



Terms of Reference

for a rulemaking task

Loss of Control Prevention and Recovery Training

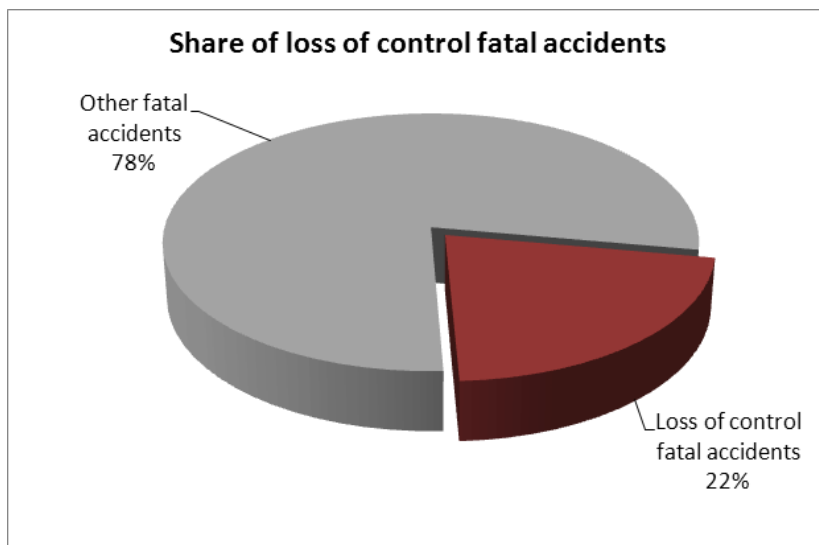
RMT.0581 AND RMT.0582 — ISSUE 2 — 4.5.2015

Applicability		Process map	
Affected regulations and decisions:	Part-FCL, Part-ARA, Part-ORA, Part-Definitions, Part-ORO, Part-ARO, CS-FCD, CS-SIMD and associated AMC or GM	Concept paper	Yes
		Rulemaking group	Yes
		RIA type	Full
Affected stakeholders:	Flight Crew, Instructors, Examiners, Approved Training Organisations, 'FSTD only' Operators, Aeroplane Operators, FSTD manufacturers and National Aviation Authorities.	Technical consultation during NPA drafting	TBD
		Publication date of the NPA	2015/Q2
Driver/origin:	Safety and Regulatory Harmonisation	Duration of NPA consultation	2 months
		Review group	Yes
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, SOUF-2010-009	Focussed consultation	TBD
		'Accelerated procedure' ED Decision on AMC/GM to Part-ORO	
	European Aviation Safety Plan (EASP 2013–2016) – safety actions.	Rulemaking lead	FS.3.2
		Rulemaking group	Yes
		RIA Type	Light
		Publication date of the ED Decision	April 2015
		Publication date of the Opinion	2016/Q1
		Publication date of the Decision	2017/Q1



1. Issue and reasoning for regulatory change

This task will address the prevention and reduction of loss of control in-flight accidents. Over the past 10 years approximately 20 % of worldwide fatal accidents in Commercial Air Transport (CAT) operation with aeroplanes can be attributed to loss control in flight. Loss of control is related to an upset condition, an in-flight condition by which an aeroplane exceeds the parameters normally experienced in normal line operations or training. An upset is generally recognised as a condition of flight during which the pitch of the aeroplane unintentionally exceeds either 25 degrees nose up or 10 degrees nose down; or a bank angle exceeding 45 degrees; or flight within the aforementioned parameters but at inappropriate airspeeds. The term 'loss of control in-flight' (LOCI) is a categorisation of accidents and incidents that result from an extreme manifestation of a deviation from the intended flight parameters.



EU carriers fatal accidents 2002-2011 in Commercial Air Transport (CAT) operations, 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.

1.1 Safety Recommendations

Various recent loss of control accidents have highlighted a further need for improvements in pilot training and checking to prevent and reduce this type of accidents. Several safety recommendations related to this issue have been addressed to the Agency 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 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 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 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)

1.2 European Aviation Safety Plan (EASp) action items

The following safety actions are related to this topic:

- 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.

1.3 LOCART and ICATEE

Two working groups (WG), Loss of Control Avoidance and Recovery Training (LOCART) and International Committee for Aviation Training in Extended Envelopes (ICATEE), have been examining various means and solutions to address the current situation. The LOCART initiative, with EASA participation, was commenced in March 2012 by FAA and supported by ICAO. The LOCART WG consists of technical experts that include experts of the FAA aviation rulemaking committee (FAA ARC 208). The ARC is a committee established by the FAA Administrator with the intent to provide FAA with recommended regulations to solve the LOCART issue. The LOCART WG has provided recommendations to ICAO. 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 loss of control in flight accidents and incidents through enhanced Upset Prevention and Recovery Training (UPRT). The Agency also participated in the ICATEE WG. The outcome of the work completed by both working groups has been shared with the aviation community, notably with ICAO, FAA and the Agency. Coordination exists between LOCART and ICATEE. Both groups have finalised their findings and recommendations. In general, these recommendations propose an integrated approach to develop UPRT requirements for theoretical, FSTD and aeroplane training for both initial and recurrent pilot training.

