

**54th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS**

*Ulaanbaatar, Mongolia
07 – 11 August 2017*

**AGENDA ITEM 3: AVIATION SAFETY AND
AIR NAVIGATION**

**ENHANCING UPSET PREVENTION & RECOVERY TRAINING
(UPRT) IN MANAGING LOSS OF CONTROL – IN-FLIGHT
(LOC-I) INCIDENTS**

(Presented by Singapore)

INFORMATION PAPER

SUMMARY

Singapore recognises the importance of UPRT and has required its air operators to develop UPRT programmes to raise the level of knowledge and skills of their flight crew. Besides the structured approach of ‘Knowledge, Skills and Attitude’ (KSA) adopted under these programmes, there is also focus on the role of the flight instructors to transfer critical knowledge and experience in recognising and overcoming upset situations to the trainees beyond what the practical lessons that an advanced FTSD could provide. This ensures that pilots are equipped with the ability to recognise LOC-I symptoms and trained to respond with the appropriate handling skills.

The Conference is invited to:

- a) Note the contents of the paper;
- b) Where appropriate, implement UPRT programmes with focus on flight instructors’ KSA to reduce operational risks of LOC-I; and
- c) Encourage States to attend the upcoming Joint CAAS-EASA UPRT seminar in October and consider sharing experiences in implementing UPRT programmes.

ENHANCING UPSET PREVENTION & RECOVERY TRAINING (UPRT) IN MANAGING LOSS OF CONTROL – IN-FLIGHT (LOC-I) INCIDENTS

1. INTRODUCTION

1.1 Since 2001, LOC-I incidents/accidents has overtaken CFIT and runway excursions to become the leading cause of air accident fatalities.¹ To mitigate the risk of LOC-I, there have been a number of initiatives involving ICAO and aviation authorities to review and implement training programmes in UPRT. The overall objective is to ensure that initial, conversion and recurrent training is adequate to provide pilots with the Knowledge, Skills and Attitudes to recognise, prevent and if necessary, recover from a LOC-I situation.

1.2 In particular, in 2009, the International Committee for Aviation Training in Extended Envelopes (ICATEE), jointly with the Royal Aeronautical Society, did a study into LOC-I accidents/incidents and had identified several areas of concern, namely:

- a) High altitude upsets leading to a stall – in which the recovery actions would be to reduce the Angle of Attack (AOA) to un-stall the aircraft including putting the aircraft into a descent.
- b) Manual flying skills – where most upsets recovery actions would require manual handling intervention techniques.
- c) Instrument Meteorological Conditions (IMC) – in the event of an upset in this flight condition; flight crew's recovery actions would have to be based primarily on information from the aircraft instruments.
- d) Startle Factor – Recovery actions that are against the flight crew's intuitive actions.
- e) Monitoring – in some cases of LOC-I events, it was the Pilot Monitoring who might have been more aware of the aircraft state than the pilot executing the recovery.

1.3 The joint initiatives by ICAO, ICATEE, EASA and FAA resulted in the publication of several guidance materials to facilitate implementation of UPRT programmes, namely:

- a) ICAO Doc 10011 Manual on Aeroplane UPRT
- b) ICAO Doc 9868 Training – Chapter 7
- c) ICAO 9625 Manual of Criteria for the Qualification of FSTDs Vol I (Edn 4).
- d) ICATEE – Teaching UPRT by Dr Sunjoo Avani
- e) FAA-AC-120-109A – Stall & Stick Shaker Training
- f) FAA-AC-120-111 – UPRT
- g) EASA Annex II to ED Decision 2015

2. IMPLEMENTATION OF UPRT IN SINGAPORE

2.1 Taking reference from the above initiatives and guidance materials, CAAS conducted a review of its UPRT guidance materials and developed an updated Advisory Circular (AC) in August 2016 to guide its air operators and Aviation Training Organisations (ATOs) in the development and implementation of UPRT programmes (see [Annex A](#)).

¹ Boeing Accidents Statistics 1959-2011

2.2 The UPRT programme is incorporated into a pilot's training as part of:

- a) CPL, MPL and type-rating training provided by ATOs; and
- b) Type-rating and recurrent training provided by air operators.

2.3 As advocated by ICAO, an effective UPRT programme must give priority to awareness training as a preventive measure to upset, a holistic approach that focuses on preventive measures is needed as opposed to training in recovery measures. Some salient areas that should be incorporated in the UPRT curriculum include:

- a) Academic knowledge in aerodynamics (For trainees and instructors).
- b) UPRT in training curriculum of MPL/CPL training programmes.
- c) Recurrent Training for Operational Line pilots.
- d) Emphasis on manual flying skills.
- e) Introduction of the element of surprise in FSTD training exercises.

2.4 In pursuing a KSA (Knowledge, Skills, Attitude) approach to implement effective UPRT programme, an Evidenced-Based training philosophy is adopted.

Knowledge

- a) Understanding the causal factors in aeroplane upsets and the recovery techniques is critical to UPRT. As such, the academic content in this area aims to establish the foundation from which situational awareness, insight, knowledge and skills are developed.
- b) Understanding of:
 - i) Environmental factors such as Wake Turbulence, Thunderstorms, Icing, Clear Air Turbulence.
 - ii) System Malfunctions that affect the controllability of the aeroplane such as Pitot-Static Systems, Flight Controls, or Flight Instruments malfunctions.
 - iii) Human Factors elements such as Mode Reversions, Pilot Induced Oscillations, Disorientation and Distractions, Surprise factor amongst others.
 - iv) Basic theory of flight, flight envelope awareness and high speed aerodynamics at high altitudes.

