Instructor
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Weather
SLPC	Single Lever Power Control
SOP	Standard Operating Procedure
SP	Single-~~P~~pilot
SPA	Single-P~~p~~ilot Aeroplane
SPH	Single-P~~p~~ilot Helicopter
SPIC	Student PIC
SPL	Sailplane Pilot Licence
SSR	Secondary Surveillance Radar
STI	Synthetic Training Instructor
TAF	(Terminal Area Forecasts) Aerodrome Forecast
TAS	True Airs~~S~~peed
TAWS	Terrain Awareness Warning System
TDP	Take-off Decision Point
TEM	Threat and Error Management
TK	Theoretical K~~k~~nowledge
TMG	Touring Motor Glider
TORA	Take-O~~o~~ff Run Available
TODA	Take-O~~o~~ff Distance Available
TR	Type Rating
TRE	Type Rating Examiner
TRI	Type Rating Instructor
UPRT	Upset Prevention and Recovery Training
UTC	~~Coordinated~~ Universal Time Coordinated
V	Velocity
VASI	Visual Approach Slope Indicator

VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOR	VHF Omni-directional Radio Range
ZFTT	Zero Flight Time Training
ZFM	Zero Fuel Mass

GM3 FCL.010 Definitions

UPSET PREVENTION AND RECOVERY TRAINING (UPRT) DEFINITIONS

Note: Throughout this Guidance Material for UPRT, there is an assumption that when the wing stalls it is consequent on a situation in which the Angle of Attack (AoA) has, accidentally or intentionally, exceeded the critical angle with the wing normally loaded as for upright flight. That is with a positive G-loading. Nevertheless, it is possible to create situations in some aeroplanes where the wing is stalled with an inverted, negative G-loading. It is not the intention of these provisions to cover such situations, which should remain exclusively within the realm of aerobatic flying training.

'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.

'Angle of attack (AoA)' means the angle between the oncoming air, or relative wind, and a defined reference line on the aeroplane or wing.

'Approach-to-stall' means flight conditions bordered by the stall warning and stall.

'Competency' means a combination of skills, knowledge and attitudes required to perform a task to the prescribed standard.

'Developed upset' means a condition meeting the definition of an aeroplane upset.

'Developing upset' means any time the aeroplane begins to unintentionally diverge from the intended flight path or airspeed.

'Energy state' means how much of each kind of energy (kinetic, potential or chemical) the aeroplane has available at any given time.

'Error' means an action or inaction by the flight crew that leads to deviations from organisational or flight crew intentions or expectations.

'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.

'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.

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

'Fidelity level' means the level of realism assigned to each of the defined FSTD features.

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

'Flight path management' means active manipulation, using either the aeroplane's automation or manual handling, to command the aeroplane's flight controls in order to direct the aeroplane along a desired trajectory.

'Load 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.

'Loss of Control In-flight (LOCI)' means a categorisation of an accident or incident resulting from a deviation from the intended flight path.

'Manoeuvre-based training' means training that focusses on a single event or manoeuvre in isolation.

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

'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 skills to a situation or setting in normal practice that does not equal the training situation or setting.

'Post-stall regime' means flight conditions at an AoA greater than the critical AoA.

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

'Stall' means loss of lift caused by exceeding the aeroplane's critical AoA.

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.

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

'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 training organisation, based on the stall recovery template, may be used.

'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 AoA.

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

'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 AoA. 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.

'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.

'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.

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

'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.

'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.

'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'.

'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 are built upon 'hard'/systemic-based resources provided by the aviation system.

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

Note: The following definitions relate to the post-stall regime in aeroplanes that might typically be used for UPRT in an aeroplane and are not intended for application to commercial air transport operations.

'Incipient spin' means a transient flight condition in the post-stall regime where an initial, uncommanded roll in excess of 45° has resulted from yaw asymmetry during a stall and which, if recovery action is not taken, will lead rapidly to a developing spin. Prompt recovery during this incipient spin stage will normally result in an overall heading change, from pre-stall conditions, of not more than 180°.

'Developing spin' means a flight condition in the post-stall regime where the aeroplane exhibits abnormal, but varying, rates of yaw and roll, together with changing pitch attitude, following an incipient spin but before the establishment of a developed spin. A developing spin follows an unrecovered incipient spin and will usually persist, in the absence of any recovery action, until a developed spin ensues.

'Developed spin' means a flight condition in the post-stall regime where the aeroplane has achieved approximately constant pitch attitude, yaw rate and roll rate on a descending flight path. In transition from a stall with significant, persistent yaw, with no recovery action, to attaining a developed spin, the aeroplane is likely to have rolled through at least 540°.

Note: Spin development — The fact that one wing may drop when an aeroplane stalls is the basic cause of spinning. This can be seen from the graphs showing variations of C_L and C_D with the AoA.

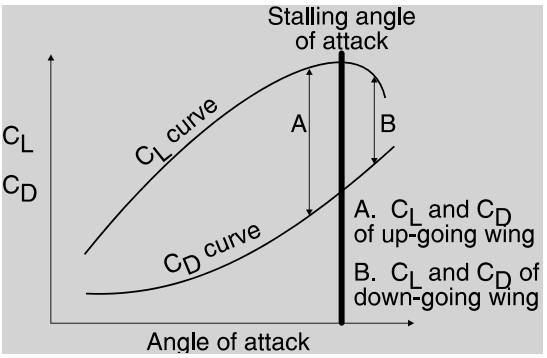


Figure 1: Variation of C_L and C_D curves with AoA

Suppose that a wing is just at the stalling angle and, therefore, at the peak of the C_L curve. If the aeroplane now rolls for some reason, the AoA of the down-going wing (particularly at the tip) is increased to some figure greater than the stalling angle (B in Figure 1), while that on the up-going wing is reduced (A in Figure 1). As a result of the decrease in lift that accompanies the stall, the total lift on the down-going wing is less than that on the up-going wing and so a rolling motion is set up. The C_D curve shows that after the stall there is a marked increase in drag, and the drag on the down-going wing is therefore higher than that on the other wing. This results in a movement that yaws the nose towards the down-going wing. The increase in drag tends to hold back the wing that is dropping, causing it to lose still more speed and lift. If this cycle is allowed to continue, it will result in a situation where the nose of the aeroplane rotates automatically towards the lower wing. This is known as autorotation. The process of autorotation, if not controlled, can lead to a number of complicated and unsteady manoeuvres involving motions about all three aeroplane axes and these motions might, in turn, lead into a spin.

To summarise, the circumstances that must prevail before an aeroplane spins are:

(a) The aeroplane must be in a stalled condition.
(b) The aeroplane must yaw and/or roll.

AMC1 FCL.110.A LAPL(A) — Experience requirements and crediting
FLIGHT INSTRUCTION FOR THE LAPL(A)

'(…)

(b) Flight instruction

(1) The LAPL(A) flight instruction syllabus should include ~~take into account the principles of~~ threat and error management, integrate upset prevention elements and associated human factors, and ~~also~~ cover:

(…)

(…)

(c) Syllabus of flight instruction

(…)

(2) Each of the exercises involves the need for the applicant to be aware of the energy state, the needs of good airmanship and look-out, which should be emphasised at all times.

(…)

(xiii) Exercise 10b: Stalling:

(A) safety checks;

(B) symptoms;

(C) recognition;

(D) ~~clean stall and recovery without power and with power;~~ recovery during the approach-to-stall and following a stall, in the clean configuration, during flight without power and with power;

(E) recovery ~~when~~ following a stall with a wing drop~~s~~ of less than 45°;

(F) recovery during the approach-to-stall in the approach and in the landing configurations, during flight ~~with and~~ without power and with power.

(xiv) Exercise 11: Spin avoidance:

(A) safety checks;

(B) instructor demonstration of developing or developed spin;

(C) stalling and recovery during the incipient spin stage;

(D) instructor-induced distractions during the stall.

(…)’

‘**GM1 FCL.125 LAPL — Skill test**
ABILITY TO MAINTAIN CONTROL OF THE AEROPLANE OR TMG

The applicant for the LAPL(A) should be able to demonstrate correct application of:

— upset prevention techniques and strategies,

— energy management,

— flight path management,

— threat and error management.’

AMC1 FCL.210;FCL.215

SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE PPL(A) AND PPL(H)

(…)

‘

		Aeroplane		**Helicopter**	
		PPL	Bridge course	PPL	Bridge course
6.	**OPERATIONAL PROCEDURES**				
	General				
	Operation of aircraft: ICAO Annex 6, General requirements				
	Definitions	x	x	x	x
	Applicability	x	x	x	x
	Special operational procedures and hazards (general aspects)	x	x	x	x
	Noise abatement				
	Noise abatement procedures	x	x	x	x
	Influence of the flight procedure (departure, cruise and approach)	x	x	x	x
	Runway incursion awareness (meaning of surface markings and signals)	x	x	x	x
	Fire or smoke				
	Carburettor fire	x	x	x	x
	Engine fire	x	x	x	x
	Fire in the cabin and cockpit, (choice of extinguishing agents according to fire classification and use of the extinguishers)	x	x	x	x
	Smoke in the cockpit and (effects and action to be taken), and smoke in the cockpit and cabin (effects and actions taken)	x	x	x	x
	Windshear and microburst				
	Effects and recognition during departure and approach	x	x	x	x
	Actions to avoid and actions taken during encounter	x	x	x	x
	Wake turbulence				
	Cause	x	x	x	x
	List of relevant parameters	x	x	x	x
	Actions taken when crossing traffic, during take-off and landing	x	x	x	x
	Emergency and precautionary landings				

		Aeroplane		**Helicopter**	
		PPL	Bridge course	PPL	Bridge course
	Definition	x	x	x	x
	Cause	x	x	x	x
	Passenger information	x	x	x	x
	Evacuation	x	x	x	x
	Action after landing	x	x	x	x
	Contaminated runways				
	Kinds of contamination	x	x		
	Estimated surface friction and friction coefficient	x	x		
	Rotor downwash			x	x
	Operation influence by meteorological conditions (helicopter)				
	White out, sand or dust			x	x
	Strong winds			x	x
	Mountain environment			x	x
	Emergency procedures				
	Influence by technical problems				
	Engine failure			x	x
	Fire in cabin, cockpit or engine			x	x
	Tail, rotor or directional control failure			x	x
	Ground resonance			x	x
	Blade stall			x	x
	Settling with power (vortex ring)			x	x
	Overpitch			x	x
	Overspeed: rotor or engine			x	x
	Dynamic rollover			x	x
	Mast bumping			x	x
	Upset prevention training				
	Aerodynamics	x	x		
	Causes of and contributing factors to upsets	x	x		
	Safety review of accidents and incidents relating to aeroplane upsets	x	x		
	G-load awareness and management	x	x		
	Energy management	x	x		
	Flight path management	x	x		
	Recognition	x	x		

		Aeroplane		**Helicopter**	
		PPL	Bridge course	PPL	Bridge course
	System malfunctions	x	x		
	TEM and human factors	x	x		

GM1 FCL.210.A

THEORETICAL KNOWLEDGE AND FLIGHT INSTRUCTION FOR THE LAPL(A) AND PPL(A) OPERATIONAL PROCEDURES — UPSET PREVENTION TRAINING

The objective of the upset prevention training is to provide student pilots with the required competencies to prevent aeroplane upsets. The upset prevention elements and respective components of Table 1 may be included into the theoretical knowledge and flight training as appropriate.

UPSET PREVENTION ELEMENTS

Table 1

Elements and components		**Theoretical knowledge**	**Flight instruction**
A.	**Aerodynamics**		
1.	Aeroplane certification and limitations	•	
2.	Aerodynamics (high and low altitudes)	•	•
3.	Aeroplane performance (high and low altitudes)	•	•
4.	AoA and stall awareness	•	•
5.	Aeroplane stability	•	•
6.	Control surface fundamentals	•	•
7.	Use of trims	•	•
8.	Icing and contamination effects	•	•
9.	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.	Relationship between kinetic, potential and chemical energy	•	•
F.	**Flight path management**		
1.	Relationship between pitch, power, speed and flight path	•	•
2.	Performance and effects of differing power plants (if applicable)	•	•
3.	Manual and automation inputs for guidance and control	•	•
4.	Automation management (if applicable)	•	•
5.	Proper use of rudder	•	•
G.	**Recognition**		
1.	Examples of physiological G-loading, visual and instrument clues during developing and developed upsets	•	•
2.	Pitch/power/roll/yaw	•	•
3.	Effective scanning (effective monitoring)	•	•
4.	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 or unreliable airspeed indication	•	•
5.	Automation failures (if applicable)	•	•
7.	Stall warning/indication system failures	•	•
I.	**TEM and human factors** (to be associated with elements A to H)		
1.	Threat and Error Management (TEM)	•	•
2.	Situational awareness: (a) active monitoring (b) fatigue management (c) workload management	•	•
3.	Startle and surprise effect: (a) physiological, psychological and cognitive responses (b) management strategies (c) resilience development	•	•
4.	Counter-intuitive behaviour	•	•

Note: Threat and Error Management (TEM) and human factors may be integrated into the flight training as appropriate.

(…)’

GM2 FCL.210.A

THEORETICAL KNOWLEDGE AND FLIGHT INSTRUCTION FOR THE LAPL(A) AND PPL(A)
OPERATIONAL PROCEDURES — UPSET PREVENTION TRAINING

Aerodynamics — AoA and stall awareness

Bank angles, wing loadings and stalling speeds

When an aeroplane makes a level turn, the G-loading experienced is equal to the reciprocal of the cosine of the angle of bank. At higher G-loadings, critical AoA is reached at higher speeds than in straight and level flight. The increase in stalling speed is related to the square root of the G-loading. The numbers are shown in the following table:

Angle of bank	15°	30°	45°	60°	75°
G-loading	1.03 g	1.15 g	1.41 g	2.00 g	3.86 g
Increase of stalling speed over V_{S1}	1.4 %	8 %	19 %	41 %	96 %

The relationship between angle of bank and G-loading or stalling speed is non-linear. Of particular note is the rapid increase of G-loading and stalling speeds at angles in excess of 45°. These data relate specifically to flights at low and medium altitudes. Margins at high altitudes and high Mach numbers may be even more critical.

If G-loading is reduced to less than 1 g, for example in transitioning from a climbing to a descending flight path, or to recover from an aeroplane upset, the wing may remain unstalled at speeds below V_{S1}. The relationship between G-loading and lowered stall speed, as a fraction of V_{S1}, is shown in the table below. This phenomenon is exploited in large aeroplanes during astronaut training to achieve periods of weightlessness. This relationship between G-loading and minimum flying speed is maintained regardless of the aeroplane's attitude.

G-loading	0 g	0.25 g	0.5 g	0.75 g	1 g
Reduced stalling speed	0	$0.5 \times V_{S1}$	$0.7 \times V_{S1}$	$0.87 \times V_{S1}$	V_{S1}

When the elevator control is moved away from the pilot, to reduce a positive G-load from the wing, the AoA is similarly reduced. If the aeroplane is close to stalling whilst loaded positively, the unloading action is always to move the elevator control away from the pilot regardless of bank angle or pitch attitude.

The physiological effects of G-loading

During an aeroplane upset and recovery, caused perhaps by severe turbulence or temporary loss of control after instrument failure, G-loads may be experienced by the crew that vary greatly from the + 1 g experienced in level flight. Transport aeroplanes are typically certified to withstand G-loadings in the range of – 1 to + 2.5 g, or + 3 g in some business aeroplanes. Sustained, high and positive G-loadings can induce loss of vision and subsequently loss of consciousness, but not when the duration of the exposure is short, 2–3 seconds, or within the range given above. However, pilots not familiar with these loadings will suffer from degraded perception and psycho-motor performance.

G-loadings below + 1 g

G-loadings between + 1 and 0 create a physiological effect that might be called 'floating'. Normal movements of the arms and legs are not affected, but as the loading approaches to 0, movements can become uncoordinated because of the lack of normal gravitational cues. Flight at 0 g removes all 'normal' load from the airframe and is thus structurally benign, but the effect on the internal organs of humans may lead to regurgitation or vomiting in those unfamiliar with the weightless sensation. At G-loadings below 0, unsecured items or personnel will move towards the aeroplane's 'ceiling'. Crew will be incapacitated unless secured by belts and will have to maintain a physical effort to keep their feet on the floor or rudder controls. At – 1 g, pilots will experience sensory inputs equivalent to being inverted, even though the aeroplane may be physically upright. Pilots without previous experience with this situation are likely to be disorientated and incapacitated, thus unable to ensure returning the aeroplane to a normal positive G-load state.