1.4 ICAO developments

ICAO has also indicated that it will be publishing amendments to Annex 1 and 6 detailing standards and recommended practices (SARPS) related to loss of control prevention and recovery in 2014. The draft amendments to ICAO Annex 1 are anticipated to mandate UPRT for multi-pilot licence (MPL) and Type Rating training, and recommend on-aeroplane UPRT for the commercial pilot licence (CPL). In addition, draft amendments to ICAO Annex 6 are expected to contain requirements for UPRT training programs for commercial air transport operators (aeroplane). ICAO procedures for air navigation services - training (PANS-TRG) is expected to include evidence-based training (EBT) and UPRT provisions for MPL, CPL, initial type rating, recurrent and instructor qualifications. In addition, ICAO foresees the publication of a training manual as guidance material to the provisions in PANS TRG by third quarter of 2013. This manual would contain new recommendations for regulators, instructors and a 'training matrix' on UPRT developed by the ICATEE WG. The training matrix will illustrate flight simulation training device (FSTD) features and fidelity requirements versus training tasks. ICAO document 9625 will be updated by ICAO to reflect guidance on FSTD modelling for UPRT, instructor operating station (IOS) and on what manoeuvres should not be trained in an FSTD to avoid negative transfer of training.

1.5 Other developments

FAA and the Agency are currently studying the recommendations by the ICATEE and LOCART working groups. In parallel, FAA published an advisory circular (AC) 120-109 on 'approach to stall and stall recovery training'. The Agency has also published a safety information bulletin (SIB) 2013-02 on the same issue. In addition, FAA have published a safety alert for operators (SAFO) 13002 on 'manual flight operations' and subsequently the Agency published a SIB 2013-05 on 'manual flight training and



operations'. The main aim of SIB 2013-05 is to reach an appropriate balance between the use of automation and the need to maintain pilot manual flying skills. Moreover, the Agency held a workshop in 2013 with selected leading experts of the aviation community to discuss the loss of control issue and recommendations by ICATEE and LOCART. The discussions highlighted that there is still some disagreement on whether or not to mandate on aeroplane UPRT. Furthermore, based on ICATEE and LOCART working group recommendations, three areas were identified that require further consideration:

- developing realistic (startle inducing) scenarios for prevention (and recovery) training, using current technology, applicable to both aeroplane and FSTD training;
- introducing new devices for G-awareness, spatial disorientation and spin training;
- developing methods for improving and maintaining manual flying skills.

1.6 Recent developments — 2014/2015.

As a result of LOCI being one of the Agency's highest priorities and recent accidents with (third-country) aeroplane operators, the Agency has decided to take apply an accelerated procedure for AMC and GM related to Part-ORO developed by the RMT.0581 & RMT.0582 Rulemaking Group experts and the Agency, to be published in April 2015. This means that the proposed amendments will not be subject to the normal consultation process prior to publication, except for the internal Agency and focussed RAG/TAG/SCC consultation. The remaining material should be published with the NPA in 2015/Q2, albeit with a reduced consultation period of 2 months. Consequently, the Opinion and ED Decision are planned to be published in 2016/Q1 and 2017/Q1 respectively. It should be highlighted that the Agency, the Commission and the EASA Committee already agreed in 2014 to introduce loss of control prevention and recovery provisions under the Part-FCL licencing rules, but to postpone the entry into force of these provisions until April 2018 to allow stakeholders a transition time for compliance.

2. Objectives

The objectives of the European Union in the field of civil aviation are defined in Article 2 of Regulation (EC) No 216/2008 (the 'Basic Regulation'). This proposal will contribute to these objectives by addressing the issues outlined in Section 1.

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

The specific objectives are:

- to ensure an adequate transposition of the future ICAO amendments into the European requirements including:
 - on-aeroplane UPRT for MPL and Type Rating training;
 - requirements for UPRT training programs for commercial air transport operators; and
 - requirements for 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 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 of 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 program.
- to assess whether UPRT provisions should be extended to other licences, such as for the CPL and private pilot licence (PPL), and to develop additional requirements accordingly.
 - to ensure that inspectors of competent authorities are able to assess UPRT.

Note: This RMT is focussed on mitigation measures for the aeroplane category. Measures for other aircraft categories will not be addressed.