Skills

- a) The training exercises in any UPRT programme are designed to prepare flight crew with the practical skills to be effectively employed in upset events. These include greater emphasis in Prevention and Recognition; and if necessary, the ability to Recover from aeroplane upset events.
- b) For an air operator, UPRT is typically conducted in a high fidelity FSTD or aircraft that can provide realism in such training. Broadly, the syllabus cover the following essentials:
 - i) Upset in nose high with wings level or with Angle of Bank
 - ii) Upset with nose low with wings level or with Angle of Bank
 - iii) Upset in power on and power off conditions.

- c) Progressively, the UPRT exercises would move on to scenario-based conditions such as the aeroplane in approach conditions with low power, in go-around conditions with the aeroplane in high nose and high power conditions, possibly with the inclusion of system malfunctions prior to a stall event.

Attitude

- a) To have an impact on the flight crew and to further motivate their development in handling upsets, the delivery of UPRT needs to be relevant. In this aspect, recent LOC-I events e.g. AF 447 accident, reinforces the need to be proficient in their Knowledge, Skills and Attitude competence.
- b) In reviewing recent LOC-I incidents, the causal/casual factors as well as the lessons learnt will be discussed

2.5 Since its implementation, the UPRT programme has benefited both air operators and flight crew. Feedback from air operators that have implemented UPRT programmes indicates that flight crew have expressed a better appreciation and understanding of the techniques in handling upsets. Prior to this, they could only imagine what an upset would look like. In addition, the reports from instructors who have undergone UPRT instructor training were also positive; they felt that the academic knowledge enhanced the Preventive aspect of UPRT. In addition, the simulator sessions enhanced the appreciation of Energy Management and the orientation of Lift Vectors. The flight crew felt that sharing by the instructors and the emphasis on energy management and lift-drag vs power at high altitudes were very beneficial.

3. POSSIBLE IMPROVEMENTS TO UPRT

3.1 The development of UPRT is dynamic. It is important to monitor developments that would arise out of the discussions in this area by safety experts, OEMs and training establishments. Based on Singapore's implementation of UPRT, we have identified several possible improvements:

- a) Use of advanced FSTD and structured training programme. This will facilitate the effective development of flying skills to overcome challenging situation or prevent an aeroplane entering an upset and if entered, recover from it. Windshear, unreliable airspeed and Controlled Flight into Terrain (CFIT) scenarios were evidence of successful training programmes leveraging on the realism of FSTD and structured training programme. Looking ahead, with improvements in the fidelity of FSTD and ability to simulate flight conditions in the extended flight envelope, the use of advanced high fidelity FSTD in LOC-I training presents an opportunity to further enhance the realism of such training.
- b) Importance of skilled and experienced flight instructors. As current FSTDs are still being developed to provide realistic UPRT programmes, to ensure effectiveness of UPRT programme, Singapore focuses on the ability of the flight instructor to transfer critical knowledge and experience in recognising and overcoming upset situations to the trainees beyond what the practical lessons that an advanced FTSD could provide.
- c) Raising awareness of situations prone to upsets. Notwithstanding today's FSTDs cannot fully replicate upset situations, it is still beneficial to raise awareness amongst trainees of scenarios where such upsets are more likely to occur e.g. during a base turn at night, when executing a missed approach.

4. ACTION BY THE CONFERENCE

4.1 The Conference is invited to:

- a) Note the contents of the paper;
- b) Where appropriate, implement UPRT programmes with focus on flight instructors' KSA to reduce operational risks of LOC-I; and
- c) Encourage States to attend the upcoming Joint CAAS-EASA UPRT seminar in October and consider sharing experiences in implementing UPRT programmes.

AC AOC-39(0)
2 August 2016



Advisory Circular

UPSET PREVENTION AND RECOVERY TRAINING (UPRT)

General	1
Purpose	1
Applicability	1
Cancellation	1
Effective date	1
References	1
Background	1
Definitions	2
Incorporating UPRT into a Pilot's Training Programme	3
Scope of an UPRT Programme	3
UPRT in CPL, MPL and Type Rating Training by ATO	4
Recurrent Training by AOC Holder	5
Bridge Training	5
Stall and UPRT Requirements for Type VII FSTD	5
Instructors	6
Templates and Scenarios	6
Appendix 1	7
Appendix 2	8
Appendix 3	10
Appendix 4	12
Appendix 5	13
Appendix 6	17
Appendix 7	18

- GENERAL.** Pursuant to paragraph 88B of the Air Navigation Order, the Director General of the Civil Aviation Authority of Singapore (DGCA) may, from time to time, issue advisory circulars (ACs) on any aspect of safety in civil aviation. This AC contains information about standards, practices and procedures acceptable to CAAS. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.
- PURPOSE.** This AC provides guidance to Singapore Air Operator Certificate (AOC) holders and Singapore Approved Training Organisations (ATO) for the development and implementation of UPRT.
- APPLICABILITY.** This AC applies to Singapore ATOs providing training leading to the issuance of a Commercial Pilot Licence (CPL), Multi-Crew Pilot Licence (MPL) and endorsement of a type rating. This AC also applies to Singapore AOC holders conducting UPRT in their recurrent training programme for type-rated pilots.
- CANCELLATION.** This is the first AC issued on this subject.
- EFFECTIVE DATE.** This AC is effective from 2 August 2016.
- REFERENCES.**
 - Air Operator Certificate Requirements (AOCR);
 - Singapore Air Safety Publication (SASP) Part 10;
 - ICAO Annex 1;
 - ICAO Annex 6 Part 1;
 - ICAO Doc 10011- Manual on Airplane UPRT;

— END —