G-loadings exceeding + 1 g

The increase in limb weight as the G-loading increases hinders control operation in those unfamiliar with the condition. At + 2 g, most people without prior experience are unable to lift a foot from the floor or to maintain visual scan of their surroundings. Between + 2 and + 3 g, this temporary incapacitation can be easily overcome by experienced pilots, but will result in stasis and lack of situational awareness in pilots unfamiliar with the sensations.

Tolerance

Exposure to these 'unusual' G-loadings results in improved tolerance, reduction of disabling symptoms (such as startle), and the ability to retain psychomotor functions. Retention of this tolerance relies on the recency and regularity of the exposure.

Recognition — examples of physiological, visual and instrument clues during developing and developed upsets

Rapid development

Rapid development of an upset, from normal flight parameters, is most likely to occur as a result of environmental factors, especially severe weather or mechanical failure. In either case, physical clues such as rapid changes of attitude or G-loading give pilots immediate warning of an abnormal state. Provided that the crew are able to overcome the startle effect, they should be well aware of the need to make a timely and meaningful intervention.

Slow development

In cases of systems (automation, anti-icing, etc.) failure, the transition from normal conditions to an upset will take some time. Similarly, an upset resulting from poor energy or flight path management is unlikely to occur very rapidly. In these situations, prevention can be assured through effective monitoring of visual cues, in VMC, or instrument cues under instrument conditions.

The are two possibilities for a gradual change from a normal to an upset state: change of attitude from that desired, or change (increase) of AoA towards a critical condition.

Attitude change can be monitored externally or by using instruments in visual conditions, but only by paying close attention to instrument readings and trends when visual conditions do not prevail. However, all aeroplanes certified for flight under instrument conditions must have instruments

capable of readily showing attitude. In the event of failure of an attitude instrument, safety relies on the ability of the pilot to maintain spatial and situational awareness with restricted information.

Relatively few aeroplanes, however, have instrumentation that shows the AoA of the wing. Instead, pilots are usually shown current airspeed and airspeed trends, and they must deduce from this the instantaneous safety margin between actual and critical AoA. All flight training for these types of aeroplanes should be conducted in such a way that this deduction of AoA from airspeed, thrust, flight path, attitude and configuration is regularly considered, so that pilots are better aware of the condition of the wing and its margin over the stall.

AMC1 FCL.210.A PPL(A) — Experience requirements and crediting

FLIGHT INSTRUCTION FOR THE PPL(A)

'(…)

(a) Flight instruction

(1) The PPL(A) flight instruction syllabus should include ~~takes into account the~~ ~~principles of~~ threat and error management, integrate upset prevention elements and associated human factors, and ~~also~~ cover~~s~~:

(i) ...

(ii) ...

(iii) ...

(iv) flight at critically low air–speeds, recognition of, and recovery from stall events during the approach-to-stall and during the incipient spin stage following a stall;

(…)

(c) Syllabus of flight instruction

(…)

(2) Each of the exercises involves the need for the applicant to be aware of the energy state, the needs of good airmanship and look-out, which should be emphasised at all times.

(…)

(xiii) Exercise 10b: Stalling:

(A) safety checks;

(B) symptoms;

(C) recognition;

(D) ~~clean stall and recovery without power and with power;~~ recovery during the approach-to-stall and following a stall, in the clean configuration, during flight without power and with power;

(E) recovery ~~when~~ following a stall with a wing drop~~s~~;

(F) recovery during the approach-to-stall in the approach and in the landing configurations, during flight ~~with and~~ without power and with power.

(xiv) Exercise 11: Spin avoidance:

(A) safety checks;

(B) instructor demonstration of developing or developed spin;

(C) stalling and recovery during the incipient spin stage;

(D) instructor-induced distractions during the stall.

(…)'

'**AMC2 FCL.210.A**
FLIGHT INSTRUCTION FOR THE LAPL(A) AND PPL(A)

UPSET PREVENTION ELEMENTS AND ASSOCIATED HUMAN FACTORS

The LAPL(A) and PPL(A) flight training should integrate the following elements;

— aerodynamics;
— causes of and contributing factors to upsets;
— safety review of accidents and incidents relating to aeroplane upsets;
— g-load awareness and management;
— energy management;
— flight path management;
— recognition;
— system malfunctions;
— TEM and human factors.'

'**GM1 FCL.235 PPL(A) — Skill test**
ABILITY TO MAINTAIN CONTROL OF THE AEROPLANE OR TMG

The applicant for a PPL(A) should be able to demonstrate correct application of:
— upset prevention techniques and strategies;
— energy management;
— flight path management;
— threat and error management.'

AMC1 to Appendix 3 Training courses for the issue of a CPL and an ATPL

GENERAL

'(…)

(c) The upset prevention elements specified in AMC3 to Appendix 3 should be integrated into the flying training phases or modules.'

'A. **ATP integrated course: aeroplanes**

(…)

FLYING TRAINING

(d) The flying instruction is divided into ~~five~~six phases:

(1) phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane including:

(i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance and precautions;

(iii) control of the aeroplane by external visual references;

(iv) normal take-offs and landings;

(v) the upset prevention exercises in AMC4 to Appendix 3, and ~~flight at critically low air speeds,~~ recognition of and recovery from ~~incipient and full stalls~~ stall events in the following configurations:

— take-off configuration,
— clean configuration, and
— landing configuration; ~~spin avoidance.~~

(vi) ~~unusual attitudes and~~ simulated engine failure.

(2) phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

(i) maximum performance (short field and obstacle clearance) take-offs and short-field landings;

(ii) flight by reference solely to instruments, including the completion of a 180° turn;

(iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;

(iv) aerodrome and traffic pattern operations at different aerodromes;

(v) crosswind take-offs and landings;

(vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions;

(vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of dual instruction and at least 40 hours as PIC.

The dual instruction and testing up to the VFR navigation progress test should comprise:

(i) repetition of exercises of phases 1 and 2;

~~(ii) VFR flight at relatively critical high air speeds, recognition of and recovery from spiral dives;~~

(~~i~~ii) VFR navigation progress test conducted by an FI not connected with the applicant's training;

(i~~v~~ii) night flight time including take-offs and landings as PIC.

(4) phase 4:

Exercises up to the instrument rating skill test comprise:

(i) at least 55 hours instrument flight, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which should be conducted by an FI or a~~n authorised~~ SFI;

(ii) 20 hours instrument time flown as SPIC;

(iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;

(iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:

(A) transition from visual to instrument flight on take-off;

(B) SIDs and arrivals;

(C) en-route IFR procedures;

(D) holding procedures;

(E) instrument approaches to specified minima;

(F) missed approach procedures;

(G) landings from instrument approaches, including circling~~.~~;

(v) ~~in-flight manoeuvres and specific flight characteristics.~~the upset prevention exercises in AMC4 to Appendix 3;

(vi) operation of an ME aeroplane in the exercises of (iv), including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative, and engine shut-down and restart (the latter training should be conducted at a safe altitude unless carried out in an FSTD).

(5) phase 5:

(i) instruction in upset recovery exercises comprises the training requirements in accordance with FCL.745.A;

(ii) if a type rating for single-pilot high-performance complex aeroplanes in multi-pilot operations or multi-pilot aeroplanes is not required upon completion of this part, the applicant should be issued with a certificate of course completion for upset recovery training in an aeroplane.

(~~5~~6) phase ~~5~~6:

(i) instruction and testing in MCC comprise the relevant training requirements;

(ii) if a type rating for MP aeroplanes is not required upon completion of this part, the applicant ~~will~~should be issued~~provided~~ with a certificate of course completion for MCC training.

C. CPL/IR integrated course: aeroplanes

'(…)

FLYING TRAINING

(d) The flying instruction is divided into ~~four~~five phases:

(1) phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane, including:

(i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance and precautions;

(iii) control of the aeroplane by external visual references;

(iv) normal take-offs and landings;

(v) the upset prevention exercises specified in AMC4 to Appendix 3, and ~~flight at critically low air speeds,~~ recognition of and recovery from ~~incipient and full stalls, spin avoidance.~~ stall events in the following configurations:

— take-off configuration,
— clean configuration, and
— landing configuration;

(vi) ~~unusual attitudes and~~ simulated engine failure.

(2) phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

(i) maximum performance (short field and obstacle clearance) take-offs and short-field landings;

(ii) flight by reference solely to instruments, including the completion of a 180° turn;

(iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;

(iv) aerodrome and traffic pattern operations at different aerodromes;

(v) crosswind take-offs and landings;

(vi) abnormal and emergency operations and manoeuvres, including simulated aeroplane equipment malfunctions;

(vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of instruction and at least 40 hours as PIC.

The dual instruction and testing up to the VFR navigation progress test and the skill test should contain the following:

(i) repetition of exercises of phases 1 and 2;

~~(ii) VFR flight at relatively critical high air speeds, recognition of and recovery from spiral dives;~~

(~~i~~ii) VFR navigation progress test conducted by an FI not connected with the applicant's training;

(i~~v~~ii) night flight time including take-offs and landings as PIC.

(4) phase 4:

Exercises up to the instrument rating skill test comprise:

(i) at least 55 hours instrument time, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which should be conducted by an FI or a~~n authorised~~ SFI;

(ii) 20 hours instrument time flown as SPIC;

(iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;

(iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:

(A) transition from visual to instrument flight on take-off;

(B) SIDs and arrivals;

(C) en-route IFR procedures;

(D) holding procedures;

(E) instrument approaches to specified minima;

(F) missed approach procedures;

(G) landings from instrument approaches, including circling.

(v) ~~in-flight manoeuvres and specific flight characteristics~~the upset prevention exercises specified in AMC4 to Appendix 3;~~.~~

(vi) operation of either an SE or an ME aeroplane in the exercises of (iv), including in the case of an ME aeroplane operation of the aeroplane solely by reference to instruments with one engine simulated inoperative and engine shut-down and restart. The latter exercise is to be conducted at a safe altitude unless carried out in an FSTD.

D. CPL integrated course: aeroplanes

'(…)

FLYING TRAINING

(d) The flying instruction is divided into ~~four~~five phases:

(1) phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane, including:

(i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance and precautions;

(iii) control of the aeroplane by external visual references;

(iv) normal take-offs and landings;

(v) the upset prevention exercises specified in AMC4 to Appendix 3, and ~~flight at critically low air speeds,~~ recognition of and recovery from ~~incipient and full stalls,~~ stall events in the following configurations:

— take-off configuration,
— clean configuration, and
— landing configuration;

~~spin avoidance.~~

(vi) ~~unusual attitudes and~~ simulated engine failure.

(2) phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

(i) maximum performance (short field and obstacle clearance) take-offs and short-field landings;

(ii) flight by reference solely to instruments, including the completion of a 180° turn;

(iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;

(iv) aerodrome and traffic pattern operations at different aerodromes;

(v) crosswind take-offs and landings;

(vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions;

(vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(vii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 30 hours instruction and at least 58 hours as PIC, including:

(~~a~~i) at least 10 hours instrument time, which may contain 5 hours of instrument ground time in an FNPT or an FFS and should be conducted by an FI or an ~~authorised~~ SFI;

(~~b~~ii) repetition of exercises of phases 1 and 2, which should include at least 5 hours in an aeroplane certificated for the carriage of at least four persons and have a variable pitch propeller and retractable landing gear;

~~(c) VFR flight at relatively critical high air speeds, recognition of and recovery from spiral dives;~~

(~~d~~iii) night flight time including take-offs and landings as PIC.

(4) phase 4:

The dual instruction and testing up to the CPL(A) skill test contain the following:

(i) up to 30 hours instruction which may be allocated to specialised aerial work training;

(ii) repetition of exercises in phase 3, as required;

(iii) in-flight manoeuvres and particular flight characteristics;

(iv) ME training.

If required, operation of an ME aeroplane including operation of the aeroplane with one engine simulated inoperative, and engine shutdown and restart (the latter exercise at a safe altitude unless carried out in an FSTD).'

E. CPL modular course: aeroplanes

'(…)

FLYING TRAINING

(d) The following flight time is suggested for the flying training:

(1)	visual flight training:	suggested flight time
(i)	Exercise 1: pre-flight operations: mass and balance determination, aeroplane inspection and servicing.	
(ii)	Exercise 2: take-off, traffic pattern, approach and landing, use of checklist, collision avoidance and checking procedures.	0:45 hours
(iii)	Exercise 3: traffic patterns: simulated engine failure during and after take-off.	0:45 hours
(iv)	Exercise 4:	

	maximum performance (short field and obstacle clearance) take-offs and short-field landings.	1:00 hours
(v)	Exercise 5: crosswind take-offs, landings and go-arounds.	1:00 hours
(vi)	Exercise 6: ~~flight at relatively critical high air speeds; recognition of and recovery from spiral dives~~the upset prevention exercises in AMC4 to Appendix 3.	0:45 hours
(vii)	Exercise 7: ~~flight at critically slow air speeds, spin avoidance,~~ recognition of and recovery from ~~incipient and full stalls~~ stall events in the following configurations: — take-off configuration, — clean configuration, and — landing configuration.	0:45 hours
(viii)	Exercise 8: cross-country flying using DR and radio navigation aids; flight planning by the applicant; filing of ATC flight plan; evaluation of weather briefing documentation, NOTAM, etc.; R/T procedures and phraseology; positioning by radio navigation aids; operation to, from and transiting controlled aerodromes, compliance with ATS procedures for VFR flights, simulated radio	10:00 hours

communication failure, weather deterioration, diversion procedures; simulated engine failure during cruise flight; selection of an emergency landing strip.

(2) instrument flight training:

(i) This module is identical to the 10-hours basic instrument flight module as set out in AMC2 to Appendix 6. This module is focussed on the basics of flying by sole reference to instruments, including limited panel and unusual attitudes.

(ii) All exercises may be performed in an FNPT I or II or an FFS. If instrument flight training is in VMC, a suitable means of simulating IMC for the student should be used.

(iii) A BITD may be used for the following exercises: (9), (10), (11), (12), (14) and (16).

(iv) The use of the BITD is subject to the following:

(A) the training is complemented by exercises in an aeroplane;

(B) the record of the parameters of the flight is available;

(C) an FI(A) or IRI(A) conducts the instruction.

(v) Exercise 9:

Basic instrument flying without external visual cues; horizontal flight; power changes for acceleration or deceleration, maintaining straight and level flight; turns in level flight with 15° and 25° bank, left and right; roll-out onto predetermined headings.	0:30 hours

(vi) Exercise 10:

Repetition of exercise 9; additionally climbing and descending, maintaining heading and speed, transition to horizontal flight; climbing and descending turns.	0:45 hours

(i) Exercise 11:

Instrument pattern:	0:45 hours
(1) start exercise, decelerate to approach speed, flaps into	

approach configuration;

(2) initiate standard turn (left or right);

(3) roll out on opposite heading, maintain new heading for 1 minute;

(4) standard turn, gear down, descend 500 ft/min;

(5) roll out on initial heading, maintain descent (500 ft/min) and new heading for 1 minute;

(6) transition to horizontal flight, 1.000 ft below initial flight level;

(7) initiate go-around;

(8) climb at best rate of climb speed.

(ii) Exercise 12:
Repetition of exercise 9 and steep turns with 45° bank; recovery from unusual attitudes. 0:45 hours

(ix) Exercise 13:
Repetition of exercise 12 0:45 hours

(x) Exercise 14:
Radio navigation using VOR, NDB or, if available, VDF; interception of predetermined QDM and QDR. 0:45 hours

(xi) Exercise 15:
Repetition of exercise 9 and ~~recovery from unusual attitudes~~ the upset prevention exercises specified in AMC4 to Appendix 3. 0:45 hours

(xii) Exercise 16:
Repetition of exercise 9, turns and level change and ~~recovery from~~ 0:45 hours

~~unusual attitudes~~the upset prevention exercises specified in AMC4 to Appendix 3 with simulated failure of the artificial horizon or directional gyro.