3. Specific tasks and deliverables

3.1. Tasks

- Review EASA Loss of Control workshop (2013) recommendations;
- Review LOCART and ICATEE working group recommendations;
- Review the amendments to the ICAO Annex 1 and 6 SARPS, in addition to ICAO Doc 10011, ICAO Doc 9868 and ICAO Doc 9995, containing UPRT and instructor training guidance;
- Review, if appropriate, any other Loss of Control-related material;
- Address safety actions of the European Safety Action Plan (EASp);
- Address safety recommendations;
- Develop a Regulatory Impact Assessment (RIA);
- Develop and amend, as appropriate, Commission regulations and Agency decisions to address the aforementioned objectives and issues.

Note: Coordination with RMT.0411 & RMT.0412 'CRM Training' is foreseen in relation to human factors issues linked to this task, such as the issues of the startle/surprise effect and workload management. In addition, coordination with RMT.0516 & RMT.0517 'Updating Part-ARO/ORO' is foreseen in relation to qualifications of flight operations inspectors.

3.2 Deliverables

- ED Decision relating to the 'accelerated procedure' applied in order to amend AMC and GM to Part-ORO (April 2015).
- Notice of Proposed Amendment (NPA).
- Opinion with draft Implementing Rules relating to Part-FCL, Part-ARA, Part-ORA, Part-Definitions, Part-ORO.
- Draft amendments to ED Decisions relating to Part-FCL, Part-ARA, Part-ORA, Part-Definitions, Part-ORO, CS-FCD and CS-SIM.
- Harmonise Commission regulations and Agency decisions with ICAO SARPs.



Note: When appropriate, the Agency may develop performance-based regulations in relation to selected elements of this task.

4. Profile and contribution of the rulemaking group

Profile of potential rulemaking group and its members:

- Initial pilot training and checking experience at CPL, MPL and type rating training level.
- Recurrent pilot training and checking experience.
- ATO management experience at licensing and recurrent level.
- Specific on-aeroplane UPRT experience.
- Performance-based risk management experience.
- Competent authority oversight experience.
- Extensive knowledge of ICAO SARPs and EU regulatory framework.

Note: The group should have an appropriate balance between regulators, operators, training organisations and pilot associations.

5. Annex I: Reference documents

5.1. Affected regulations

- Annex I (Part-FCL) 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 Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council as amended by Commission Regulation (EU) No 290/2012 of 30 March 2012 (OJ L: 311, 25.11.2011, p. 1).
- Annex VI (Part-ARA) to Commission Regulation (EU) No 290/2012 of 30 March 2012 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council (OJ L 100, 5.4.2012, p. 1).
- Annex VII (Part-ORA) to Commission Regulation (EU) No 290/2012 of 30 March 2012 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council (OJ L 100, 5.4.2012, p. 1).
- Annex I (Part-Definitions) to Commission Regulation (EU) No 965/2012 of 28 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).
- Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012 of 28 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).
- Annex II (Part-ARO) to Commission Regulation (EU) No 965/2012 of 28 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).

5.2. Affected decisions

- Decision 2011/016/R of the Executive Director of the Agency of 15 December 2011 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 (AMC and GM to Part-FCL) pursuant to Commission Regulation (EU) No 216/2008 of



the European Parliament and of the Council as amended by Commission Regulation (EU) No 290/2012 of 30 March 2012.

- Decision 2012/007/R of the Executive Director of the Agency of 19 April 2012 on Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 290/2012 of 30 March 2012 laying down technical requirements and administrative procedures related to civil aviation aircrew (AMC and GM to Part-ORA) pursuant to Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council.
- Decision 2012/015/R of the Executive Director of the Agency of 24 October 2012 on Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 965/2012 of 28 October 2012 laying down technical requirements and administrative procedures related to air operations (GM to Part-Definitions) pursuant to Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council.
- Decision 2012/017/R of the Executive Director of the Agency of 24th October 2012 on Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 965/2012 of 28 October 2012 laying down technical requirements and administrative procedures related to air operations (AMC and GM to Part-ORO and Part-ARO) pursuant to Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council.
- Decision 2014/008/R of the Executive Director of the European Aviation Safety Agency of 31 January 2014 adopting Certification Specifications and Guidance Material related for Flight Crew Data (CS-FCD).
- Decision 2014/033/R of the Executive Director of the European Aviation Safety Agency of 2 December 2014 adopting Certification Specifications for Simulator Data (CS-SIMD).