~~(xiii) Exercise 17:~~

~~Recognition of, and recovery from, incipient and full stalls.~~ ~~0:45 hours~~

(xi~~v~~ii) Exercise 1~~8~~7:

Repetition of exercises (14)~~,~~ and (16) ~~and (17)~~. 3:~~3~~00 hours

(3) ME training

If required, operation of an ME aeroplane in the exercises 1 through 1~~8~~7, including operation of the aeroplane with one engine simulated inoperative, and engine shutdown and restart. Before commencing training, the applicant should have complied with the type and class ratings requirements as appropriate to the aeroplane used for the test.

AMC2 to Appendix 3 Training courses for the issue of a CPL and an ATPL

CREDITING PRIOR EXPERIENCE OF THE UPSET RECOVERY TRAINING COURSE IN AN AEROPLANE

The ATO should give full credit towards the upset recovery training course in an aeroplane requirement in the ATPL(A) training course to applicants who have completed the upset recovery training course in an aeroplane in accordance with FCL.745.A, provided the course was completed within 5 years from the commencement of the training course for the ATPL(A).

AMC3 to Appendix 3;AMC1 to Appendix 5

UPSET PREVENTION TRAINING FOR CPL(A), ATPL(A) and MPL training courses

The objective of the upset prevention training is for student pilots to gain the required competencies in order to prevent aeroplane upsets.

UPSET PREVENTION ELEMENTS

The upset prevention elements and respective components in Table 1 should be integrated into the flying training modules and phases, such that all the elements are covered.

Table 1: Elements and components of the upset prevention training

Core elements and components		Pre-flight briefing	Flying training
A.	**Aerodynamics**		
1.	General aerodynamic characteristics	•	•
2.	Aeroplane certification and limitations	•	•
4.	Aerodynamics (high and low altitude)	•	•
5.	Aeroplane performance (high and low altitude)	•	•
6.	AoA and stall awareness	•	•
7.	Aeroplane stability	•	•
8.	Control surface fundamentals	•	•
9.	Use of trim	•	•
10.	Icing and contamination effects	•	•
11.	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)	•	•
C.	**Flight path management**		
1.	Relationship between pitch, power and performance	•	•
2.	Performance and effects of differing power plants	•	•
3.	Manual and automation inputs for guidance and control (if applicable)	•	•
4.	Class-specific characteristics of flight path management	•	•
5.	Management of go-arounds from various stages during the approach	•	•

6.	Automation management (if applicable)	•	•
7.	Proper use of rudder	•	•
D.	**Recognition**		
1.	Class-specific examples of instrumentation during developing and developed upset	•	•
2.	Pitch/power/roll/yaw	•	•
3.	Effective scanning (effective monitoring)	•	•
4.	Stall protection systems and cues	•	•
5.	Criteria for identifying stalls and upsets	•	•
E.	**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.	Stall protection system failures, including icing alerting systems	•	•

TEM, CRM AND HUMAN FACTORS

Threat and Error Management (TEM), Crew Resource Management (CRM) and human factors in Table 2 should be integrated into the flying training modules and phases as appropriate.

Table2: Elements and components of TEM, CRM and human factors

Core elements and components		**Pre-flight briefing**	**Flying training**
A.	**TEM**		
1.	TEM framework	•	•
2.	Recognition of threats and errors	•	•
3.	Management of threats and errors	•	•
4.	Countermeasures against threats and errors to prevent undesired aircraft states	•	•
B.	**CRM**		
1	Situational awareness	•	•

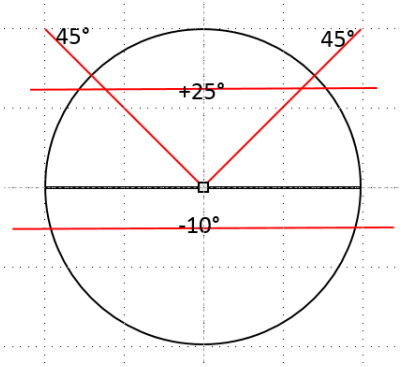
2.	Aeroplane flight path management, manual control	•	•
3	Aeroplane flight path management, automation	•	•
4	Application of procedures	•	•
5	Problem-solving and decision-making	•	•
6	Workload management	•	•
7	Communication	•	•
8	Leadership and teamwork	•	•
C.	**Undesired aircraft states**		
1	Early intervention and timely switching to manage undesired aircraft states when necessary to prevent upsets	•	•
D.	**Human factors**		
1.	Instrument interpretation, active monitoring, checking	•	•
2.	Distraction, inattention, fixation, fatigue	•	•
3.	Human information processing, cognitive effects	•	•
4.	Perceptual illusions (visual or physiological) and spatial disorientation, effects of G-loads	•	•
5.	Stress, startle and surprise effect	•	•
6.	Intuitive and counter-intuitive behaviour	•	•

AMC4 to Appendix 3 Training courses for the issue of a CPL and an ATPL

UPSET PREVENTION EXERCISES

The upset prevention exercises in Table 1 should remain within the recommended training envelope to assure that sufficient safety margins are maintained.

Recommended training envelope for use during the upset prevention exercises.



Bank:	up to 45° left and right bank
Pitch:	up to 25° nose-high and 10° nose-low
AoA:	< AoA crit.
Airspeed:	≤ Design maneuvering speed

Table 1: Upset prevention exercises

	Core exercises	Pre-flight briefing	Flying training
A.	**Timely and appropriate intervention**		
1.	Arresting divergence of the aeroplane from intended flight path	•	•
2.	Preventing flight at airspeeds inappropriate for the (intended flight) condition	•	•
3.	Spin avoidance	•	•
B.	**Flight path management**		
1.	Steep turns	•	•
2.	Slow flight (including flight at critically low airspeed)	•	•
3.	High airspeed (including flight at relatively high airspeed)	•	•
C.	**Application of OEM recommendations (if applicable) during developing upsets**		
1.	Nose-high attitudes at various bank angles	•	•
2.	Nose-low attitudes at various bank angles (including spiral dive)	•	•

GM1 to Appendix 3 Training courses for the issue of a CPL and an ATPL

UPSET PREVENTION EXERCISES

Application of OEM recommendation during developing upsets

Nose-high and nose-low prevention training exercises should apply the prevention strategies recommended by the OEMs contained in Tables 1 and 2 below.

Note: As OEM procedures always take precedence over the recommendations, training organisations should consult the OEM on whether any approved class-specific procedures are available prior to using the templates.

Refer to revision 2 of the Aeroplane Upset Recovery Training Aid (AURTA) for a detailed explanation and rationale of nose-high and nose-low recovery strategies as recommended by the OEMs.

Table 1: Recommended nose-high recovery strategy template

Nose-high recovery strategy template		
Recognise and confirm the developing situation by announcing **'nose high'**		
PF		
1.	**AUTOPILOT — DISCONNECT** (A large out-of-trim condition could be encountered when the AP is disconnected)	
2.	**AUTOTHRUST/AUTOTHROTTLE — OFF** (if applicable)	
3.	**APPLY** as much nose-down control input as required to obtain a nose-down pitch rate	
4.	**POWER — ADJUST** (if required)	
5.	**ROLL — ADJUST** (if required) (Avoid exceeding 60-degree bank)	
6.	When airspeed is sufficiently increasing — **RECOVER** to level flight (Avoid the secondary stall due to 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.		

Table 2: Recommended nose-low recovery strategy template

Nose-low recovery strategy template		
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		
1.	**AUTOPILOT — DISCONNECT** (A large out-of-trim condition could be encountered when the AP is disconnected)	
2.	**AUTOTHRUST/AUTOTHROTTLE — OFF** (if applicable)	
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.	**POWER** and **DRAG — ADJUST** (if required)	
6.	**RECOVER** to level flight (Avoid the secondary stall due to 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.

ADDITIONAL GUIDANCE

Specific guidance on upset prevention training is available in the latest revision of the ICAO Doc 10011 'Manual on Aeroplane Upset Prevention and Recovery Training'.

AMC1 to Appendix 4 B. 3. (e) Content of the skill test for the issue of a CPL — Aeroplanes

ABILITY TO MAINTAIN CONTROL OF THE AEROPLANE

During the skill test, the applicant should be able to demonstrate correct application of:

— upset prevention techniques and strategies,
— energy management,
— flight path management,
— threat and error management.

GM to Appendix 5

MPL TRAINING SCHEME
The following scheme should be applied:

MPL Training Scheme
Minimum 240 hours of training, including "~~–~~Pilot Flying~~"~~ (PF) and "~~–~~Pilot ~~Non-Flying~~Monitoring~~"~~ (P~~NF~~M)

Phases of training	Training items	Flight and simulated flight training media - Minimum level requirement -		Ground training media
Phase 4 ~~—~~– advanced Type rating training within an airline-oriented environment	• CRM • Landing training • All weather • LOFT • Abnormal procedures • Normal procedures • Type-specific UPRT	Aeroplane: ME Multi-crew certified FSTD FS level D or C + ATC simulation	12 take-offs and landings as PF PF / P~~NF~~M	• CBT • E-learning • Part-task trainer • Class-room
Phase 3 ~~—~~– intermediate Application of multi-crew operations in a high-performance ME turbine aeroplane	• CRM • LOFT • Abnormal procedures • Normal procedures • Multi-crew • Instrument flight • Non-type-specific UPRT	FSTD: *representing an ME turbine-powered aeroplane to be operated with a co-pilot and qualified to an equivalent standard to level B + ATC simulation*	PF / P~~NF~~M	
Phase 2 ~~—~~– basic Introduction of multi-crew operations and instrument flight	• CRM • PF / ~~PNF~~PM complement • IFR cross-country • Instrument flight	Aeroplane: SE or ME FSTD: FNPT II + MCC	PF / P~~NF~~M	
Phase 1 ~~—~~– core flying skills Specific basic SP training	• CRM • VFR c~~C~~ross-country • Solo flight • Basic i~~I~~nstrument flight • Principles of flight • Cockpit procedures • ~~On aeroplane U~~upset recovery in an aeroplane • Night flight	Aeroplane: SE or ME FSTD: FNPT I / BITD	PF	

Integrated TEM principles

Refer to FCL.745.A for the recovery course in an aeroplane requirements.

AMC1 FCL.725(a) Requirements for the issue of class and type ratings

SYLLABUS OF THEORETICAL KNOWLEDGE FOR CLASS OR TYPE RATINGS
I. SE AND ME AEROPLANES

'(…)

(i) Special requirements for single-pilot high-performance complex aeroplanes in multi-pilot operations and multi-pilot type ratings.

Additional theoretical knowledge instruction on upset prevention in accordance with AMC3 FCL.725(a).'

'AMC3 FCL.725(a);AMC3 to Appendix 9

ADDITIONAL THEORETICAL KNOWLEDGE AND FLIGHT INSTRUCTION ON UPSET PREVENTION FOR SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES IN MULTI-PILOT OPERATIONS AND MULTI-PILOT AEROPLANE TYPE RATINGS

Table 1: Elements and respective components of upset prevention training

Elements and components		**TK instruction**	**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.	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	•	•

GM1 to FCL.725(a); GM1 to Appendix 9

UPSET PREVENTION AND RECOVERY TRAINING (UPRT) FOR SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES IN MULTI-PILOT OPERATIONS AND MULTI-PILOT AEOPLANE TYPE RATINGS

The objective of the UPRT is to help type rating applicants acquire the required competencies in order to prevent or recover from a developing or developed aeroplane upset. Prevention training prepares applicants to avoid incidents whereas recovery training prepares applicants 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 as well as the importance of resilience development should be emphasised.

Training should also emphasise that an actual upset condition may expose pilots 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.

ADDITIONAL GUIDANCE

Specific guidance to the UPRT elements and exercises contained in the AMC is available in the latest revision of the ICAO Doc 10011 'Manual on Aeroplane Upset Prevention and Recovery Training'.

Further guidance is available in revision 2 of the AURTA, in the UK CAA Paper 2013/02 'Monitoring Matters - Guidance on the Development of Pilot Monitoring Skills', and in the Flight Safety Foundation publication 'A Practical Guide for Improving Flight Path Monitoring', November 2014.

GM1 Appendix 9

UPSET RECOVERY TRAINING FOR SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES IN MULTI-PILOT OPERATIONS AND MULTI-PILOT TYPE RATINGS

The upset recovery training exercises should be manoeuvre-based, which enable type rating applicants 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.

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

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

Item 3.7 — STALL EVENT RECOVERY EXERCISE

It is of utmost importance that stall event recovery exercises take 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 '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 FFSs, 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 FFSs, 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 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 conducted in accordance with the stall event recovery procedures of the OEMs.

Note: If an OEM-approved recovery procedure does not exist, training organisations 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 of 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 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 to premature recovery or excessive G-loading)	

ITEM 3.7.1 — NOSE-HIGH AND NOSE-LOW RECOVERY EXCERSISES

Nose-high and nose-low recovery exercises should be conducted in accordance with the strategies recommended by the OEMs contained in Tables 2 and 3 below.

Note: As the OEM procedures always take precedence over the recommendations, training organisations should consult the 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 of nose-high and nose-low recovery strategies as recommended by the OEMs.

Table 2: Recommended nose-high recovery strategy template

Nose-high recovery strategy template		
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-degree bank)	
6.	When airspeed is sufficiently increasing — **RECOVER** to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	
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.		

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><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>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 to 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>

AMC1 FCL.745.A(a)(1);Appendix 5

UPSET RECOVERY TRAINING — AEROPLANES: THEORETICAL KNOWLEDGE INSTRUCTION

The theoretical knowledge instruction should comprise:

(a) if not already undertaken during a CPL(A), ATPL(A) or an MPL training course, the relevant theoretical knowledge instruction on upset recovery;

(b) the elements and respective components in Table 1.

Table 1: Elements and components of upset recovery training

Core elements and components	
A.	**Threat and Error Management (TEM) & Crew Resource Management (CRM)**
1.	TEM framework
2.	Recognition of threats and errors of undesired aircraft states
3.	Management of threats and errors of undesired aircraft states
4.	Countermeasures of threats and errors of undesired aircraft states (early intervention and timely switching to undesired aircraft states management when necessary to prevent upsets)
	Situational awareness Aeroplane flight path management, manual control Application of procedures Problem-solving and decision-making Workload management Communication Leadership and teamwork
B.	**Human factors — managing consequential psychological and physiological effects of developed upsets**
1.	Active monitoring and checking
2.	Human information processing, cognitive effects
3.	Perceptual illusions (visual or physiological) and spatial disorientation, effects of G-loads
4.	Correct interpretation of upset attitudes and energy states
5.	Management of surprise and startle induced by upset attitudes
6.	Managing the effects of G-loads
7.	Understanding counter-intuitive behaviour
8.	Distraction, inattention, fixation
C.	**Application of recovery templates**
1.	Recovery from nose-high attitudes at various bank angles
2.	Recovery from nose-low attitudes at various bank angles
D.	**Application of the OEM stall recovery procedure or the stall recovery template**

1.	Recovery from aerodynamic stall, including uncoordinated stalls (aggravating yaw)
2.	Recovery from an accelerated stall
3.	Recovery from secondary stall
E.	**Application of spin recovery technique**
1.	Recovery from incipient spin
2.	Recovery from fully developed spin

AMC1 FCL.745.A(a)(2);Appendix 5

UPSET RECOVERY TRAINING — AEROPLANE: UPSET RECOVERY TRAINING IN AN AEROPLANE QUALIFIED FOR THE TRAINING TASK

The upset recovery training should comprise the exercises in Table 1.

Table1: Upset recovery exercises

Upset recovery exercises*		**Pre-flight briefing**	**Flying training**
A.	**Application of OEM recommendations**		
1.	Recovery from nose-high upsets at low airspeed at various bank angles	•	•
2.	Recovery from nose-low upsets at high airspeed at various bank angles, including spiral dive	•	•
B.	**Application of the stall recovery procedure**		
1.	Recovery from stall, including uncoordinated stalls (aggravating yaw)	•	•
2.	Recovery from an accelerated and secondary stall	•	•
3.	Recovery from incipient spin	•	•

*Student pilots should not be required to perform any manoeuvres not listed in Table 1.