5.3. Reference documents

- ICAO Annexes 1 (Personnel Licensing) and 6 (Operation of Aircraft) to the Chicago Convention on International Civil Aviation, signed at Chicago on 07 December 1944
- ICAO Document 9868 — Manual of Procedures for Air Navigation Services - Training and guidance material, 1st edition, 2006 (Amendment 1, August 25, 2011)
- ICAO Document 9995 — Manual of Evidence-based Training, 1st edition, 2013
- ICAO Document 10011 — Manual on Aeroplane Upset Prevention and Recovery Training, 1st edition, 2014
- ICAO Document 9625 — Manual of Criteria for the Qualification of Flight Simulation Training Devices, AN/938, 3rd edition, 2009
- FAA §121.423 'Extended Envelope Training'
- Loss of Control Avoidance and Recovery Training (LOCART) FAA Aviation Rulemaking committee (ARC) 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 SAFO 13002 Manual Flight Operations
- EASA Safety Information Bulletin (SIB) 2013-02 Stall and Stick Pusher Training
- EASA SIB 2013-05 Manual Flight Training and Operations
- Aircraft Upset Recovery Training Aid (AURTA), revision 2
- EBT Data report (IATA, August 2013)
- UK CAA Paper 2013/02 — Monitoring Matters
- Flight Safety Foundation Publication – A Practical Guide for Improving Flight Path Monitoring, November 2014





European Aviation Safety Agency

Annex to ToR RMT.0581 and RMT.0582

Concept Paper

Loss of Control Prevention and Recovery Training



EXECUTIVE SUMMARY

The proposed rulemaking task (RMT) addresses a safety and regulatory harmonisation issue related to loss of control in flight. The specific objective is to ensure that initial and recurrent pilot training is adequate to provide a pilot with the competencies to prevent or recover from a loss of control in flight. Currently approximately 20 % of all fatal accidents in Commercial Air Transport (CAT) operation with aeroplanes over the past 10 years can be contributed to loss of control in flight. This equates to a global rate of about 1 fatal accident per year and a European rate of 1 per 3 years. An additional objective is to ensure that EU regulations are in compliance with ICAO standards and recommended practices (SARPS). ICAO has already made substantial progress supported by the loss of control avoidance recovery (LOCART) and International Committee for Aviation Training in Extended Envelopes (ICATEE) working group initiatives.

Moreover, there are numerous safety recommendations which request EASA to address the loss of control issue and several safety action items put forward in the European Aviation Safety Plan (EASp (2013–2016)) relating to the issue. This further indicates the severity and importance of the issue. The issue is considered complex as it concerns the Aircrew Regulation (Part-FCL, Part-ARA, Part-ORA), Certification Specification Flight Crew Data and Simulators (CS-FCD, CS-SIM) and Air Operations Regulations (Part-ORO). It is also considered complex because it affects on-going RMTs (RMT.0411/0412 crew resource management (CRM) training and RMT.516/517 updating Part-ARO and Part-ORO) and tasks to be initiated soon (Flight Simulation Training Devices (FSTDs)). In addition, it should be highlighted that currently not all information is available to address the issue and therefore may require further research and study. The issue is also considered to be controversial as, although stakeholders agree in general that it must be addressed, there are different positions on the approach to be taken.

The proposed mitigation measures include an integrated approach addressing initial and recurrent training with increased focus on prevention by specific upset prevention and recovery training (UPRT) covering theoretical, FSTD training and possibly on-aeroplane training. It is also proposed to address instructor and inspector competencies in this context.

The options identified propose either no amendment to existing regulation or an integrated approach to mitigate the issue through reviewing and amending theoretical training (TK), FSTD training, including mandating on-aeroplane UPRT for multi-pilot licence (MPL) and recommending on-aeroplane UPRT for other licences such as the commercial pilot licence (CPL) and private pilot licence (PPL) in line with ICAO. In addition, one option also mandates on-aeroplane UPRT for the CPL in addition to MPL. Based on the analysis, the Agency decided to commence rulemaking task RMT.0581/0582. The group members will, together with the Agency, review the recommendations and identified options to establish the most appropriate way forward. The chosen option may lead to rule changes for initial and recurrent pilot training, and training for instructors and inspectors. In addition, transitional measures are foreseen to provide time for training organisation and competent authorities to adapt to any new requirements. However, if the option for amending the existing regulation is not pursued, regulatory de-harmonisation with ICAO will occur and will not lead to the safety recommendations and EASp action items being addressed. It should be highlighted, however, that currently a number of CAT operators have already implemented some form of training to mitigate this issue, although they are not necessarily required to do so under the current regulations.