GM1 FCL.745.A(a)(2);Appendix 5

UPSET RECOVERY TRAINING EXERCISES

The aim of the training in an aeroplane should be to build pilot resilience. Resilience can be increased by raising the level of competence (knowledge, skills and attitude) and by achieving the appropriate level of confidence (trust).

(a) The training objectives should enable student pilots to:

(1) apply effective strategies to recover from actual developed upsets;

(2) manage psychological and physiological effects induced by all-attitude exposure;

(3) perform appropriate counter-intuitive actions whilst experiencing unusual accelerations, especially those experienced during deviations from normal 1G flight conditions.

(b) Instructors should:

(1) deliver training in an aeroplane in a spirit of collaborative learning and ensure that student pilots will experience the successful outcome of their actions. Success will allow student pilots to build positive thinking and confidence in their ability to successfully recover from any developed nose-high or nose-low attitude, and from stalls. Such experience may positively contribute to resilience and consequentially reduce the level of stress in difficult situations. Lower stress levels will then allow problem-focussed coping with the situation (including the application of TEM and CRM) and prevent or reduce emotional effects, such as attention-channelling and degraded information processing;

(2) place emphasis on the differences in aerodynamic behaviour and flight controls of large transport aeroplanes in comparison to the training aeroplane to avoid negative transfer of training;

(3) place emphasis on the correct application of:

(i) the stall recovery Standard Operating Procedures (SOPs) of the Original Equipment Manufacturers (OEMs), or the OEM recommended template in GM3 FCL.745.A(a)(2), and to reduce the AoA whilst accepting the resulting altitude loss. The training should also emphasise the avoidance of secondary stalls during the recovery; and

(ii) the nose-high and nose-low recommendations of the OEM in GM3 FCL.745.A(a)(2) during nose-high attitudes (various bank angles) and nose-low attitudes (various bank angles) exercises.

GM2 FCL.745.A(a)(2);Appendix 5

UPSET RECOVERY TRAINING EXERCISES

The objective of this GM is to provide further guidance on the conduct of the various upset recovery exercises, which requires instructor performance in the all-attitude/all-envelope environment, beyond that experienced in normal operations.

GENERAL

(a) Instructors should:

(1) ensure that the training objectives of the upset recovery exercises are achieved;

(2) understand that upset recovery exercises in an aeroplane build primarily resilience and confidence. In other words, the training serves mainly human factor training objectives and less flying skills training;

(3) have knowledge and understanding of how:

(i) UPRT in an aeroplane and in an FSTD complement each other; and

(ii) to ensure that negative transfer of training from light aeroplanes to heavier transport category aeroplanes is avoided. This may be achieved by observing UPRT in an FSTD, especially in a type-specific FFS;

(4) have knowledge and understanding of the upset prevention theoretical knowledge and flight instruction elements taught during the CPL(A) and ATPL(A) training courses to ensure continuity and consistency in delivering UPRT;

(5) ensure that the risk mitigation procedures developed by the ATO are strictly adhered to in order to ensure that safety margins are maintained.

Note: The safety implications of poor upset recovery instructional technique or misleading information is *more significant* than in any other areas of pilot training.

Note: Transport aeroplanes are typically certified to withstand G-loadings in the range of –1 to +2.5G (or +3G in some business aeroplanes). As the upset recovery training is mainly focussed on future airline pilots, instructors should ensure that student pilots are not exposed to G-loading outside this range to avoid negative transfer of training.'

EXERCISES

The overarching training aim is for the student pilot to be able to identify and recover safely from aeroplane upsets.

(a) In general, the training objectives are for the student pilot to be able to:

(1) recognise and confirm the situation;

(2) apply an appropriate, effective and timely recovery action;

(3) stay within the speed and G-loading envelope;

(4) correctly recognise when recovered from the upset situation;

(5) set safe parameters of heading, altitude and speed whilst re-establishing situational awareness;

(6) identify the reasons for the aeroplane entering the upset situation and take appropriate corrective actions to prevent further upsets;

(7) become more confident about their skills and ability to recover from an upset situation.

(b) The instructor should ensure that the training area remains well clear of traffic and significant weather.

(c) Guidance on specific exercises:

In broad terms, there are three kinds of upset situations that should be addressed:

1. Nose-high with low airspeed;
2. Nose-low with high airspeed;
3. Airspeed stable with high angle of bank.

Exercise A.1 & A.2	
Instructor role	To implement scenarios that result in: 1. an unexpected nose-high attitude (25° or greater) with high angle of bank with or without full power; 2. an unexpected nose-low attitude (– 10° or greater) with high angle of bank with or without full power; 3. 'normal' pitch attitude but high angle of bank.
Objective	The student pilot should be able to recognise and confirm the developing situation, announces 'upset situation', and immediately performs the appropriate upset recovery strategy (power, roll, pitch).
Areas of special emphasis	— Recognition and recovery. — Crew coordination. — AoA management, including available AoA indications. — Possible effect of thrust on pitch moment. — Aural and visual warnings (environment and aeroplane cueing). — Startle and surprise effect. — Situational awareness while returning the aeroplane to safe flight, including

	items such as heading, altitude, other aeroplanes, and flight deck automation.
Aeroplane set-up and further considerations	In order to create realistic conditions, consider the use of: — system malfunctions resulting in erroneous pitch attitude indications; — other system malfunctions that may influence nose attitude; — realistic environmental threats destabilising the flight path.
Exercise elements	Upon recognition of the first indication of an upset, perform the upset recovery strategy. Smooth, deliberate and positive control inputs are necessary to avoid increasing load factors, especially 'rolling G'.
Completion standards	— Recognises and confirms the situation. — Initiates recovery by: • identifying airspeed trend, verifying that the autopilot and autothrottle/autothrust are disconnected, and sets thrust accordingly (bearing in mind the engine configuration of the aeroplane): ○ speed high and increasing: reduce thrust; ○ speed low and reducing: increase thrust; ○ speed stable: no change to thrust setting; • initiating roll to the nearest horizon; • once 'wings level' condition is achieved, initiating pitch change sufficient to arrest climb or descent rate (caution to be aware of 'rolling G'). — When control is re-established, proper recovery consists of up to full forward movement of the control column to achieve nose-down elevator and by using stabiliser trim, if required. A steady nose-down pitch rate should be achieved, and it should be noted that the aeroplane would be less than 1G and the associated characteristics of such. — When approaching the horizon, the pilot checks airspeed, adjusts thrust and establishes the appropriate pitch attitude and stabiliser trim setting for level flight. — The manoeuvre is considered complete once a safe speed is achieved and the aeroplane is stabilised. — Satisfactory crew coordination should be demonstrated.
Common student pilot errors	— Fails to confirm the developing situation. — Fails to announce the situation. — Fails to disengage or annunciate autopilot and/or autothrottle. — Fails to reduce thrust sufficiently, if necessary, to obtain nose-down pitch. — Reduces thrust excessively. — Fails to use sufficient elevator authority. — Fails to use stabiliser trim when necessary.
Common instructor errors	— Fails to notice improper control inputs which may lead to exceedance of the aeroplane's limits (speed and G-loading)

Exercises B.1 & B.2	
Instructor role	Show that an aeroplane can be stalled at any airspeed and attitude (demonstration only). While manoeuvring, point out that the aeroplane can be in a nose-high attitude with a low airspeed and less effective controls but, because there is no buffet, the aeroplane is not stalled. However, the aeroplane can be in a nose-low attitude with the airspeed increasing and well above the basic stalling speed, but if the AoA is increased sufficiently by pulling the control column, the aeroplane can be stalled. Emphasise that in a real situation the student should take recovery action immediately when they notice any sign that the aeroplane is approaching the stall. Implement scenarios that result in an unexpected stall event.
Objective	The student pilot should be able to recognise and confirm the developing situation. Announces 'stall' and immediately performs the recovery procedure.
Areas of special emphasis	— Recognition and recovery. — Crew coordination. — AoA management, including available AoA indications. — Aural and visual warnings (environment and aeroplane cueing). — Surprise and startle. — Situational awareness while returning to desired flight path after the stall recovery, including items such as heading, altitude, other aeroplanes, and flight deck automation.
Aeroplane set-up and further considerations	In order to create potential realistic conditions, consider the use of: — system malfunctions resulting in erroneous pitch attitude which may lead to a stall event; — other system malfunctions resulting in a low-speed configuration; — manoeuvres which lead to potential stalling conditions, e.g. visual turn to final approach.
Exercise elements	Upon recognition of the first indication of a stall, perform the stall recovery procedure. Smooth, deliberate, and positive control inputs to reduce the AoA and effect a safe recovery without inducing a secondary stall.
Completion standards	— Recognises and confirms the situation. — Initiates recovery by: • verifying that the autopilot and autothrottle/autothrust are disconnected; • moving the control column centrally forward in order to reduce the AoA whilst simultaneously increasing thrust (bearing in mind the engine configuration of the aeroplane); • rolling in the shortest direction to wings level; • when approaching the horizon, the pilot checks airspeed, adjusts thrust, and establishes the appropriate pitch attitude and stabiliser trim setting for level flight or climb as appropriate. — The manoeuvre is considered complete once a safe speed is achieved and the aeroplane is stabilised. — Do not enter into an accelerated stall by exceeding the stall AoA. Aeroplane limitations of g-forces and airspeed should also be respected.

	— Satisfactory crew coordination should be demonstrated.
Common student pilot errors	— Fails to recognise the developing situation. — Fails to announce the situation. — Fails to disengage the autopilot and/or autothrottle and to announce 'off'. — Fails to reduce the AoA by not moving the control column centrally forward. — Fails to roll in the shortest direction to wings level. — Fails to move control column forward before rolling. — Enters in a secondary accelerated stall by exceeding the stall AoA due to premature attempt to stabilise altitude/initiate climb or excessive G-loading.
Common instructor errors	Fails to notice improper control inputs which may lead to a secondary stall.

Exercise B.3	
Instructor role	Implement scenarios that result in an incipient spin.
Objective	— The student should understand that a spin results from a stall, regardless of loading or attitude, that is accompanied by yaw or roll. — An incipient spin can result from misusing the controls at a high AoA and/or low airspeed, close to the stall. The incipient spin is indicated by buffet and uncommanded roll. The student must understand that in this context uncommanded roll could mean: • roll when no control inputs demanding roll have been made; • a sudden increase in the rate of roll; • an uncommanded reduction in the rate of roll; • a complete loss of control, where the aeroplane is no longer responding to control inputs. — The student must understand that the intended recovery actions will require to remove any stalled condition (buffet), and stop both yaw and roll. — The student must be able to recognise the conditions that are likely to lead to an unintentional spin and to take recovery action promptly at the incipient stage. — At the end of an incipient spin from manoeuvre, the aeroplane could finish up in any attitude. — Upon recognition of the incipient spin, the student pilot announces 'right spin' or 'left spin', and immediately performs the recovery procedure.
Areas of special emphasis	— Recognition and recovery. — Crew coordination. — AoA management, including available AoA indications. — Rotation management, including available rotation indicators (rate-turn gyros, either turn needle or turn coordinator). — Aural and visual warnings (environment and aeroplane cueing). — Human factors: disorientation, nausea. — Surprise and startle. Situational awareness while returning to desired flight path after the spin recovery, including items such as heading, altitude, other aeroplanes, and flight deck automation.

Aeroplane set-up and further considerations	In order to create potential realistic conditions, consider the use of 'case study' situations like: — System malfunctions resulting in erroneous slide-slip indications which may lead to an asymmetric stall event. — Incorrect stall recovery procedure which may lead to an incipient spin. — Hold the aeroplane in a fully developed clean stall until an appreciable rate of roll develops. This gives a slow and unhurried demonstration of the recognition symptoms; the aeroplane is stalled with uncommanded roll present. — Mishandle the aeroplane in a low speed turn reversal; the sudden change in the rate of roll marks the point of departure. — Mishandle the aeroplane in aerobatic manoeuvres such as loop, roll off the top and stall turn, to initiate departure. These must be manoeuvres that the student has seen before; otherwise, they might not recognise what is happening. The student should confirm verbally that they can recognise the point of departure. Stress that in order to avoid incipient spin, they must avoid pulling into the buffet.

Note: Spin recovery procedures for those aeroplanes certified for such manoeuvres are particular to each aeroplane. In the event that the aeroplane enters a full spin, the recovery action MUST be completed in accordance with the AFM. The instructor must be familiar with these procedures even when limiting the student instruction to incipient spin recoveries. The aeroplane used for such exercises should be certified for spinning.

GM3 FCL.745.A(a)(2);Appendix 5

UPSET RECOVERY TRAINING EXERCISES

STALL RECOVERY EXERCISES

The OEM procedures always take precedence over the recommendations.

Note: Training providers should therefore consult the OEM on whether any approved type-specific stall recovery procedures are available prior to using the template in Table 1.

Refer to revision 2 of the AURTA for a detailed explanation and rationale of the stall recovery template 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)		
1.	**AUTOPILOT — DISCONNECT** (A large out-of-trim condition could be encountered when the autopilot is disconnected)	
2.	**AUTOTHRUST/AUTOTHROTTLE — OFF** (if applicable)	
3.	**(a) NOSE-DOWN PITCH CONTROL** apply until stall warning is eliminated **(b) NOSE-DOWN PITCH TRIM** (as needed) (Reduce the AoA whilst accepting the resulting altitude loss)	
4.	**BANK — WINGS LEVEL**	
5.	**POWER — ADJUST** (as needed)	
6.	**SPEEDBRAKES/SPOILERS — RETRACT**	
7.	When airspeed is sufficiently increasing — **RECOVER** to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	

NOSE-HIGH AND NOSE-LOW RECOVERY EXCERSISES

Nose-high and nose-low recovery exercises should use the strategies recommended by the OEMs contained in Tables 2 and 3 below.

Note: As the OEM procedures always take precedence over the recommendations, training providers should consult the respective 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 of nose-high and nose-low recovery strategies as recommended by the OEMs.

Table 2: Recommended nose-high recovery strategy template

Nose-high recovery strategy template		
PF — Recognise and confirm the developing situation by announcing **'nose high'**		
PF		
1.	**AUTOPILOT — DISCONNECT** (A large out-of-trim condition could be encountered when the AP is disconnected)	
2.	**AUTOTHRUST/AUTOTHROTTLE — OFF** (if applicable)	
3.	**APPLY** as much nose-down control input as required to obtain a nose-down pitch rate	
4.	**POWER — ADJUST** (if required)	
5.	**ROLL — ADJUST** (if required) (Avoid exceeding 60-degree bank)	
6.	When airspeed is sufficiently increasing — **RECOVER** to level flight (Avoid the secondary stall due to 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.		

Table 3: Recommended nose-low recovery strategy template

Nose-low recovery strategy template		
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		
1.	**AUTOPILOT — DISCONNECT** (A large out-of-trim condition could be encountered when the AP is disconnected)	
2.	**AUTOTHRUST/AUTOTHROTTLE — OFF** (if applicable)	
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 to 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.		

AMC1 FCL.915
(e) General prerequisites and requirements for instructors
UPSET RECOVERY INSTRUCTOR TRAINING COURSE IN AN AEROPLANE

(a) The objectives of the upset recovery instructor training course is to train instructors to deliver training in accordance with the train-to-proficiency concept.

(b) Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching upset recovery techniques and strategies, whilst exploring the associated physiological and psychological aspects.

PRE-ENTRY FLIGHT ASSESSMENT

(c) Instructors for the flight instruction privilege for the upset recovery training course should have passed a pre-entry flight assessment with an instructor holding the privilege to instruct in the upset recovery instructor course within 6 months preceding the start of the course, to assess their ability to undertake the course.

THEORETICAL KNOWLEDGE AND FLIGHT INSTRUCTION

(d) The training course should comprise:

(1) theoretical knowledge instruction on the upset recovery exercises in AMC1 FCL.745.A and the elements in Table 1.

Table 1

Additional instructor upset recovery course elements	
1.	Completion of a flight risk assessment
2.	Resilience- and confidence-building strategies, managing startle and surprise
3.	Understanding the operating environment
4.	Understanding the limitations and type-specific characteristics of the aeroplane used for training
5.	Value and benefits of an instructor-led demonstration
6.	Energy management factors
7.	Workload management
8.	Instructor techniques to induce and manage startle and surprise
9.	Upset recognition and recovery strategies
10.	Disorientation
11.	Distraction
12.	Recognition of student pilot errors
13.	Intervention strategies

(2) flight instruction on the upset recovery course exercises in AMC1 to FCL.745.A and the content of the assessment of competence in AMC1 FCL.915(e).

(e) The instructor competencies should be assessed continuously during the training course based on the assessment of competence in AMC1 FCL.915(e).

(f) The instructor should be issued with a certificate of course completion for the instructor upset recovery course in an aeroplane.

GM1 FCL.915(e) General prerequisites and requirements for instructors
PRE-ENTRY FLIGHT ASSESSMENT

The pre-entry assessment may be based on selected elements of the assessment of competence in AMC1 FCL.915(e) whilst taking into account the experience level of the applicant.

AMC1 FCL.915(e) General prerequisites and requirements for instructors
ASSESSMENT OF COMPETENCE

(a) Content of the assessment:

SECTION 1 — THEORETICAL KNOWLEDGE — ORAL	
1.1	Aerodynamics
1.2	Causes of and contributing factors to upsets
1.3	Learning from causes and contributing factors following accidents and incidents relating to aeroplane upsets
1.4	G awareness and management
1.5	Energy management
1.6	Flight path management
1.7	Recognition of developing and developed upset conditions
1.8	Upset prevention and recovery techniques and strategies
1.9	System malfunctions
1.10	TEM, CRM and human factors
1.11	Resilience- and confidence-building strategies, managing startle and surprise
1.12	Instructor intervention skills

SECTION 2 — PRE-FLIGHT PREPARATION	
2.1	Correct completion of a flight risk assessment
2.2	Understanding the operating environment
2.3	Understanding the limitations and type-specific characteristics of the aeroplane used for training
2.4	Safety briefing
SECTION 3 — FLIGHT	
3.1	Accurately deliver the training curriculum employing sound instructional techniques
3.2	Understand the importance of adhering to the upset recovery scenarios that have been validated by the training programme developer during the lesson
3.3	Application of OEM recommendations during recovery from nose-high and nose-low attitudes
3.4	Recovery from various bank angles
3.5	Recovery from the spiral dive
3.6	Recovery from aerodynamic stalls, including uncoordinated stalls (aggravating yaw) and recovery from incipient spin
3.7	Recovery from an accelerated stall
3.8	Recovery from secondary stall
3.9	Recovery from a fully developed spin
3.10	Instructor-led demonstrations
3.11	Instructor techniques to induce and manage startle and surprise
3.12	Recognition of student pilot errors
3.13	Recover the aeroplane in those instances when corrections are required which could exceed the capabilities of the student pilot; intervention strategies
3.14	Foresee the development of flight conditions which might exceed aeroplane limitations and acting swiftly and appropriately to maintain necessary margins of safety

3.15	Project the aeroplane's flight path and energy state based on present conditions with consideration to both current and anticipated flight control inputs
3.16	Determine when it becomes necessary to interrupt training to maintain safety and the well-being of the student pilot

SECTION 4 — POST-FLIGHT DEBRIEFING	
4.1	Accurately assess the student pilot's performance levels and provide effective remediation
4.2	Use of available instructor tools for providing accurate feedback on student pilot performance
4.3	Avoid negative transfer of training

(b) The theoretical knowledge assessment in Section 1 is tested orally.

(c) Sections 2, 3 and 4 comprise exercises in order to demonstrate the ability to instruct in the course. The applicant is required to demonstrate competence in all the abilities, including briefing, flight instruction and exercises, and debriefing.

GM2 FCL.915(e) General prerequisites and requirements for instructors

THEORETICAL KNOWLEDGE AND FLIGHT INSTRUCTION

The UPRT in the environment of an aeroplane may be beyond that which is experienced during normal training operations. The unpredictable nature of student pilot inputs, reactions and behaviour requires fluency in response to a wide variety of potential situations requiring a time-constrained and accurate response. This specialised expertise cannot be acquired through routine flight operations alone, but demands that instructor training provide the appropriate degree of exposure necessary to develop a comprehensive understanding of the entire UPRT operating environment, as well as the aeroplane's limitations and capabilities.

Instructors for the upset recovery course privilege should therefore be trained-to-proficiency and remain current to ensure competence in aeroplane manoeuvring as well as being able to consistently employ effective intervention skills that may become necessary to maintain adequate margins of safety. Such interventions may be required with regard to aeroplane limitations, altitude, airspace, avoidance of collision, human performance and limitations of the instructor or the student pilot or any other threat or error that might reduce margins of safety. Instructors' training should therefore focus on risk/safety margin management, strong teaching skills with respect to human factors, students' psychophysiological reactions (startle and surprise), confidence building, and in-flight recovery skills.

Note: Transport aeroplanes are typically certified to withstand G-loadings in the range of –1 to +2.5G (or +3G in some business aeroplanes). As the upset recovery training in an aeroplane is mainly focussed on future airline pilots, instructors should ensure that student pilots are not exposed to G-loading outside this range to avoid negative transfer of training.'

AMC1 FCL.920 Instructor competencies and assessment

'(…)

(b) The training and assessment of instructors should be made against the following performance standards:

Competence	**Performance**	**Knowledge**
Prepare resources	(a) ensures adequate facilities; (b) prepares briefing material; (c) manages available tools~~;~~ (d) recognises the limitations of the training platform	(a) understands objectives; (b) available tools; (c) competency-based training methods~~;~~ (d) FSTD: understands the Valid Training Envelope (VTE) of the device in use and appreciates the potential of negative training that may exist when training beyond the boundaries of this VTE.
Create a climate conducive to learning	(a) establishes credentials, role models appropriate behaviour; (b) clarifies roles; (c) states objectives; (d) ascertains and supports student pilot's needs.	(a) barriers to learning; (b) learning styles.
Present knowledge	(a) communicates clearly; (b) creates and sustains realism; (c) looks for training opportunities.	teaching methods~~.~~
Integrate TEM ~~or~~and CRM to prevent undesired aircraft states	(a) makes TEM ~~or~~and CRM links with technical training~~.~~; (b) for aeroplanes: makes upset prevention links with technical training.	(a) HF, TEM ~~or~~and CRM~~.~~; (b) for aeroplanes: upset prevention links, with emphasis on flight path and energy management.
Manage time to achieve training objectives	A~~a~~llocates the appropriate time ~~appropriate~~ to achieve~~ing~~ competency objective.	syllabus time allocation~~.~~
Facilitate learning	(a) encourages student pilot participation; (b) shows motivating, patient, confident and assertive manner; (c) conducts one-to-one coaching; (d) encourages mutual support.	(a) facilitation; (b) how to give constructive feedback; (c) how to encourage student pilots to ask questions and seek advice~~;~~.

Assesses student pilot performance	(a) assesses and encourages student pilot self-assessment of performance against competency standards; (b) makes assessment decision and provides clear feedback; (c) observes CRM behaviour.	(a) observation techniques; (b) methods for recording observations.
Monitor and review progress	(a) compares individual outcomes to defined objectives; (b) identifies individual differences in learning rates; (c) applies appropriate corrective action.	(a) learning styles; (b) strategies for training adaptation to meet individual needs.
Evaluate training sessions	(a) elicits feedback from student pilots; (b) tracks training session processes against competence criteria; (c) keeps appropriate records.	(a) competency unit and associated elements; (b) performance criteria.
Report outcome	R~~e~~eports accurately using only observed actions and events.	(a) phase training objectives; (b) individual versus systemic weaknesses.'

GM1 FCL.920 Instructor competencies and assessment

UPSET PREVENTION TRAINING: INTEGRATING TEM AND CRM TO PREVENT UNDESIRED AIRCRAFT STATES

TEM and CRM should be applied by instructors in a practical way during upset prevention training. As upset prevention training focusses on preventing undesired aircraft states, training should go beyond replicating known events. It should strengthen the countermeasures which enable (student) pilots to recognise and manage threats and errors successfully before an undesired aircraft state or even when an upset occurs. Prevention training, therefore, means to focus on CRM skills and pilot competencies; they are the countermeasures against the constantly present threats and errors. Their continuous application leads to successful prevention of upsets and they also serve recovery once an upset has occurred. As the number and conditions of possible causes of and contributing factors in upsets (threats, errors and undesired aircraft states) are infinite, there will always be unforeseeable events for which (student) pilots have not been trained before. Developing the CRM skills and their underlying pilot competencies should prepare (student) pilots to cope with both predictable and unforeseen situations (sometimes described as 'black swans').

Causes of upsets are connected to TEM, CRM and upset prevention training as follows:

Threats and errors are the causes of and contributing factors in upsets. They have been grouped into:

— environmental,

— mechanical/aeroplane systems, and

— pilot-/human-induced.

Table 1 below shows how TEM functions in upset prevention training. It includes organisational threats and suggests how CRM and pilot competencies serve as countermeasures against undesired aircraft states.

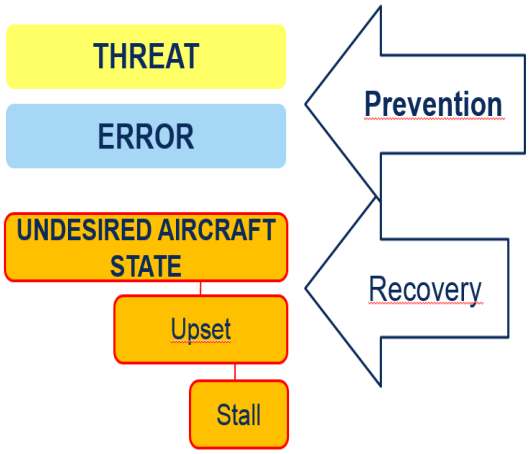
<table>
<tr><th colspan="3">TEM</th></tr>
<tr><td>Causes/contributory factors (may be any combination of)*:</td><td rowspan="3"> 
</td><td rowspan="3">Pilots use CRM skills and pilot competencies as countermeasures to recognise and manage threats, errors and undesired aircraft states.</td></tr>
<tr><td>THREATS
— environmental
— aeroplane systems
— organisational</td></tr>
<tr><td>ERRORS
— pilot/human</td></tr>
</table>

Table 1

AMC1 FCL.930.TRI TRI — Training course

TRI TRAINING COURSE: AEROPLANES

GENERAL

'(…)

(i) The student instructor should understand the capabilities and limitations of the device used.

CONTENT

(~~i~~j) The training course consists of three parts:

(1) Part 1: teaching and learning instruction that should comply with AMC1 FCL.920;

(2) Part 2: technical theoretical knowledge instruction (technical training);

(3) Part 3: flight instruction.

Part 1

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

The instruction should comprise theoretical knowledge instruction on the capabilities and limitations of the FSTDs.

(…)'

AMC3 FCL.930.TRI TRI Training course

UPSET PREVENTION AND RECOVERY TRAINING (UPRT)

It is of paramount importance that instructors have the specific competence to deliver UPRT during the type rating course, including the ability to demonstrate knowledge and understanding of the type-specific upset recovery procedures and recommendations developed by the Original Equipment Manufacturers (OEMs). Therefore, during the TRI training course the student instructor should:

(a) be able to demonstrate application of the type-specific upset recovery procedures and recommendations developed by the OEMs;

(b) understand the importance of applying type-specific OEMs procedures for recovery manoeuvres;

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

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

(g) understand and be able to use the FSTD instructor tools available for providing accurate feedback on pilot 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 student pilot(s) receiving the training.'

'**GM1 FCL.905.TRI(b) Privileges and conditions**

TRI INSTRUCTING FOR THE ISSUE OF A TRI OR SFI CERTIFICATE

Upset recovery training in an aeroplane for a TRI(A) instructing for the issue of a TRI(A) or SFI(A) certificate is not a requirement. However, it may be beneficial that such a TRI has first-hand experience of the critical psychological and physiological human factors, which might be present during recoveries from developed upsets.

These human factors (effects of unusual acceleration, such as variations from normal 1G flight, the difficulty to perform counter-intuitive actions, and the management of associated stress response) can only be experienced during training in an aeroplane because FFSs are not capable of reproducing sustained accelerations.

Student pilots within the FFS environment who may not have been exposed to these human factors will have to rely on the competency of their instructor to compensate for this exposure gap.'

AMC2 ORA.ATO.125 Training programme

TYPE RATING COURSES – AEROPLANES

'(…)

(k) Aeroplane training with FFS

(1) with the exception of courses approved for ZFTT, certain training exercises normally involving take-off and landing in various configurations should be completed in the aeroplane rather than in an FFS. ~~For MPAs, where the student pilot has more than 500 hours of MPA experience in aeroplanes of similar size~~

~~and performance, these should include at least four landings of which at least one should be a full-stop landing, u~~Unless otherwise specified in the OSD established in accordance with Regulation (E~~C~~U) No ~~1702/2003~~748/2012, ~~when available,~~ these should include:

(A) at least three landings of which at least one should be a full-stop landing; and

(B) one go-around with all engines operating.

~~In all other cases the student should complete at least six landings.~~ This aeroplane training may be completed after the student pilot has completed the FSTD training and has successfully undertaken the type rating skill test, provided it does not exceed 2 hours of the flight training course.

(…)'

'**GM2 ORA.ATO.125 Training programme**

TYPE RATING COURSES — AEROPLANES

FLIGHT TRAINING IN AN AEROPLANE

THREE LANDINGS

The following performance criteria may be taken into account by the TRI(A) for the successful conduct of the three landings by the student pilot.

The student pilot should demonstrate the ability to:

— fly a stable approach (defined by trajectory, speed, configuration and thrust) by the minimum height specified (normally 500 feet for a visual approach);
— maintain a stable approach until flare;
— initiate flare at the correct height;
— flare to the correct attitude;
— touch down in the correct touchdown area;
— control thrust reduction to achieve the correct speed at touchdown;
— control touchdown to achieve a normal rate of descent;
— control lateral position to achieve a touchdown on the runway's centre line,
— control nose wheel touchdown as applicable;
— control deceleration and roll-out using applicable devices.

Due consideration should be given to environmental conditions when evaluating the demonstration of task proficiency and related criteria.

GO-AROUND WITH ALL ENGINES OPERATING

The objective of the go-around exercise in an aeroplane is to expose the student pilot to the somatogravic illusion. The TRI(A) should ensure that the applicant understands the objective of the exercise and should provide the student with appropriate coping strategies, including TEM.

Due consideration should be given to environmental conditions when evaluating the demonstration of task proficiency and related criteria.'

‘**GM2 ORA.ATO.125 Training programme**

TYPE RATING COURSES — AEROPLANES

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 OEMs to avoid negative training or negative transfer of training.

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

FFS QUALIFIED FOR THE UPSET RECOVERY TRAINING TASK

The FFS used for the upset recovery training should be qualified to ensure that 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 qualify 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 qualify, 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’ of 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, functions and subjective tests

FSTD standards
Appendix 1 to CS-FSTD(A).300 Flight simulation training device standards (Ref.: CS-FSTD(A), pp. 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) pp. 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), p. 115)
p. Special effects — *Effects of airframe and engine icing* — (2)(a) (See Appendix 1 to CS FSTD(A).300 1.t.1.)’

‘**AMC5 ORA.ATO.125 Training programme**

UPSET RECOVERY TRAINING COURSE — AEROPLANES

(a) Introduction

(1) The upset recovery training course should provide for a continuous process of ground and flight training to enable the student pilot to assimilate the knowledge, skills and attitude to achieve competency in applying upset recovery strategies. The student pilot’s ability to do this should be determined by training them to the required level of proficiency during both ground and flight training.

(2) The upset recovery training should normally be conducted as a single, full-time course of study and training.

(b) Programme of theoretical knowledge and flight training

(1) The ATO training programme should specify the time allocated to theoretical knowledge training and flying training.

FLIGHT TRAINING

(i) Aeroplane training

(1) It is widely accepted that flying training normally involves inherent delay in achieving an acceptable flight situation and configuration for training to be delivered in accordance with the agreed syllabus. These could include ATC or other traffic delay on the ground prior to take-off, the necessity to climb to height or transit to suitable training areas, and the unavoidable need to physically reposition the aeroplane for subsequent or repeat manoeuvres. In such cases the ATO should ensure that the training syllabus provides adequate flexibility to enable the minimum amount of required flight training to be delivered.