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1. Background

- 1.1 This concept paper is related to RMT.0581 and 0582. It aims to address the prevention and reduction of loss of control in flight accidents. Statistically, over the past 10 years approximately 20 % of worldwide fatal accidents in commercial air transport (CAT) operations with aeroplanes can be attributed to loss of control in flight. 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. These statistics in conjunction with various recent loss of control accidents have highlighted a need for improvements in pilot training to prevent and reduce this type of accidents. Furthermore, the European Aviation Safety Plan (EASp) also contains several action items related to this issue.
- 1.2 Two working groups, Loss of Control Avoidance and Recovery Training (LOCART) and International Committee for Aviation Training in Extended Envelopes (ICATEE), have been examining various means and solutions to address the current situation. The LOCART initiative, with participation of the European Aviation Safety Agency (EASA), was commenced in March 2012 by the Federal Aviation Authority (FAA) and supported by International Civil Aviation Organisation (ICAO). The LOCART WG consisted of technical experts that included experts of the Aviation Rulemaking Committee (FAA 208 ARC). The ARC is a committee established by the FAA Administrator with the intent to provide FAA with recommended regulations to solve the LOCART issue. The LOCART WG has provided recommendations to ICAO. 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 loss of control in flight accidents and incidents through enhanced upset prevention and recovery training (UPRT). EASA also participated in the ICATEE WG. The outcome of the work completed by both working groups will be shared with the aviation community, notably with ICAO, the FAA and EASA. Coordination exists between LOCART and ICATEE to ensure a common approach. Both groups finalised their findings and recommendations, and have presented their results.
- 1.3 In parallel, FAA has published an Advisory Circular (AC) 120-109, and EASA has published a Safety Information Bulletin (SIB) 2013-02, on 'Stall and Stick Pusher Training'. In addition, FAA has published a safety alert for operators (SAFO) 13002 on 'Manual Flight Operations' and subsequently EASA published a SIB 2013-05 on 'Manual Flight Training and Operations'. The main aim of SIB 2013-05 is to reach an appropriate balance between the use of automation and the need to maintain pilot manual flying skills. ICAO has also indicated that they will be publishing amendments to Annex 1 and 6 detailing standards and recommended practices (SARPS) related to loss of control prevention and recovery in 2014. In addition, ICAO foresees the publication of a training manual as guidance material to the provisions in PANS TRNG by third quarter of 2013. This manual will contain new recommendations for regulators, instructors and a 'training matrix' on UPRT developed by the ICATEE WG. The training matrix will illustrate Flight Simulation Training Device (FSTD) features and fidelity requirements versus UPRT tasks.

2. Identification of the issue

- 2.1 The regulations and associated Acceptable Means of Compliance (AMC) or Guidance Material (GM) that are foreseen to be affected are Annex 1 (Part-FCL), Annex VI (Part-ARA) and Annex VII (Part-ORA) to Commission Regulation (EU) No 1178/2011 amended by Commission Regulation (EU) No 290/2012, and Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012. In addition, on-going rulemaking tasks (RMTs) affected include RMT.0196 on FSTDs, RMT.0411 on Crew Resource Management (CRM) Training and tasks developing Certification Specifications on Flight Crew Data and FSTDs (CS-FCD and CS-SIM respectively). The CRM training task is currently addressing the issues of the startle/surprise effect and workload management.



- 2.2 This RMT will likely impact on flight crew, instructors, examiners, approved training organisations (ATOs), and operators, including 'FSTD only' operators, manufacturers and authorities.
- 2.3 This task is considered both complex and controversial. Complex because it affects several regulatory publications and may require coordination with other on-going RMTs, covering aircrew and operational rules. Moreover, it might require further research and study. The Agency does foresee that the research completed and recommendations presented by LOCART and ICATEE working groups may come of use during this RMT. The task can also be considered controversial as, although there is notable consensus among stakeholders that the issue needs to be addressed, there are different positions on the most appropriate course of action, such as on whether to mandate on-aeroplane training or not, or on the type of modelling to be used for flight simulation training devices (FSTDs).
- 2.4 If no action is taken, the situation remains unchanged and could potentially lead to additional accidents and incidents related to loss of control in flight. Furthermore, no action would also lead to international de-harmonisation, as the ICAO SARPS and several third country regulators (i.e. FAA) are currently reviewing and amending their regulations to address the same issue.
- 2.5 The root cause of this issue is multifaceted but has led to global accident rate of 1 accident (with 100 % fatalities) per year globally. Within Europe the rate is 1.6 fatal accidents per 10,000,000 flights or 1 fatal accident every 3 years. It therefore constitutes a high safety risk. A potential cause is the current level of training. This may be inadequate and needs to be improved to prevent such events or ensure safe recovery from situations outside the normal flight envelope. Underlying factors are that initial and recurrent training does not specifically cover training for situations outside the normal flight envelope and that existing FSTDs are not certified to accurately simulate situations outside the normal flight envelope.
- 2.6 Additional drivers for the rulemaking project are recent accidents that have highlighted a need to prevent and reduce loss of control related accidents. Several safety recommendations resulting from these types of accidents have been addressed to EASA. Furthermore, this issue is also driven by the safety action items contained in the European Aviation Safety Plan (2013-2016) (See appendices).
- 2.7 Furthermore, an EASA loss of control workshop was held in Q1/2013. Workshop participants were leading industry and authority experts, and some represented various loss of control initiatives, such as the LOCART and ICATEE working groups. The discussions at the workshop highlighted that an enormous amount of time and effort has already been spent on the issue.
- 2.8 Based on the ICATEE and LOCART recommendations, the most appropriate option to pursue is a harmonised and integrated approach to UPRT. The approach should cover theoretical knowledge (TK), practical flying and FSTD training. There should also be a change to the training paradigm from Upset Recovery or Unusual Attitude Training to UPRT, where the awareness and prevention are meant to avoid incidents, and the recovery training to reduce accidents. The emphasis of UPRT should ensure training to proficiency only and should not include checking. UPRT should be revisited during the entire pilot career by continually refreshing knowledge and awareness during recurrent training. Human factors should also be integrated into all training levels, especially in a multi-pilot environment, where the crew response, to any divergence that could lead to a loss of control situation, should be stimulated rather than focussing on individual pilot competencies alone.
- 2.9 As stated previously, ICAO, EASA and FAA have been studying the recommendations produced by LOCART and ICATEE. As a result, ICAO intends to amend Annex 1 by possibly mandating UPRT for MPL and Type Rating training, and by recommending UPRT for the CPL (on aeroplane UPRT). In addition, ICAO Annex 6 is expected to contain