(2) Upset recovery training in an aeroplane involves exercises that expose student pilots to greater risks when compared with flight training within the normal operating envelope. Therefore, the ATO should ensure that:

(i) the aeroplane used is qualified for the conduct of the various training exercises whilst maintaining an adequate safety margin.

(ii) the instructor providing the upset recovery training is qualified in accordance with FCL.915(e), is competent and current in delivering the course material, and possesses the ability to make accurate performance assessments and recommendations for remediation, whenever necessary.

TRAINING TO PROFICIENCY

(j) The student pilot should be trained-to-proficiency. No assessment or examination should be conducted by the ATO.

COURSE COMPLETION CERTIFICATE

(k) The Head of Training (HT) is required to certify that the applicant has successfully completed the upset recovery training course in an aeroplane in FCL.745.A.’

‘**GM1 ORA.ATO.125 Training programme**

UPSET RECOVERY TRAINING COURSE — AEROPLANE QUALIFIED FOR THE TRAINING TASK

Use of aerobatic aeroplanes would be the optimum solution to provide maximum training value and safety margins. However, it is recognised that some upset recovery exercises do not necessarily require the use of an

aerobatic aeroplane. To provide a certain amount of flexibility, the ATO may use a normal or utility category aeroplane for some of the exercises. In such cases, the ATO, in consultation with their competent authority, should carefully evaluate whether an adequate safety margin can be maintained if an aeroplane category other than aerobatic is used for each specific exercise.'

'**GM2 ORA.ATO.125 Training programme**

UPSET RECOVERY TRAINING COURSE — INSTRUCTORS

The upset recovery training in an aeroplane environment will be beyond that which is experienced during training within the normal training envelope. The unpredictable nature of student inputs, reactions and behaviour requires fluency in response to a wide variety of potential situations requiring a time-constrained and accurate response. This specialised expertise cannot be acquired through routine flight operations alone, but demands that instructor training provide the appropriate degree of exposure necessary to develop complete knowledge and understanding of the entire UPRT operating environment.'

'**GM1 ARA.GEN.200(a)(2)**

UPSET PREVENTION AND RECOVERY TRAINING (UPRT)

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

The competent authority should regard UPRT as training-to-proficiency. Testing or checking of student pilots in the context of UPRT should not be conducted. The successful outcome of UPRT should be based upon the student pilot's ability to consistently apply effective countermeasures to upset-related threats in a safe and expeditious manner upon completion of the approved training.

To ensure appropriate oversight of the recovery training in an aeroplane conducted during the ATPL(A) and MPL training courses, and during the stand-alone upset recovery course in an aeroplane, the inspector should have knowledge of and understand that:

(a) the training will require departure from normal flight parameters with the application of recovery strategies and actions by the student pilot whilst under supervision;

(b) the training should be mitigated by thorough flight planning processes and briefings, and should only be conducted by instructors holding the upset recovery training privilege in accordance with FCL.915(e);

(c) the instructors providing the upset recovery training in an aeroplane holding the privilege in accordance with FCL.915(e) are trained-to-proficiency and remain current to ensure competence in upset recovery training in an aeroplane, as well as consistently employing effective interventions that may become necessary to maintain adequate margins of safety. Such interventions may be required with regard to aeroplane limitations, altitude, airspace, avoidance of collisions, human performance and limitations of the instructor or student pilot or any other threat or error that might reduce margins of safety;

(d) the aeroplanes used for the training should be qualified and suitable for the training task; and

(e) the Approved Training Organisations (ATOs) providing the training should;

(1) identify the safety risks associated with the training as part of their management system; and

(2) establish procedures for minimum dispatch and weather criteria, such as minimum safe altitudes and airspace restrictions.

To ensure appropriate oversight of UPRT conducted during single-pilot high-performance complex aeroplane type ratings in multi-pilot operations and multi-pilot aeroplane type rating training courses in an FSTD, the inspector should have knowledge of and understand that:

(a) FSTD-based training may require exposing pilots into upset situations which they would have avoided in the normal course of events. It is essential that the potential negative training aspects of such situations are considered by the ATO during the course design and training implementation, and consequently either avoided or remedied;

(b) FSTDs are not capable of accurately simulating the full range of physical sensations, structural limitations and aeroplane responses that may be experienced during an actual upset, and this may lead to negative training in a training scenario that does not take these aspects into account for mitigation;

(c) the FSTD instructor has the specific competence to deliver UPRT training during the type rating course, including the ability to demonstrate knowledge and understanding of the type-specific upset recovery procedures and recommendations developed by the OEMs;

(d) the FSTD used during the training is qualified for the training task, especially during the upset recovery exercises;

(e) the ATO providing the type rating training course has a comprehensive training and standardisation programme in place to ensure that FSTD instructors have and maintain complete knowledge and understanding of the UPRT operating environment and skill sets.

ADDITIONAL GUIDANCE

Specific guidance to the UPRT elements and exercises is available in the latest revision of the ICAO Doc 10011 'Manual on Aeroplane Upset and Prevention Training'. Further guidance is available in revision 2 of the AURTA, in the UK CAA Paper 2013/02 'Monitoring Matters - Guidance on the Development of Pilot Monitoring Skills', and in the Flight Safety Foundation publication 'A Practical Guide for Improving Flight Path Monitoring', November 2014.'

'**GM2 ARO.GEN.200(a)(2) Management system**

UPSET PREVENTION AND RECOVERY TRAINING

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

The competent authority should regard UPRT as training-to-proficiency. Testing or checking of student pilots in the context of UPRT should not be conducted. The success of UPRT should be based upon the student pilot's ability to consistently apply effective countermeasures to upset-related threats in a safe and expeditious manner upon completion of the approved training.

To ensure appropriate oversight of UPRT conducted during the operator conversion training course and recurrent training programme, the inspector should understand that:

(a) FSTD-based training may require exposing flight crews into upset situations which they would have avoided in the normal course of events. It is essential that the potential negative training aspects of such situations are considered by the training provider and either avoided or remedied;

(b) FSTDs are not capable of accurately simulating the full range of physical sensations, structural limitations and aeroplane responses that may be experienced during an actual upset, and this may lead to negative training in a training scenario that does not take these aspects into account for mitigation; and

(c) FSTD-based training should be conducted using the highest level of FSTD fidelity available.

ADDITIONAL GUIDANCE

Specific guidance on the UPRT elements and exercises contained in this AMC is available in the latest revision of the ICAO Doc 10011 'Manual on Aeroplane Upset Prevention and Recovery Training'.

Further guidance is available in revision 2 of the AURTA, in the UK CAA Paper 2013/02 'Monitoring Matters - Guidance on the Development of Pilot Monitoring Skills', and in the Flight Safety Foundation publication 'A Practical Guide for Improving Flight Path Monitoring', November 2014.'

'**AMC1 FCL.800 Aerobatic rating**

THEORETICAL KNOWLEDGE AND FLYING TRAINING

(…)

(c) Theoretical knowledge

The theoretical knowledge syllabus should cover the revision or explanation of:

(5) emergency procedures:
(i) recovery from ~~unusual attitudes~~aeroplane upsets;
(…)

(…)

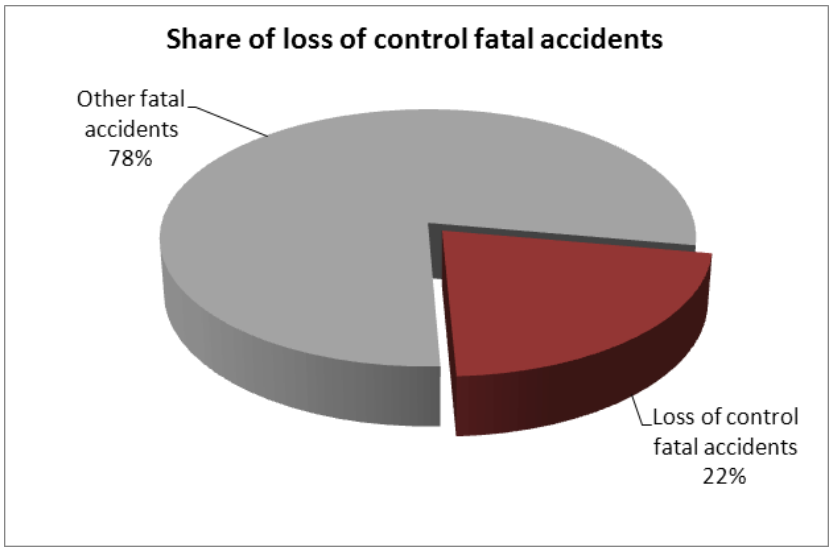
(d) Flying training
The exercises of the aerobatic flying training syllabus should be repeated as necessary until the applicant achieves a safe and competent standard. Having completed the flight training, the student pilot should be able to perform a solo flight containing a sequence of aerobatic manoeuvres. The dual training and the supervised solo training flights should be tailored to the category of aircraft and limited to the permitted manoeuvres of that type of aircraft. The exercises should comprise at least the following practical training items:
(1) confidence manoeuvres and recoveries:
(…)
(vii) recovery from ~~unusual attitudes~~aeroplane upsets.'

4. Regulatory Impact Assessment (RIA)

4.1. Issues to be addressed

Safety issue

Over the past 10 years, approximately 20 % of the fatal accidents worldwide in CAT operations with aeroplanes can be attributed to LOCI.



2002–2011 EU carriers fatal accidents in CAT operations with aeroplanes with MTOM above 5 700 kg

Source: EASA Safety Analysis.

The approximate global rate is 5.4 accidents per 10 000 000 flight movements or 1 fatal accident per year. Within Europe, the rate is 1.6 fatal accidents per 10 000 000 flights or 1 fatal accident every 3 years.

Safety Recommendations (SRs)

The importance of the safety issue is further exemplified by the following LOCI-related SRs addressed to the Agency:

— FRAN-2012-039: The French Accident Investigation Board (BEA) recommends that European Aviation Safety Agency ensure the integration, in type rating and recurrent training programmes, of exercises that take into account all of the reconfiguration laws. The objective sought is to make its recognition and understanding easier for crews especially when dealing with the level of protection available and the possible differences in handling characteristics, including at the limits of the flight envelope.

— FRAN-2012-040: The BEA recommends that: more generally, EASA ensure that type rating and recurrent training programmes take into account the specificities of the aircraft for which they are designed.

— NETH-2010-007: The French Civil Aviation Authority (DGAC), International Civil Aviation Organisation (ICAO), Federal Aviation Administration (FAA) and EASA should change their regulations in such a way that airlines and flying training organisations see to it that their recurrent training programmes include practicing recovery from stall situations on approach.

— FRAN-2010-004: The BEA recommends that EASA undertake a safety study with a view to improving the certification standards of warning systems for crews during reconfigurations of flight control systems or the training of crews in identifying these reconfigurations and determining the immediate operational consequences.

— FRAN-2010-005: The BEA recommends that EASA, in cooperation with manufacturers, improves training exercises and techniques relating to approach-to-stall to ensure control of the aeroplane in the pitch axis.

— FRAN-2011-009: The BEA recommends that EASA review the content of check and training programmes and make mandatory, in particular, the setting up of specific and regular exercises dedicated to manual aircraft handling of approach to stall and stall recovery, including at high altitude.

— SPAN-2011-018 : It is recommended that FAA and EASA require take-off stall recovery as part of initial and recurring training programs of airline transport pilots.

— SOUF-2010-009: It is recommended that the Regulatory and Certificating Authorities of all States of Design and States of Manufacture should introduce requirements to operators that they should provide flight crews with more basic hand flying and simulator flight training on new generation aircraft to address the technological developments in aviation, inclusive of effective stall training.

— FRAN-2012-021: The BEA recommends that EASA introduce the surprise effect in training scenarios in order to train pilots to react to these phenomena and work under stress.

— FRAN-2012-041: The BEA recommends that EASA define recurrent training programme requirements to make sure, through practical exercises, that the theoretical knowledge, particularly on flight mechanics, is well understood.

— FRAN-2012-046: The BEA recommends that EASA ensure the introduction into the training scenarios of the effects of surprise in order to train pilots to face these phenomena and to work in situations with a highly charged emotional factor.

— FRAN-2013-023: The BEA recommends that the EASA review the regulatory requirements for the first CS-25 type rating in order to make mandatory the performance of a go-around in the aeroplane with all engines operating.

— FRAN-2013-041: The BEA recommends that the EASA, in cooperation with the national civil aviation authorities, major non-European certification authorities and manufacturers ensure that pilots have practical knowledge of the conduct required during a go-around at low speed with pitch trim in an unusual nose-up position, and that they make a competence assessment.

— NETH-2014-005: The EASA should review the applicable regulations on initial and recurrent flight crew training to assess whether they adequately address the potential degradation of situational awareness (basic pilot skills) and flight path management due to increased reliance on aircraft automation by flight crews.

— FINL-2014-002: The EASA consider the translation, provide more detailed comments on the purpose of this exercise, and clarify it with practical examples. In addition, it is recommended that the possible new translation and the practical examples would be mandated to be incorporated in the training programs of the training organisations. (Ref. Exercise 11, 'Spin Avoidance' training in the PPL(A) flight instruction syllabus)

European Aviation Safety Plan (EASp)

In addition, the importance of the safety issue is also emphasised in the EASp through the following LOCI-related action items:

— AER4.8 Response to upset conditions,

— AER4.10 Response to unusual attitudes,

— AER4.16 Flight crew are not adequately trained to respond to loss of control.

EASA Annual Safety Review

LOCI is also a recurring safety issue highlighted in the Agency's annual safety reviews, emphasising further the importance of this issue.

Regulatory harmonisation issue

The safety issue is also acknowledged by ICAO and other international aviation regulatory bodies, such as the FAA. In 2014, ICAO published amendments to Annex 1 and 6 detailing Standards and Recommended Practices (SARPs) related to Loss of Control Avoidance and Recovery Training (LOCART). The amendments to ICAO Annex 1 mandate UPRT for MPL and multi-pilot aeroplane type rating training courses, and recommend UPRT in an aeroplane for CPL training courses. In addition, the amendments to ICAO Annex 6 contain requirements on UPRT training programmes for CAT operators using aeroplanes. The ICAO 'Procedures for Air Navigation Services — Training (PANS-TRG)' also include UPRT provisions for MPL, CPL, initial multi-pilot type rating, recurrent, as well as instructor and inspector qualifications. In addition, ICAO published Doc 10011 'Manual on Aeroplane Upset Prevention and Recovery Training' which contains further Guidance Material.

In 2013, the FAA published the Code of Federal Regulations (CFR) 121.423 'Pilot: Extended Envelope Training' and the Advisory Circular (AC) 120-109 'Stall and Stick Pusher training', and in 2015 the AC 120-111 'Upset Prevention and Recovery Training'.

4.1.1. Safety risk assessment

As mentioned in 4.1. already, globally there is a rate of 1 fatal accident per year as a result of LOCI and there is a substantial number of SRs and other Agency analyses indicating the existence of significant safety risks related to LOCI. The safety risks that have been identified by the LOCART and ICATEE WGs, and have been confirmed by the RMG experts, are the following:

— Existing licensing training requirements do not provide:

- adequate in-depth theoretical knowledge instruction to ensure appropriate knowledge of awareness/recognition of developing or developed upsets, and to ensure knowledge of appropriate strategies to return an aeroplane to safe flight; and
- adequate in-depth flight training aimed at providing pilots with all the necessary skills to prevent an upset from developing or to recover from developed upsets;

— Existing initial type rating training courses do not provide:

- adequate in-depth type-specific theoretical knowledge instruction needed to ensure that pilots have appropriate type-specific knowledge of awareness/recognition of developing or developed upsets and to ensure knowledge of appropriate strategies to return an aeroplane to safe flight; and
- adequate in-depth FSTD flight training aimed at providing pilots with all the necessary skills to prevent an upset from developing or to recover from developed upsets.

Therefore, the probability of occurrence is assessed as 'improbable' and the severity of occurrence as 'catastrophic'.

Table 1: Safety risk matrix

Probability of occurrence		**Severity of occurrence**				
		Negligible	**Minor**	**Major**	**Hazardous**	**Catastrophic**
		0.5	2	3	5	8
Extremely improbable	1					
Improbable	2					**16**
Remote	3					
Occasional	4					
Frequent	5					

4.1.2. Who is affected?

This proposal will affect pilots, instructors, Approved Training Organisations (ATOs), competent authorities, inspectors, and the Agency.

4.1.3. How could the issue/problem evolve?

If no action is taken, the high risk of LOCI events will remain. Furthermore, the aforementioned SRs addressed to the Agency will not be dealt with, and the EASp and the EASA Annual Safety Review will continue to highlight the risk of LOCI. Moreover, the EU aviation regulations will not be harmonised with the ICAO SARPs and with other international aviation authorities' regulations, such as the FAA's.

4.2. Objectives

The overall objectives of the EASA system are defined in Article 2 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Chapter 2 of this NPA.

The overall objective of this task is to ensure that initial and operator training and checking is adequate to provide pilots with the knowledge, skills and attitude to be competent in preventing and, if necessary, recovering from a LOCI event.

The specific objectives are:

— to ensure adequate transposition of the ICAO amendments into the European Union requirements including:

- UPRT in an aeroplane for MPL and FSTD UPRT for (multi-pilot) type rating training courses;
- requirements for UPRT training programmes for CAT operators; and
- requirements for flight and FSTD instructors;

— to consider whether (multi-pilot) type rating and/or operator training programmes should consist of theoretical and practical training that includes:

- training in flight mechanics;
- training in all applicable flight control laws of the aeroplane type and the operational consequences resulting from law degradations;
- training in all the relevant specificities of the specific aeroplane type;
- recovery exercises from (impending) stall situations during the take-off and the approach phases;
- manual aeroplane handling exercises and techniques during stall prevention and stall recovery scenarios, including exercises at high altitude;
- realistic training scenarios that contain startle/surprise effects;
- more emphasis on manual aeroplane handling skills and, for initial type rating training, a requirement to conduct a go-around in the aeroplane with all engines operating;
- training on the conduct of a go-around at low speed with pitch trim in an unusual nose-up position, and consider including this exercise in the skill test or proficiency check;
- more emphasis on the potential degradation of situational awareness (basic pilot skills) and flight path management due to the increased flight crew reliance on aircraft automation;
- for the PPL(A) flight instruction syllabus, clarification of the intent using practical exercise examples of Exercise 11 'Spin Avoidance' training, and a consideration for mandating these sample exercises for inclusion in the training programme;

— to assess whether UPRT provisions should be extended to other licences, such as the CPL and the PPL, and to develop additional requirements accordingly;

— to ensure that inspectors of competent authorities are able to perform adequate oversight of UPRT, including the aeroplane and FFS upset recovery training exercises.

4.3. Policy options

Table 1 shows the options against the safety recommendations.

Table 2: Selected policy options

	Option 1			**Option 2 (= Option 1 + LAPL(A), PPL(A))**	
Objectives	**CPL(A) and ATPL(A) training courses**	**MPL training courses**	**Single-pilot high-performance complex aeroplanes in multi-pilot operations and multi-pilot type rating courses**	**LAPL(A)**	**PPL(A)**
To ensure adequate transposition of the ICAO amendments into the European Union requirements including:					
— UPRT in an aeroplane for CPL and MPL and FSTD UPRT for type rating training.	— TK LOs and examination of upset prevention and recovery are included in RMT.0595. — Upset prevention integrated into existing flight training. — Upset recovery training in an aeroplane mandated for the ATPL(A) training course, and is optional for CPL(A) training courses.		— UPRT integrated into respective type rating courses. — The upset recovery training in an aeroplane is a prerequisite for the respective type rating courses.	N/A	
— Requirements for flight and FSTD instructors.	— After receiving additional training, existing instructors have the privilege to deliver upset prevention training. New instructors will automatically be provided with upset prevention training. — New instructor privilege in case of delivering upset recovery training in an aeroplane.		— After receiving additional training, existing SFI/TRIs have the privilege to conduct UPRT in the FSTD. — New FSTD instructors will automatically be provided with UPRT.	After receiving additional training, existing instructors have the privilege to teach upset prevention. New instructors will automatically be provided with upset prevention training.	
To consider whether type rating and/or operator training programmes should consist of theoretical and practical training that includes:					
Training in flight mechanics.	Aerodynamics TK and flight training.	Aerodynamics TK and flight training.	Type-specific UPRT including emphasis on type-specific aerodynamics.	N/A	
Training in all applicable flight control laws of the aeroplane type and the operational consequences resulting from law degradations.	N/A	N/A	If applicable, type-specific UPRT including emphasis on mode degradations and immediate handling operational consequences.	N/A	
Training in all the relevant specificities of the specific aeroplane type.	N/A	N/A	Type-specific UPRT including emphasis on type-specific aerodynamics.	N/A	
Recovery exercises from (impending) stall situations during the take-off and the approach phases.	N/A	N/A	The RMG experts indicated that stall events during the take-off phase are difficult, if not impossible, to develop. A stall event during take-off in the clean configuration is unrealistic, and would lead to negative training. Consequently, stall events in the take-off configuration and approach phases are proposed.	N/A	

Manual aeroplane handling exercises and techniques during stall prevention and stall recovery scenarios including exercises at high altitude.	N/A	N/A	Type-specific UPRT	N/A
Realistic training scenarios that contain startle/surprise effects.	The startle and surprise effects are likely to be experienced by pilots undergoing the recovery training in an aeroplane.		Type-specific UPRT including training scenarios that attempt to expose students to the startle/surprise effect.	N/A
More emphasis on manual aeroplane handling skills and, for initial type rating training, a requirement to conduct a go-around in the aeroplane with all engines operating.	N/A	N/A	Type-specific UPRT with increased emphasis on manual handling exercises. During the flight training, a go-around is mandated with all engines operating with the intent to expose pilots to somatogravic illusion.	N/A
Training on the conduct of a go-around at low speed with pitch trim in an unusual nose-up position, and consider including this exercise in the skill test or proficiency check.	N/A	N/A	The Agency and RMG experts do not believe that this exercise should be checked. Only training-to-proficiency should be conducted. This exercise is conducted as a stall event during the approach in the landing configuration.	N/A
More emphasis on the potential degradation of situational awareness (basic pilot skills) and flight path management due to the increased flight crew reliance on aircraft automation.	N/A	N/A	Type-specific UPRT with increased emphasis on flight path management and manual handling skills whilst using TEM and CRM.	N/A
For the PPL(A) flight instruction syllabus, clarification of the intent using practical exercise examples of exercise 11 'Spin Avoidance' training, and a consideration for mandating these sample exercises for inclusion in the training programme.	N/A	N/A	N/A	Spin avoidance intent clarified by including definitions and sample demonstration/ exercise proposed for both LAPL(A) and PPL(A) for consistency.
To assess whether UPRT provisions should be extended to other licences, such as the CPL and the PPL, and to develop additional requirements accordingly.	ATPL(A) and CPL(A) training course to include UPRT TK and upset prevention flight instruction. In addition, ATPL(A) training course requires upset recovery training in an aeroplane. Upset recovery	N/A	N/A	The RMG group believes that focus on upset prevention at an early stage will benefit a pilot later in life. Upset recovery training is optional for PPL(A) (or LAPL(A)) and may be credited towards the ATPL(A) training course.

	training is optional for CPL(A) training course graduates.			
To ensure that inspectors of competent authorities are able to perform adequate oversight of UPRT including the aeroplane and FFS upset recovery training exercises.	Guidance Material developed by the Agency to ensure that inspectors have knowledge and understanding of UPRT in an aeroplane, in particular the upset recovery training.		Guidance Material developed by the Agency to ensure that inspectors have knowledge and understanding of UPRT in an FSTD, in particular the upset recovery training. **Note:** Also similar Guidance Material included for flight operations inspectors.	N/A

4.4. Methodology and data (only for a full RIA)

4.4.1. Applied methodology

The methodology applied for this RIA in order to assess the impacts is the Multi-Criteria Analysis (MCA), which allows comparing all options by scoring them against a set of criteria.

MCA covers a wide range of techniques that aim to combine a range of positive and negative impacts into a single framework to allow easier comparison of the scenarios. Essentially, it applies cost–benefit thinking to cases where there is a need to present impacts that are a mixture of qualitative, quantitative and monetary data, and where there are varying degrees of certainty. The MCA key steps generally include the following:

— establishing the criteria to be used to compare the options (these criteria must be measurable, at least in qualitative terms);

— attributing weight to each criterion to reflect its relative importance to the decision;

— scoring how well each option meets the criteria; the scoring needs to be relative to the baseline scenario;

— ranking the options by combining their respective weights and scores; and

— performing sensitivity analysis on the scoring to test the robustness of the ranking.

The criteria used to compare the options were derived from the Basic Regulation and the guidelines for Regulatory Impact Assessment developed by the European Commission. The principal objective of the Agency is to 'establish and maintain a high uniform level of safety' (Article 2(1) of the Basic Regulation). As additional objectives, the Basic Regulation identifies environmental, economic, proportionality and harmonisation aspects which are reflected below (apart from environmental aspects which are not relevant for this RIA).

The scoring of the impacts uses a simple scale with '+' and '–' to indicate the positive and negative impacts. This was found to be a proportionate way to assess the impacts, instead of analysing impacts with a scale from, e.g., – 5 to + 5 (very negative to very positive).

4.4.2. Data collection

The data requested for the analysis is based on expert judgement and estimates gathered through a survey addressed to stakeholders.

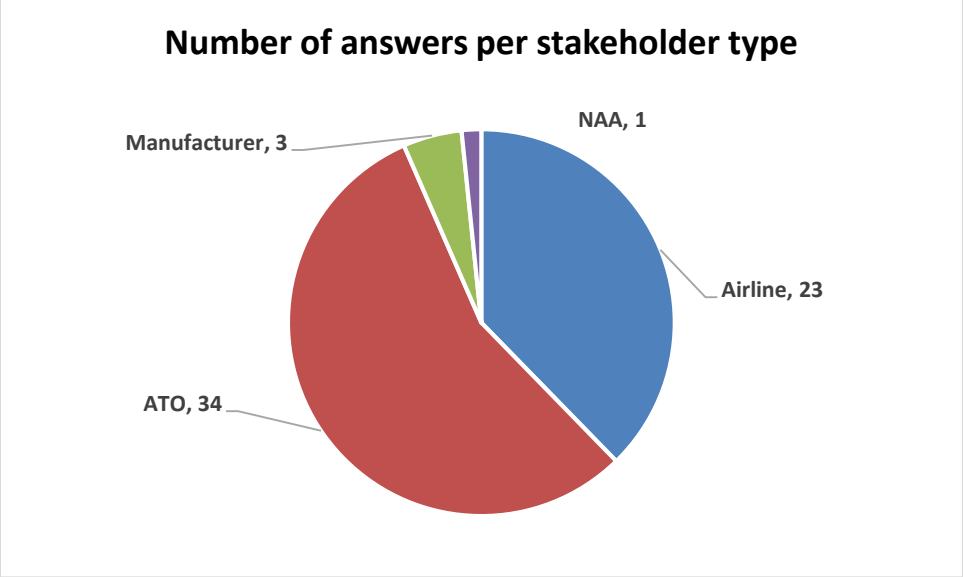
Expert judgement

The RMG consisted of 15 members, including the (co-)chairs of the ICATEE and LOCART WGs, with a variety of expertise in initial licensing and type rating training courses, as well as operator training. In addition, the RMG meetings were observed by the FAA and several Agency experts. All members contributed actively by providing the necessary expertise.

RMT.0581: UPRT survey

The survey was published on 26 January 2015 for a period of 2,5 months, and expired on 17 April 2015. It was addressed to the Rulemaking Advisory Group (RAG) and to the Flight Crew Licensing & Air Operations (FCL&OPS) Thematic Advisory Group (TAG) members and observers. A total of 61

responses were received from operators, aviation authorities and pilot unions (including third-country parties).



The feedback received provided limited data; it gave, however, some insight into the current developments in relation to the extent of implementation of UPRT based on the ICAO SARPs.

10 % of the ATOs which have answered have already developed UPRT on a voluntary basis. For the ATOs which have not yet developed UPRT training, 65 % of the ATOs are not yet in the process of developing UPRT elements.

4.5. Analysis of impacts

4.5.1. Safety impact

Option 0	The high risk of LOCI events/occurrences remains.	
Option 1	**CPL(A) and ATPL(A) training courses**	The safety level is expected to increase by improving existing training standards for the CPL(A) and ATPL(A) training course, based on the ICAO SARPs and on the ICATEE and LOCART WG recommendations.
	MPL training courses	The safety level is expected to increase by improving existing training standards for the MPL training course, based on the ICAO SARPs and on the ICATEE and LOCART WG recommendations. It should be highlighted that upset recovery training was already mandated for the MPL; however, the additional upset prevention training requirements and harmonisation with the future CPL(A) and ATPL(A) training course requirements are foreseen to increase the safety level.
	Single-pilot high-performance complex aeroplane in multi-pilot operations and multi-pilot type rating training courses	The safety level is expected to increase by improving existing training standards for said type rating training course, based on the ICAO SARPs and on the ICATEE and LOCART WG recommendations.
	Instructors	The safety level is expected to increase by improving existing standards for flight instructors and FSTD instructors delivering said type rating training courses, based on the ICAO SARPs and on the ICATEE and LOCART WG recommendations.
	NAA inspectors	Enhanced knowledge and understanding should contribute to an increased safety level through better oversight.
Option 2 **(= Option 1 + LAPL(A), PPL(A) training courses)**	**LAPL(A) and PPL(A) training courses**	The safety level is expected to further increase by improving existing training standards, mainly focussed on upset prevention, for the LAPL(A) and PPL(A) training courses, based on the RMG experts recommendation.

The Agency and the RMG experts believe that the safety level will markedly increase by the proposed amendments in Option 2. The amendments are based on the ICAO SARPs and on the ICATEE and LOCART WG recommendations. Moreover, the Agency and the RMG experts decided to also propose to improve the training standards for the LAPL(A) and PPL(A), albeit to a more proportionate safety level when compared to the CPL(A) and ATPL(A) training courses. Option 2 is, therefore, considered to provide the most appropriate option, improving existing training standards for the LAPL(A), PPL(A), CPL(A), ATPL(A), MPL, for single-pilot high-performance complex aeroplane in multi-pilot operations and multi-pilot aeroplane type rating training courses, and for instructors.

4.5.2. Social impact

Option 0	No impact	
Option 1	**CPL(A) and ATPL(A) training courses**	Mandated only for the ATPL(A) training course, upset recovery training in an aeroplane may have an impact on the psychological health of certain student pilots. However, the training provides a majority of student pilots with increased resilience against the psychological and physiological effects often associated with aeroplane upset conditions.
	MPL training courses	No impact as upset recovery training in an aeroplane was already mandated for the MPL.
	Single-pilot high-performance complex aeroplane in multi-pilot operations and multi-pilot type rating training courses	The upset recovery training in an aeroplane is a prerequisite for the multi-pilot type rating. Therefore, PPL(A) holders and CPL(A) training course graduates will have to complete this training prior to commencing the said type rating. As mentioned already, upset recovery training in an aeroplane may have an impact on the psychological health of certain student pilots. However, the training provides a majority of student pilots with increased resilience against the psychological and physiological effects often associated with aeroplane upset conditions.
	Instructors	The instructors' scope of competence will increase with the newly introduced upset recovery training course in an aeroplane. A positive side effect is an increased interest for the instructors themselves and a higher appeal for potential new instructors.
	NAA inspectors	No impact.
Option 2 (= Option 1 + LAPL(A), PPL(A) training courses)	**LAPL(A) and PPL(A) training courses**	No impact.

The requirement in FCL.745.A for upset recovery training in an aeroplane, which includes potential manoeuvres with more than 90 degrees bank, may have an impact on the psychological health of certain student pilots. This in turn could lead to the discontinuation of their training and consequently their intended future airline career. Conversely, for many student pilots this training is foreseen to provide them with increased resilience against the psychological and physiological effects often associated with aeroplane upset conditions, thereby enabling student pilots to better apply effective strategies and Standard Operating Procedures (SOPs) to recover from actual developed upsets.