requirements for UPRT training programs for commercial air transport operators (aeroplane). The amendments to ICAO PANS-TRG are expected to include Evidence Based Training (EBT) and UPRT provisions for MPL, CPL, initial type rating, recurrent and instructor qualifications. ICAO is also expected to publish a manual on Aeroplane Upset Prevention and Recovery training, and ICAO document 9625 with guidance on FSTD modelling for UPRT, instructor operating station (IOS) and what manoeuvres should not be trained in an FSTD to avoid negative transfer of training. This rulemaking task will consider these amendments to the ICAO documents for transposition into the European requirements.

2.10 This rulemaking task may take into account some of the below recommendations and proposals developed by LOCART, ICATEE, the 2013 EASA workshop and ICAO developments.

Theoretical Training	<ul style="list-style-type: none"> ▪ TK training to emphasise understanding and awareness of causal factors, awareness, prevention and recovery strategies. ▪ TK training at all levels, including initial, type rating and recurrent training. Focus should be on introducing UPRT TK training when commencing training for the commercial pilot licence (CPL) or multi-pilot licence (MPL). ▪ A knowledge based approach to upset prevention and recovery is essential. A solely theoretical approach without practical skill development has limited effectiveness. ▪ Introduce a one-off TK 'bridging'/UPRT fundamental course to provide additional training to current commercial air transport pilots who have not been exposed to UPRT before.
On-aeroplane Training	<ul style="list-style-type: none"> ▪ Limitations of FSTD motion cueing have not exposed pilots to the full range of attitudes and behaviours that on-aeroplane training would provide. On-aeroplane training will fill the gaps in pilot experience when confronted with an upset. ▪ On-aeroplane UPRT during initial licencing training exposes pilots to the physiological and psychological elements. Which in turn provides confidence that cannot be acquired through FSTD training. ▪ No additional risk identified by LOCART for providing UPRT on aeroplane compared to other flight training, provided the ATO has an effective SMS, has suitable aeroplanes and appropriately qualified instructors, and the authorities has adequately trained inspectors for oversight of UPRT. ▪ On-aeroplane training will be mandated by ICAO for the MPL, but recommended for the CPL. ▪ UPRT is not synonymous with aerobatic flight training. Only UPRT addresses the element of surprise and develops the full spectrum of analytical reasoning skills required to rapidly and accurately determine the course of recovery action during periods of high stress. ▪ UPRT should be either optional or mandated for current air transport pilots. This task will further assess the need for on-aeroplane UPRT for current pilots.
Aeroplanes for UPRT	<ul style="list-style-type: none"> ▪ The aeroplane must be certified as capable of supporting the training exercises for which it is used. Different training elements may require different aeroplane capabilities. Aerobatic capable aeroplanes may therefore not necessarily be required for UPRT.
Flight Simulation Training Device (FSTD) Training	<ul style="list-style-type: none"> ▪ UPRT FSTD training complements the application of techniques introduced during the on-aeroplane UPRT. ▪ FSTD used for UPRT should be appropriately qualified to deliver the training. The valid training envelope should be adhered to, to prevent