4.5.3. Economic impact

Implementation costs

Table 3 — Unit cost and assumption per option item

Option 0	No impact	
Option 1	**CPL(A) and ATPL(A) training courses**	— Additional TK training and examination cost estimated at EUR 750 per student pilot due to the introduction of additional UPRT TK. — Minimal additional training cost related to the integration of upset prevention elements into the practical flight training. — ATPL(A) training course only, additional flight training cost related to the upset recovery training in an aeroplane estimated at EUR 3 500 per student pilot (this includes also aerobatic category aeroplanes directly purchased by the ATO or subcontracting this activity to a third party by the ATO).
	MPL training courses	— Additional TK training and examination cost estimated at EUR 750 per student pilot due to the introduction of additional UPRT TK. — Minimal additional training cost related to the integration of upset prevention elements into the practical flight training. **Note:** Upset recovery training in an aeroplane is already mandated for the MPL, therefore the impact is likely to be minimal.
	Single-pilot high-performance complex aeroplane in multi-pilot operations and multi-pilot type rating training courses	— ATOs providing type rating courses will have to amend their training syllabi to include the upset prevention and recovery training provisions and to ensure that their instructors are adequately trained. The foreseen changes are accommodated through the usual update process of training courses. ATOs are also free to integrate more than one prevention element into a single training session. — Additional TK and flight training cost estimated at EUR 1 500 per student pilot due to the introduction of UPRT. (EUR 1 000 for additional FFS session + additional EUR 350 TK training cost + EUR 150 for one-day extra accommodation = EUR 1 500)
	Instructors	— Training costs for existing instructors are estimated to represent 1 day per instructor at an approximate one-off cost of EUR 500 per instructor. — Only an estimated subset of 10 % of these instructors will be required to undergo an extensive additional upset recovery instructor training in an aeroplane for the ATPL(A) training course students. It is anticipated to last 1–2 weeks, and is likely to involve ground and flight training in an aerobatic category aeroplane at an estimated one-off cost of EUR 4 000 per instructor. — The additional FSTD instructor training may take several days and is likely to involve ground and flight training in an FFS at an estimated one-off total cost of EUR 2 500 per FSTD instructor. There are approximately

		50 000 flight crew members in the EU[9] and it is roughly estimated that there are 10 active[10] FSTD instructors for every 100 flight crew members, which makes a total of 5 000 active FSTD instructors.
	NAA inspectors	One-off additional training cost of maximum EUR 2 500 related to developing inspectors' knowledge and understanding of UPRT.
Option 2 **(= Option 1 + LAPL(A), PPL(A) training courses)**	**LAPL(A) and PPL(A) training courses**	Minimal additional training cost related to TK training and to the integration of upset prevention elements into the practical flight training.

9 Source: 'Study on the effects of the implementation of the EU aviation common market on employment and working conditions in the Air Transport Sector over the period 1997/2010', Table 4.5.

10 'Active' means instructors providing FSTD training on behalf of an operator.

Table 4 — Basic data and assumption on number of pilots and instructors for aeroplane in the EASA Member States (MSs)

Item	*Estimates for 2014*	
Pilots licences		
MPL	500	The average annual number of new MLP students in the EASA MSs for the next years is also 500
ATPL(A)	70 000	
CPL(A)	40 000	
ATPL(A) + CPL(A)	110 000	
PPL(A)	100 000	
Instructors		
Total number of instructors	20 000	Reasoning: there are about 12 000 flight examiners in the EASA MSs => it is assumed that the number of instructors is approximately 2 times more.
Total number of new instructors able to provide recovery training for ATPL(A) training	2 00	
NAAs		
Total number of NAA staff	7 000	
OPS inspectors	350	5 % of NAA staff

The figures in Table 5 form the basis of Table 5 below.

Table 5 — Total implementation cost impact per option item

On the basis of a 10-year appraisal period

Cost impact per option		Assumption	Estimated number of persons subject to this option item per year	Unit cost	Type of cost (one-off/ recurrent)	Total annual costs	Potential maximum implementation cost for 10 years	Comments on the potential maximum cost impacts
Cost impact per option item								
Option 1: CPL(A) training courses	*1.0 %*	*Estimated number of CPL(A) students per year in the next year for the EASA MSs*	1 100	750	Recurrent	825 000	8 250 000	30 % of ATOs have already implemented or started to implement UPRT training; in that case, the cost impact should be lower than estimated
Option 1: ATPL(A) training course	*2.0 %*	*Estimated number of ATPL(A) students per year in the next year for the EASA MSs. Pilot career lasts approximately 30 years, i.e. 2 % per year of new pilots to renew the current number of pilots*	2 200	4 250	Recurrent	9 350 000	90 350 000	30 % of ATOs have already implemented or started to implement UPRT training; in that case, the cost impact should be lower than estimated
Option 1: MPL training courses	*500*	*Estimated number of MPL students per year in the next year for the EASA MSs*	500	750	Recurrent	375 000	3 750 000	These cost impacts are likely to be already included in the current training programmes

Option 1: Single pilot high-performance complex aeroplanes used in multi-pilot operations and multi-pilot aeroplane type rating training courses	*50 %*	*It is estimated that 50 % of the annual CPL and ATPL pilots would follow TR courses*	1 650	1 500	Recurrent	2 475 000	24 750 000	30 % of ATOs have already implemented or started to implement UPRT training; in that case, the cost impact should be lower than estimated
Option 1: Training cost for current instructors		*See table above for number of instructors*	20 000	500	One-off	*Not applicable*	10 000 000	
Option 1: New instructors able to provide recovery training in an aeroplane for the ATPL(A) training course		*See table above for number of **new** instructors*	2 00	4000	One-off	*Not applicable*	800 000	This cost impact to ensure adequate transition time to allow instructors to be trained before they have to train pilots
Option 1: FSTD instructors	*10*	*10 active FSTD instructors for every 100 flight crew members (EASA Decision 2015/012/R) Scope: ATPL + CPL*	11 000	2500	One-off	*Not applicable*	27 500 000	Some FSTD instructors are already currently trained thanks to ED Decision 2015/012/R. Therefore, this is a potential maximum cost impact.
Option 1: Inspectors & NAAs for OPS	*5 %*	*Estimated share of OPS inspectors in NAAs*	350	2500	Recurrent	*Not applicable*	875 000	
Option 2: LAPL(A), PPL(A)	*2.5 %*	*PPL lasts approximately 40 years, i.e. 2.5 % per year of new pilot to renew the current number of pilots*	2 500	200	Recurrent	500 000	5 000 000	
Total costs per option over 10 years								
Total costs: Option 1							166 275 000	
Total costs: Option 2							171 275 000	

With the introduction of UPRT in the various courses, an economic impact is expected in the order of magnitude of EUR 170 million over 10 years, i.e. EUR 17 million per year. However, in comparison to the overall cost of the training courses, the additional cost related to UPRT is minimal.

Non-quantifiable benefits

In addition, it should be highlighted that insurance cost for operators may be reduced as a consequence of the reduced risk of pilots being better trained to cope with developing and developed upsets. This is not estimated in this economic impact section due to lack of information.

Moreover, pilots trained in the EASA MSs are likely to have a higher level of competency compared to their peers outside the EASA MSs. This may be a real advantage when looking for job opportunities in the aviation domain worldwide.

Stakeholders are invited to provide their feedback on the economic impact and the cost-effectiveness of the mitigation measures by providing comments based on quantified impacts (or estimates). Any information to better estimate the impacts in terms of unit cost per pilot or instructor and in terms of number of pilots or instructors will be very helpful.

Depending on the accuracy of the data provided, this RIA might be updated if necessary at the Opinion stage.

4.5.4. General Aviation (GA) and proportionality issues

Option 0	No impact	
Option 1	**CPL(A) and ATPL(A) training courses**	No impact.
	MPL training courses	No impact.
	Single-pilot high-performance complex aeroplane in multi-pilot operations and multi-pilot type rating training courses	The recovery training in an aeroplane is a prerequisite for the type rating training course. Therefore, PPL(A) holders (or CPL(A) training course graduates) will have to complete this training prior to commencing the said type rating. This should ensure that the PPL(A) holder attains a comparable safety standard to their peers who graduated from an ATPL(A) training course.

	Instructors	No impact.
	NAA inspectors	No impact.
Option 2 **(= Option 1 + LAPL(A), PPL(A) training courses)**	**LAPL(A) and PPL(A) training courses**	By including 'light' prevention elements in the theoretical and flight training for the LAPL(A) and PPL(A), the Agency and the RMG experts believe that a proportionate alleviation is provided from the more stringent requirements proposed for the CPL(A) and ATPL(A) training courses. Although the upset recovery training in an aeroplane is mandated for the ATPL(A) training course, the said training remains optional for LAPL(A) or PPL(A) holders if they wish to receive such training, and in addition the recovery course may be credited towards the ATPL(A) training course. In addition, the Agency has provided flexible instructor provisions in order for other types of instructors (such as CRIs) delivering training in an aeroplane to also become qualified to instruct in an upset recovery course.

Option 1 will not affect GA significantly as the UPRT is mainly focussed on CPL(A), ATPL(A) and MPL, and on type rating training courses. Upset recovery training in an aeroplane according to FCL.745.A is optional for LAPL(A) and PPL(A), and may be credited towards an ATPL(A) training course. Only PPL(A) pilots wishing to obtain a type rating will be required to conduct the upset recovery training in an aeroplane in accordance with FCL.745.A as a prerequisite for their first multi-pilot type rating.

Option 2 will affect GA through 'light' TK and flight training on upset prevention. Compared to the CPL(A), ATPL(A) and the MPL, the impact is more proportionate. Upset recovery training in an aeroplane in FCL.745.A is optional for LAPL(A) and PPL(A), and may be credited towards an ATPL(A) training course. However, Option 1 includes a requirement for the conduct of the upset recovery training in an aeroplane as a prerequisite for the first multi-pilot type rating.

In addition, the type rating training course includes a requirement for type-specific UPRT. In case an FFS qualified for the training task is not available, the upset recovery training exercises in an FFS do not need to be conducted for the time being.

4.5.5. Impact on 'better regulation' and harmonisation

Option 0	Regulatory drift and lack of harmonisation will occur if this option is chosen. ICAO requires UPRT for MPL and for initial multi-pilot type rating training courses, and recommends this for the CPL(A) training course.	
Option 1	**CPL(A) and ATPL(A) training courses**	Harmonisation with ICAO SARPs — Annex 1
	MPL training courses	Harmonisation with ICAO SARPs — Annex 1
	Multi-pilot type rating training courses	Harmonisation with ICAO SARPs — Annex 1
	Instructors	Harmonisation with ICAO SARPs — Annex 1
	NAA inspectors	Harmonisation with ICAO SARPs — Annex 1 and 6
Option 2 **(= Option 1 + LAPL(A), PPL(A) training courses)**	**LAPL(A) and PPL(A) training courses**	ICAO does not require upset prevention and recovery training for PPL(A). Upset recovery training in an aeroplane is optional for LAPL(A) or PPL(A) holders if they wish to receive such training. As GA is also affected by LOCI events, upset prevention training will support in increasing the safety level without providing a significant additional burden.

The requirement for the conduct of upset recovery training in an aeroplane will pose initial implementation challenges for ATOs. It is a new course and requires instructor training for an extension of the instructor privileges. Moreover, for some parts of the recovery course aeroplanes qualified and capable of delivering the training should be utilised in order to ensure that an adequate margin of safety is maintained.

The Agency also proposes to set up a UPRT advisory board to support the implementation and provision of further guidance, in particular for the upset recovery training in an aeroplane.

There is no danger of duplication at national level and the proposal does not have an impact on Member States' obligations towards ICAO.

The Aircrew and Air Operations Regulations will be harmonised with the ICAO SARPs. Although Option 1 is fully in line with ICAO, Option 2 requires more than ICAO does, because the proposal also includes LAPL(A) and PPL(A).

4.5.6. Comparison of options

Table 6 — Summary of impacts per option and per criteria

Type of impacts	*Option 0*	*Option 1 (commercial pilots)*	*Option 2 (option 1 + GA pilots)*
Safety impact	–	+	++
Social impact	0	+	+
Economic impact	0	– (minor negative impact)	–/0 (very minor negative impact)
GA and proportionality issues	0	0	+
Impact on 'better regulation' and harmonisation	0	+ (compliant with ICAO)	+ ('better regulation' principles for GA)
Overall	**0**	**+**	**++**

If Option 0 is chosen, the high risk of LOCI events remains. Furthermore, the aforementioned SRs addressed to the Agency will not be dealt with, and the EASp and the EASA Annual Safety Review will continue to highlight the risk of LOCI. Moreover, the EU aviation regulations will not be harmonised with the ICAO SARPs and with other international aviation authorities' regulations, such as the FAA's.

Option 2 also addresses GA pilots. This is also more than what ICAO requires; however, Option 2 is very cost-effective by providing a minimum UPRT training which could be beneficial to reduce the number of LOCI events in GA community. In that respect, Option 2 is well in line with the 'better regulation' principles. In contrast, Option 1 is fully harmonised with ICAO.

Based on an analysis of the LOCI occurrences in GA over the past years, it is clear that GA is also exposed to LOCI events. In addition, the RMG experts indicated that skill-based behaviours are most often the first type of behaviour encountered when a pilot-to-be begins their training. Therefore, exposing student pilots to upset prevention training at an early stage enhances their upset prevention skills later in life. The Agency and the RMG experts, therefore, believe that although ICAO has not included any UPRT provisions for PPL(A), a certain level of mitigating measures should be included in these proposals, albeit to a lesser and more proportionate safety level. The Agency and the RMG experts, therefore, agreed to propose Option 2 as the best option. Both Option 1 and 2 are considered to be cost-effective.

4.5.7. Monitoring and ex post evaluation

The Agency foresees setting up a UPRT advisory board to support the implementation and to provide further guidance where needed. In addition, the Agency intends to organise workshops to further discuss and support any implementation-related issues.

5. References

5.1. Affected regulations

— Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011, p. 1)

— Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1)

5.2. Affected CS, AMC and GM

— Decision 2014/022/R of the Executive Director of the Agency of 1 April 2014 amending Acceptable Means of Compliance and Guidance Material to Part-FCL of Commission Regulation (EU) No 1178/2011 ('AMC and GM to Part-FCL – Amendment 1')

— Decision N^{o} 2012/007/R of the Executive Director of the Agency of 19th April 2012 on Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council ('Acceptable Means of Compliance and Guidance Material to Part-ORA)

— Decision 2014/025/R of the Executive Director of the Agency of 28 July 2014 adopting Acceptable Means of Compliance and Guidance Material to Part-ARO of Regulation (EU) No 965/2012 and repealing Decision 2014/014/R of the Executive Director of the Agency of 24 April 2014 ('AMC and GM to Part-ARO — Issue 3')

5.3. Reference documents

— ICAO Annex 1 (Personnel Licensing) and 6 (Operation of Aircraft) to the Chicago Convention on International Civil Aviation, signed at Chicago on 7 December 1944

— ICAO Doc 10011 'Manual on Aeroplane Upset Prevention and Recovery Training', first edition, 2014

— ICAO Doc 9868 'Procedures for Air Navigation Services – Training (PANS-TRG)', amendment No. 3, interim edition, April 2014

— ICAO Doc 9625 'Manual on Criteria for the Qualification of Flight Simulation Training Devices', third edition, 2009

— FAA Code of Federal Regulations (CFR) 121.423 'Pilot: Extended Envelope Training'

— Loss of Control Avoidance and Recovery Training (LOCART) FAA Aviation Rulemaking committee (ARC) 208 final report

— International Committee for Aviation Training in Extended Envelopes (ICATEE) final report

— FAA Aeronautical Circular (AC) 120-109 'Stall and Stick Pusher Training'

— FAA AC 120-111 'Upset Prevention and Recovery Training'

— EASA Safety Information Bulletin (SIB) 2013-02 ‘Stall and Stick Pusher Training’

— EASA SIB 2013-05 ‘Manual Flight Training and Operations’

— EASA SIB 2014-09 ‘Aeroplane Go-Around Training’

— Aircraft Upset Recovery Training Aid (AURTA), Revision 2

— UK CAA Paper 2013/02 ‘Monitoring Matters - Guidance on the Development of Pilot Monitoring Skills’

— Flight Safety Foundation publication ‘A Practical Guide for Improving Flight Path Monitoring’, November 2014