	<p>misleading and inappropriate techniques that can result in negative training.</p> <ul style="list-style-type: none"> ▪ To support UPRT, enhancements could be made to existing FSTD types (Ref. ICAO doc. 9625) to support training outside the normal flight/training envelope and associated UPRT scenarios. A choice could also be made between using type specific or representative FSTD simulation models. FAA will mandate the use of type specific simulation models during type rating UPRT. ▪ FSTDs to provide better objective feedback to instructors, possibly through the IOS. ▪ Introduce a one-off 'bridging'/UPRT fundamental course to provide additional UPRT in an FSTD to current commercial air transport pilots who have not been exposed to UPRT before. ▪ UPRT for commercial air transport pilots should be embedded in recurrent training, with the objective to re-enforce awareness and prevention of upset threats, and recovery training. ▪ Develop (realistic) evidence based training FSTD scenarios in the context of UPRT, which also produce surprise/startle effects. However, negative training transfer from FSTD to aeroplane must be avoided at all times. ▪ Introduction and certification of new already developed devices for (elements of) UPRT. These may serve as an alternative or be complementary to using on aeroplane training, such as spin training devices, G awareness devices and spatial disorientation devices.
Instructor competencies	<ul style="list-style-type: none"> ▪ Instructors need additional training to gain competencies to enable appropriate and specific UPRT instruction. ▪ Instructors should receive theoretical knowledge training appropriate to support their delivery of UPRT. ▪ On-aeroplane instructors need to be competent, experienced in delivering on aeroplane UPRT. Such an instructor should especially possess the appropriate skills for in-flight recovery. ▪ FSTD instructors need to be assessed by the ATO prior to UPRT on proper and consistent instructor knowledge (of device limitations) and capabilities (and not instruct beyond their knowledge on the subject) to deliver the UPRT instruction.
Competent authority inspector	<ul style="list-style-type: none"> ▪ Inspectors need additional training to enable appropriate oversight of UPRT.

Note: UPRT is considered as a new skill that will need to be developed with repetition over a period of time.

3 Identification of the possible options

The scope of this concept paper is to propose the way forward, by considering the possible different options, for Agency's rulemaking action, taking into account the ICATEE and LOCART recommendations, the ICAO activities, third country activities (i.e. FAA), the various safety recommendations and EASP action items, the outcome of the EASA workshop, and the pre-RIA (regulatory impact assessment) related to this task.

3.1 In line with Article 2 of Regulation (EC) No 216/2008 the specific objectives of the proposed approach are to:

- ensure that Member States (MS), industry and the Agency develop harmonised concepts and rules for addressing the identified safety risk and regulatory



coordination issue to achieve and maintain high and uniform safety for commercial and non-commercial operations;

- assist MS in fulfilling their obligations under the Chicago Convention, by providing a basis for a common interpretation and uniform implementation of its provisions, and by ensuring that its provisions are duly taken into account during the development of rules.

3.2 Three potential options have been identified as follows:

- Option 0: Do nothing - This means no change to the current Commission Regulations pertaining to the aviation domain.
- Option 1: Transposition of ICAO development.
- Option 2: Option 1 with additional requirements on CPL.

Table 1: Possible options

Option content	Option 0 – Do nothing	Option 1 – ICAO transposition	Option 2 – Option 1 with additional requirements CPL
Training content	No change	Rulemaking using an integrated approach to develop UPRT requirements through reviewing and amending theoretical training (TK), FSTD training and aeroplane training requirements for both initial and recurrent pilot and instructor training	= Option 1
UPRT training per licence type			
Mandatory training	No change	MPL	MPL and CPL
Recommended training	No change	CPL and other licences (e.g. PPL)	Other licences (e.g. PPL)



4. Analysis of impacts for the possible options

Criteria	Option 0 – Do nothing	Option 1 – ICAO transposition	Option 2 – Option 1 with additional CPL requirements
Safety impact	<p>No change in the level of safety.</p> <p>Safety recommendation and EASP action items not addressed.</p> <p>A high safety risk remains, however a number of CAT operators have already implemented some form of training to mitigate this issue, although they are not necessarily required to do so under the current regulations</p>	<p>Increased level of safety.</p> <p>Safety recommendations and EASP action items addressed.</p> <p>Safety risk reduced.</p>	<p>Highest level of safety.</p> <p>Safety recommendations and EASP action items addressed.</p> <p>Safety risk lowest, as risk further reduced when compared to option 1.</p>
Economic impact	<p>Potential competitive advantages as there are no compliance/implementation cost.</p>	<p>Compliance/Implementation issues due to:</p> <ul style="list-style-type: none"> ▪ Lack of suitably qualified instructors, especially for on-aeroplane UPRT. ▪ Required (re)training and selection of instructors for UPRT. ▪ An potential increase of aerobatic/UPRT capable aeroplanes required. ▪ Applicants for an MPL will have higher training costs. ▪ Potential requirements for FSTD enhancements (type specific model/representative) and/or introduction of new devices. ▪ NAA inspectors require additional training on overseeing on-aeroplane UPRT. ▪ Operators face increased cost due requirement to provide bridging UPRT courses to their current flight crews. ▪ Time needed to adapt/replace FSTDs, (re)train and select appropriate instructors / inspectors for UPRT. 	<p>Compliance/implementation issues due to:</p> <ul style="list-style-type: none"> ▪ Lack of suitably qualified instructors, especially for on-aeroplane UPRT. ▪ Required (re)training and selection of instructors for UPRT. ▪ A potential larger than option 1 increase of aerobatic/UPRT capable aeroplanes required. ▪ Applicants for both MPL and CPL will have higher training cost. ▪ Potential requirements for FSTD enhancements and/or introduction of new devices. ▪ NAA inspectors require additional training on overseeing on-aeroplane UPRT. ▪ Operators face increased cost due requirement to provide bridging UPRT courses to their current flight crews. ▪ Potential competitive disadvantages: as many third countries will not mandate on aeroplane training at CPL level, their initial training cost will be lower outside the EU.



Social impact		Due to potential cognitive issues developed during on-aeroplane training a pilot may need to discontinue their training and chosen career path i.e. an UPRT exercise could lead to unforeseen traumatic and stressful experiences for a student pilot.	Due to potential cognitive issues developed during on-aeroplane training a pilot may need to discontinue their training and chosen career path i.e. an UPRT exercise could lead to unforeseen traumatic stressful experiences for a student pilot.
Impact on regulatory coordination and harmonisation	Commission Regulations will not be in line with the ICAO SARPS and will also differ from FAA/TCCA regulations. Impact on Member State obligations towards ICAO.	Full harmonisation with ICAO SARPS.	Harmonisation with ICAO SARPS. However some requirements will be more stringent when compared to the ICAO SARPS.
Impact on existing organisations including the Agency	The Agency will not have addressed the Safety Recommendations and EASP action items.	<ul style="list-style-type: none"> ▪ The Agency will have addressed the Safety Recommendations and EASP action items. ▪ Training organisations and operators faced with higher training costs of pilots and instructors and cost of acquiring or enhancing training devices and aeroplanes. ▪ Time needed to (re)train and select appropriate inspectors. 	<ul style="list-style-type: none"> ▪ The Agency will have addressed the Safety Recommendations and EASP action items. ▪ Training organisations and operators faced with higher training cost for pilots, instructors, and cost of acquiring or enhancing training devices and aeroplanes. ▪ Time needed to,(re)train and select appropriate inspectors.

Note1: The environmental impact and proportionality issues have been omitted as they are not considered to be relevant in the comparison of options at this stage. However, they will be included in the full regulatory impact assessment (RIA) which has to be established in conjunction with the notice of proposed amendment (NPA) later on in the rulemaking process.

Note2: This rulemaking task will develop appropriate transitional measures to manage potential resource issues, such as a lack of qualified instructors or aeroplanes, as a direct result of newly proposed regulations.

5. Conclusion

To conclude, the current situation poses a high safety risk and might lead to further accidents and regulatory de-harmonisation if not addressed. In addition, there are several safety recommendations and EASP action items that are required to be addressed. The issue is considered complex while it affects several regulatory publications and on-going rulemaking tasks. It is also considered a controversial issue as there are different positions on the most appropriate course of action. The recommendations by LOCART and ICATEE show the need for an integrated approach to UPRT covering initial and recurrent pilot training, as well as instructor training. In addition, their proposals also include references to requiring on-aeroplane training and enhancing existing FSTD modelling. 3 options have been identified. The major difference between option 1 and 2 is the mandating of on-aeroplane UPRT for the CPL.

Based on the analysis, the Agency decided to commence rulemaking task RMT.0581/0582. The group members will, together with the Agency, review the aforementioned recommendations and identified options to establish the most appropriate way forward.



The chosen option may lead to rule changes for initial and recurrent pilot training, and training for instructors and inspectors. In addition, transitional measures are foreseen to provide time for training organisation and competent authorities to adapt to any new requirements.

6 Appendices

6.1 Safety Recommendations

Various recent loss of control accidents have highlighted a further need for improvements in pilot training and checking to prevent and reduce this type of accidents. Several safety recommendations related to this issue have been addressed to EASA as follows:

- FRAN-2012-039 - The French Accident Investigation Board (BEA) recommends that European Aviation Safety Agency (EASA) 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.

6.2 European Aviation Safety Plan (EASp) action items



The following safety actions from the EASp (2013-2016) are related to this topic:

- AER4.8 Response to upset conditions
- AER4.10 Response to unusual attitudes

